MODERNIZATION
AND
FLEXIBLE INSTRUCTIONAL SPACE

Cherrywood Elementary School
BERRYESSA UNION SCHOOL DISTRICT

PROJECT MANUAL
August 22, 2018

IBI Group - Project No. 109583

IBI GROUP
160 West Santa Clara Street, Suite 800
San Jose, CA 95113 USA
Tel (408) 924-0811
Fax (408) 924-0844

PROJECT MANUAL

Cherrywood Elementary School
Modernization and F.I.S.

Cherrywood Elementary School
Berryessa Union School Dictrict
IBI Group Project No. 109583

Date: 8/21/2018

Owner: Berryessa Union School District
1376 Piedmont Road
San Jose, CA 95132

FILE No: 43-7

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APPL NO:
01-117059
AC KWen FLS SS
DATE OCT 11 2018

ACS: KRIS WEN
FLS: ANDY CHEN
SS: ED MAI

Deferred Approvals

None

ARCHITECT:
IBI Group
160 West Santa Clara Street, Suite 800
San Jose, CA. 95113

By: _____
Sharon A. Russo (C-27345)

STRUCTURAL ENGINEER:
Hohbach-Lewin, Inc.
260 Sheridan Avenue, Suite 150
Palo Alto, CA 94306

REGISTERED PROFESSIONAL ENGINEER
DANIEL G. LEWIN
No. S 3272
STRUCTURAL
STATE OF CALIFORNIA

By: _____
Dan Lewin (S-3272)

MECHANICAL/PLUMBING ENGINEER:
Alfa Tech
1321 Ridder Park Drive, No. 50
San Jose, CA 95131

By: _____
Timothy Chadwick (M-029729)

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY MALCOLM CHADWICK
No. M029729
Exp. 6-30-20
Mechanical
STATE OF CALIFORNIA

ELECTRICAL ENGINEER:
Alfa Tech
1321 Ridder Park Drive, No. 50
San Jose, CA 95131

By: _____
S. Mark Fisher (E-16525)

REGISTERED PROFESSIONAL ENGINEER
S. MARK FISHER
E16525
Exp: 12-31-19
ELECTRICAL
STATE OF CALIFORNIA

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DSA DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

DSA-103 Issued 9/1/2017

List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #:

DSA File No.: 43-7
Application No.: 01-117059

Date Submitted: 8/21/18

Revised:
Revised:

School Name	Cherrywood Elementary School Modernization & F.I.S.	District	Berryessa Union School District

IMPORTANT: This form is only a summary list of structural tests and some of the special inspections required for the project. Generally, the structural tests and special inspections noted on this form are those that will be performed by the Geotechnical Engineer of Record, Laboratory of Record, or Special Inspector. The actual complete test and inspection program must be performed as detailed on the DSA approved documents. The appendix at the bottom of this form identifies work NOT subject to DSA requirements for special inspection or structural testing. The project inspector is responsible for providing inspection of all facets of construction, including but not limited to, special inspections not listed on this form such as structural wood framing, high-load wood diaphragms, cold-formed steel framing, anchorage of non-structural components, etc., per Title 24, Part 2, Chapter 17A.
NOTE: This form is also available for projects submitted for review under the 2007, 2010, and 2013 CBC.

INSTRUCTIONS: Click a plus sign (+) before any category or subcategory to reveal additional tests and special inspections. A shaded box indicates a test or special inspection that may be required, depending on the scope of the construction and other issues. A shaded box can be clicked indicating your selection of that test. **Note:** A minus (-) on a category or subcategory heading indicates that it can be collapsed. However, any selections you may have made will be cleared. Click on the "COMPILE" button to show only the tests and inspections finally selected. **For more information on use of this form, see DSA-103.INSTR.**

Note: References are to the 2016 edition of the California Building Code (CBC) unless otherwise noted.

REQUIRED	TEST OR SPECIAL INSPECTION	TYPE[1]	PERFORMED BY[2]	CODE REFERENCE AND NOTES
+	**SOILS**			
-	**CONCRETE**			**Table 1705A.3, ACI 318-14 Sections 26.12 & 26.13**
-	**7. CAST IN PLACE CONCRETE**			
	Material Verification and Testing:			
X	**a.** Verify use of required design mix.	**Periodic**	**SI***	**Table 1705A.3 Item 5, 1910A.1** (1909.2.3[+]). * To be performed by qualified batch-plant inspector and concrete sampling technician
X	**b.** Identifiy, sample, and test reinforcing steel.	**Test**	**LOR**	**1910A.2** (1909.2.4[+]); ACI 318-14 Section 26.6.1.2. DSA IR 17-10.16
X	**c.** During concrete placement, fabricate specimens for strength tests,perform slump and air content tests, and determine the temperature of the concrete.	**Test**	**LOR**	**Table 1705A.3 item 6**; ACI 318-14 Sections 26.5 & 26.12
X	**d.** Test concrete (f'_c).	**Test**	**LOR**	**1905A.1.16** (1909.3.7[+]); ACI 318-14 Section 26.12.
	Inspection:			
X	**e.** Batch plant inspection ○ Continuous ◉ Periodic	**See Notes**	**SI**	Default of **'Continuous'** per **1705A.3.3**; If approved by DSA, batch plant inspection may be reduced to **'Periodic'** subject to requirements in Section **1705A.3.3.1** or eliminated per **1705A.3.3.2.** (See Appendix for exemptions.)
-	**11. POST-INSTALLED ANCHORS:**			
X	**a.** Inspect installation of post-installed anchors	**See Notes**	**SI***	**Table 1705A.3 Item 4a (Continuous) & 4b (Periodic)** (see Appendix for exemptions). ACI 318-14 Sections 17.8 & 26.13 * May be performed by the project inspector when specifically approved by DSA.
X	**b.** Test post-installed anchors.	**Test**	**LOR**	**1910A.5** (1909.2.7[+]). (See Appendix for exemptions.)
+	**MASONRY**			**TMS 402-13/ACI 530-13/ASCE 5-13 Table 3.1.3 & TMS 602-13/ACI 530.1-13/ASCE 6-13 Table 5**

+ In the CODE REFERENCE AND NOTES column indicates DSA-SS/CC sections that may be used by community colleges, per 2016 CBC Sec. 1.9.2.2.

DSA DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

DSA-103 Issued 9/1/2017

List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.: 43-7
Application No.: 01-117059
Date Submitted: 8/21/18
Revised:
Revised:

-	**STEEL, ALUMINUM**			**Table 1705A.2.1, AISC 303-10, AISC 360-10, AISC 341-10, AISC 358-10, AISI S100-07/S2-10**
-	**17. STRUCTURAL STEEL, COLD-FORMED STEEL, AND ALUMINUM USED FOR STRUCTURAL PURPOSES**			
	Material Verification:			
X	**a.** Verify identification of all materials and: • Mill certificates indicate material properties that comply with requirements, • Material sizes, types and grades comply with requirements.	**Periodic**	*	**2203A.1** (2203.1[+]), **Table 1705A.2.1 Item 3a-3c;** AISI S100-07/S2-10 Section A2.1 & A2.2, AISI S200-12 Section A3, AISI S220-11 Section A4. * By special inspector or qualified technician when performed off-site.
X	**b.** Test unidentified materials	**Test**	**LOR**	**2203A.1** (2203.1[+]).
X	**c.** Examine seam welds of HSS shapes	**Periodic**	**SI**	DSA IR 17-3.
	Inspection:			
X	**e.** Verify and document steel fabrication per DSA approved construction documents.	**Periodic**	**SI**	Not applicable to cold-formed steel light-frame construction, except for trusses (**1705A.2.4**).
-	**19. WELDING:**			**1705A.2.5, Table 1705A.2.1 Items 4 & 5;** DSA IR 17-3, AWS D1.1 and AWS D1.8 for structural steel, AWS D1.2 for Aluminum, AWS D1.3 for cold-formed steel, AWS D1.4 for reinforcing steel. (See Appendix for exemptions.)
	Verification of Materials, Equipment, Welders, etc:			
X	**a.** Verify weld filler material identification markings per AWS designation listed on the DSA approved documents and the WPS.	**Periodic**	**SI**	DSA IR 17-3.
X	**b.** Verify weld filler material manufacturer's certificate of compliance.	**Periodic**	**SI**	DSA IR 17-3.
X	**c.** Verify WPS, welder qualifications and equipment.	**Periodic**	**SI**	DSA IR 17-3.
-	**19.1 SHOP WELDING:**			
X	**a.** Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds	**Continuous**	**SI**	**Table 1705A.2.1 Item 5a1-4.** Per AISC 360-10 (and AISC 341-10 as applicable). DSA IR 17-3.
X	**b.** Inspect single-pass fillet welds ≤ 5/16", floor and roof deck welds	**Periodic**	**SI**	**1705A.2.2, Table 1705A.2.1 Item 5a.5 & 5a.6.** Per AISC 360-10 (and AISC 341-10 as applicable). DSA IR 17-3.
-	**19.2 FIELD WELDING:**			
X	**a.** Inspect groove welds, multi-pass fillet welds, single pass fillet welds > 5/16", plug and slot welds	**Continuous**	**SI**	**Table 1705A.2.1 Item 5a1-4.** Per AISC 360-10 (and AISC 341-10 as applicable). DSA IR 17-3.
X	**b.** Inspect single-pass fillet welds ≤ 5/16"	**Periodic**	**SI**	**Table 1705A.2.1 Item 5a.5.** Per AISC 360-10 (and AISC 341-10 as applicable). DSA IR 17-3.
+	**WOOD**			
+	**OTHER**			

+ In the CODE REFERENCE AND NOTES column indicates DSA-SS/CC sections that may be used by community colleges, per 2016 CBC Sec. 1.9.2.2.

DSA DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

DSA-103 Issued 9/1/2017

List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.: 43-7
Application No.: 01-117059
Date Submitted: 8/21/18
Revised:
Revised:

List of required verified report(s):

1 All Structural Testing: Laboratory Verified Report - Form DSA-291
2 Concrete Batch Plant Inspection: Laboratory Verified Report - Form DSA-291
3 Shop Welding Inspection: Laboratory Verified Report - Form DSA-291, or, for independently contracting SI, Special Inspection Verified Report - Form DSA-292
4 Field Welding Inspection: Laboratory Verified Report - Form DSA-291, or, for independently contracting SI, Special Inspection Verified Report - Form DSA-292

KEY to Columns

1 **Type -**	2 **Performed By -**
Continuous – Indicates that a continuous special inspection is required	**GE** – Indicates that the special inspection is to be performed by a registered geotechnical engineer or his or her authorized representative
Periodic – Indicates that a periodic special inspection is required	**LOR** – Indicates that the test or inspection is to be performed by a testing laboratory accepted in the DSA Laboratory Evaluation and Acceptance (LEA) Program. See section 4-335, 2013 CCR Title 24, Part 1.
Test – Indicates that a test is required	**SI** – Indicates that the special inspection is to be performed by a special inspector

Name of Architect or Engineer in general responsible charge

Dan Lewin, S.E.

Name of Structural Engineer (When structural design has been delegated)

Dan Lewin 8/16/2018

Signature of Architect or Structural Engineer date

IDENTIFICATION STAMP
DIV OF THE STATE ARCHITECT
APP. #

AC N/A F/LS N/A SS

DATE 10/11/2018

+ In the CODE REFERENCE AND NOTES column indicates DSA-SS/CC sections that may be used by community colleges, per 2016 CBC Sec. 1.9.2.2.

DSA DIVISION OF THE STATE ARCHITECT
DEPARTMENT OF GENERAL SERVICES

DSA-103 Issued 9/1/2017

List of Required Structural Tests & Special Inspections - 2016 CBC

INCREMENT #

DSA File No.: 43-7

Application No.: 01-117059

Date Submitted: 8/21/18

Revised:

Revised:

Appendix: Work Exempt from DSA Requirements for Special Inspection or Structural Testing

Exempt items given in IR A-22 or the 2016 CBC (including DSA amendments) and those items identified below with an "X" by the design professional are NOT subject to DSA requirements for the structural tests or special inspections noted. Items marked as exempt shall be identified by either: 1) listing specific details/sheets noted in the spaces provided below OR 2) on the approved construction documents. The project inspector shall verify all construction complies with the approved construction documents.

Exempted by Design Prof.	Soils:
X	1. Deep foundations acting as a cantilever footing designed based on minimum allowable pressures per 2016 CBC Table 1806A.2 and having no geotechnical report for the following types of structures: free standing sign, scrolling message sign, scoreboard, covered walkway or shade structure with dead load less than 5 psf and other light-weight structures of which the apex is less than 8' above the highest adjacent grade.
X	2. Shallow foundations meeting the exception item #1 criteria specified in 2016 CBC Section 1803A.2.
(Optional) List details for applicable exempt items:	
	Concrete/Masonry:
X	1. Post-installed anchors for the following: 1) exempt non-structural components (e.g., mechanical, electrical, plumbing equipment - see item 7 for "Welding") given in CBC Section 1616A.1.18 (which replaces ASCE 7-10, Section 13.1.4) or 2) interior nonstructural wall partitions meeting criteria listed in exempt item 3 for "Welding."
X	2. Concrete batch plant inspection is not required for items given in CBC Section 1705A.3.3.2 subject to the requirements and limitations in that section.
X	3. Masonry retaining walls less than 4'-0" above the top of foundation not supporting a surcharge and free standing nonbearing non-shear masonry walls up to 6'-0" above adjacent grade do not require grout, mortar or masonry core testing or DSA special inspection.

Exempted by Design Prof.	Welding:
X	1. Solid-clad and open-mesh gates with maximum leaf span or rolling section for rolling gates of 10' and apex height less than 8'-0" above lowest adjacent grade. When located above circulation or occupied space below, these gates are not located within 1.5x gate/fence height (max 8'-0") to the edge of floor or roof.
X	2. Handrails, guardrails, and modular or relocatable ramps associated with walking surfaces less than 30" above adjacent grade (excluding post base connections per the 'Exception' language in Section 1705A.2.1); fillet welds cannot be ground flush.
X	3. Non-structural interior cold-formed steel framing spanning less than 15'-0", such as in interior partitions, interior soffits, etc. supporting only self weight and light-weight finishes or adhered tile, masonry, stone, or terra cotta veneer no more than 5/8" thickness and apex less than 20'-0" in height and not over an exit way. Maximum tributary load to a member shall not exceed the equivalent of that occurring from a 10'x10' opening in a 15' tall wall for a header or king stud.
X	4. Manufactured support frames and curbs using hot rolled or cold-formed steel (i.e., light gauge) for mechanical, electrical, or plumbing equipment weighing less than 2000# (equipment only) (connections of such frames to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	5. Manufactured components (e.g., Tolco, B-Line, Afcon, etc.) for mechanical, electrical, or plumbing hanger support and bracing (connections of such components to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	6. TV Brackets, projector mounts with a valid listing (see DSA IR A-5) and recreational equipment (e.g., playground structures, basketball backstops, etc.) (connections of such elements to superstructure elements using welding will require special inspection as noted in selected item(s) for section 19, 19.1 and/or 19.2 of listing above).
X	7. Any support for exempt non-structural components given in CBC Section 1616A.1.18 (which replaces ASCE 7-10, Section 13.1.4) meeting the following: 1) when supported on a floor/roof, <400# and resulting composite center of mass (including component's center of mass) <= 4' above supporting floor/roof, 2) when hung from a wall or roof/floor, <20# for discrete units or <5 plf for distributed systems.

+ In the CODE REFERENCE AND NOTES column indicates DSA-SS/CC sections that may be used by community colleges, per 2016 CBC Sec. 1.9.2.2.

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Revised:

Revised:

X	4. Epoxy shear dowels in site flatwork.	
(Optional) List details for applicable exempt items:		(Optional) List details for applicable exempt items:

+ In the CODE REFERENCE AND NOTES column indicates DSA-SS/CC sections that may be used by community colleges, per 2016 CBC Sec. 1.9.2.2.

DOCUMENT 00 00 00

PROJECT MANUAL

BID # B-02-2018-19

CHERRYWOOD ELEMENTARY SCHOOL

MODERNIZATION & F.I.S.

BERRYESSA UNION SCHOOL DISTRICT

Measure L Bond Program
Berryessa Union School District
1376 Piedmont Road
San Jose, CA 95132

Advertisement Dates: 11/06/18 and 11/13/18

Job Walk #1 Date: November 7, 2018

Job Walk #2 Date: November 14, 2018

Bid Due Date: November 29, 2018 Before 1:00pm

Contract Number: B-02-2018-19

DOCUMENT 00 11 16

NOTICE TO BIDDERS

Notice is hereby given that Berryessa Union School District (hereinafter referred to as "Owner") will receive sealed bids prior to the date and time stated for the Bid Opening for:

Berryessa Union School District
Cherrywood Elementary School
2550 Greengate Dr.
San Jose, CA 95132

The Modernization and F.I.S. Project will be constructed TBD.

As described in more detail in the bidding documents, the following is a list of various Bid Divisions.

Bids will be received for:

Cherrywood Elementary School
Bid B-02-2018-19 Modernization and F.I.S. Project

Work in the Contract comprises: Construction of a new F.I.S. space, interior finish improvements throughout campus, new HVAC unit.

Pre-Bid Conference/Job Site Visit

Two non-mandatory pre-bid conference/job site visits will be held to familiarize bidders with the project.

Cherrywood ES Modernization and F.I.S. Pre-Bid conference

Job Site Visit #1 will be conducted on November 7, 2018 at 3:15pm

Job Site Visit #2 will be conducted on November 14, 2018 at 3:15pm

Pre-Bid conferences/job site visits will be held at:
Cherrywood Elementary School
2550 Greengate Dr.
San Jose, CA. 95132

The lowest bid shall be determined:

1. On the amount of the base bid.

Pre-Bid Questions/RFI's

Requests for clarification or interpretation of the Bidding Documents must be in writing and received no later than:

November 20, 2018

Submission of Bids

Sealed bids for the Lump Sum Base Bid for each Bid Division must be received at the above address before 1:00 pm on:

November 29, 2018 before 1:00pm

Faxed Bids Will Not Be Accepted

Bids shall not expire for a period of 90 days after the date set for bid submission.

The Owner reserves the right to add or deduct any of the additive or deductive items after the lowest responsible and responsive bidder is determined.

This Project is subject to prequalification. If a bidder is not prequalified to bid on the Project, Owner will not accept the bid. The prequalification package is available at the BUSD website. Prequalification packages must be received at BUSD as follows:

On or before November 19, 2018

Addendum
Revisions, additions or deletions will be made by written addenda only as issued by Kitchell and IBI Group. The last Addendum, if any, will be issued on/or before TBD.

Basis of Award
Kitchell and the Owner will award the Bid Division contracts in accordance with Section 00 21 13 Instructions to Bidders.

Project Stabilization Agreement
The successful Bidder and its Subcontractors will be required to follow the nondiscrimination requirements set forth in the Bidding Documents and to pay prevailing wage rates at the location of the Work.

Contractors License
The successful Bidder will be required to have the appropriate State of California Contractor's License current at the time of submission of Bid.

CLASS B LICENSING

Project Documents
Project Notice to Bidders – Plans/Specifications, Reference Documents and Prequalification RFQ will be available at: ftp://ftp.ca.kitchell.com.

Project Bidding Documents will be available at: ftp://ftp.ca.kitchell.com.

Go to Kitchell website, select View and then Open ftp site in Window Explorer
Username: berryessa
Password: berryessa
Folder – TBD

For public works contracts awarded on and after January 1, 2015, those public works projects shall be subject to compliance monitoring and enforcement by the Department of Industrial Relations.

As of March 1, 2015, a contractor or subcontractor shall not be qualified to submit a bid or to be listed in a bid proposal subject to the requirements of Public Contract Code section 4104 unless currently registered and qualified under Labor Code section 1725.5 to perform public work as defined by Division 2, Part 7, Chapter 1 (§§1720 et seq.) of the Labor Code.

As of April 1, 2015, a contractor or subcontractor shall not be qualified to enter into, or engage in the performance of, any contract of public work (as defined by Division 2, Part 7, Chapter 1 (§§1720 et seq.) of the Labor Code) unless currently registered and qualified under Labor Code section 1725.5 to perform public work.

Schedule
Time of completion for the Project shall be Cherrywood ES Modernization & F .I.S. One Hundred Fifty Two (152) calendar days from receipt of the Owner's Notice to Proceed.

Bids will be opened, sealed and filed in the Purchasing Department of the Owner at:

Berryessa Union School District
1376 Piedmont Road
San Jose, CA 95132

Cherrywood Elementary School
Modernization and F.I.S.
on TBD, before 1:00 p.m. on the clock designated by the Owner or its representative as the bid clock. Facsimile (FAX) copies of the bid will not be accepted.

The Owner will require the successful Bidder to achieve the minimum goal of 3% DVBE (Disabled Veteran Business Enterprises) established in the bidding documents or to provide acceptable evidence of good faith efforts to do so. The DVBE documents must be sealed and filed in the Business Office of the Owner before the Bid Division Trade Contractor specific Bid Dates/Times listed above at which time the bids (including the DVBE forms) will be opened in public.

Bids must be accompanied by a bidder's bond, cashier's check, or certified check for at least ten percent (10%) of the amount of the base bid and made payable to the Owner. If a bid bond is used, it must be issued by an Admitted Surety (an insurance organization authorized by the Insurance Commissioner to transact surety insurance in the State of California during this calendar year), which shall be given as a guarantee that the bidder will enter into a Contract if awarded the Work and will be declared forfeited, paid to, or retained by the Owner as liquidated damages if the bidder refuses or neglects to enter into the Contract provided by the Owner after being requested to do so. The surety insurer must, unless otherwise agreed to by Owner in writing, at the time of issuance of the bond, have a rating not lower than "A-" as rated by A.M. Best Company, Inc. or other independent rating companies. Owner reserves the right to approve or reject the surety insurer selected by Contractor and to require Contractor to obtain a bond from a surety insurer satisfactory to the Owner.

Bids must be accompanied by an executed Fingerprinting Notice and Acknowledgment.

Pursuant to the Contract Documents, the successful bidder will be required to furnish a Payment (Labor and Material) Bond in the amount of one hundred percent (100%) of the Contract Sum, and a Faithful Performance Bond in the amount of one hundred percent (100%) of the Contract Sum, said bonds to be secured from Admitted Surety insurers (an insurance organization authorized by the Insurance Commissioner to transact business of insurance in the State of California during this calendar year). The surety insurers must, unless otherwise agreed to by Owner in writing, at the time of issuance of the bonds, have a rating not lower than "A-" as rated by A.M. Best Company, Inc. or other independent rating companies. Owner reserves the right to approve or reject the surety insurers selected by the successful bidder and to require the successful bidder to obtain bonds from surety insurers satisfactory to the Owner. The bidder will be required to furnish insurance as set forth in the Contract Documents.

The successful bidder will be allowed to substitute securities or establish an escrow in lieu of retainage, pursuant to Public Contract Code Section 22300, and as described in the Agreement Between Owner and Contractor and General Conditions.

The Owner will not consider or accept any bids from contractors who are not licensed to do business in the State of California, in accordance with the California Public Contract Code, providing for the licensing of contractors. In accordance with Section 3300 of said Code, the bidder shall have a "Class X for Modernization and F.I.S." license and shall maintain that license in good standing through Project completion and all applicable warranty periods. Bidder shall state the California contractor license number on the

Designation of Subcontractors form for all subcontractors doing more than one-half of one percent (0.5%) of the bidder's total bid. An inadvertent error in listing a California contractor's license number shall not be grounds for filing a bid protest or for considering the bid nonresponsive if the bidder submits the corrected contractor's license number to the Owner within 24 hours after the bid opening, or any continuation thereof, so long as the corrected contractor's license number corresponds to the submitted name and location for that subcontractor.

Subcontractors shall maintain their licenses in good standing through Project completion and all applicable warranty periods. Owner reserves the right to reject any bid as nonresponsive if bidder or any subcontractor is not licensed in good standing from the time the bid is submitted to Owner up to award of the Contract, whether or not the bidder listed the subcontractor inadvertently, or if a listed subcontractor's license is suspended or expires prior to award of the Contract. Owner also reserves the right to reject any bid as non responsive if a listed subcontractor's license is not in good standing to perform the work for which it is listed from the time of submission of the bidder's bid to award of the Contract.

The Director of Industrial Relations of the State of California, in the manner provided by law, has ascertained the general prevailing rate of per diem wages and rate for legal holidays and overtime work. The Contractor must pay for any labor therein described or classified in an amount not less than the rates specified. Copies of the required rates are on file at the Owner's business office and are available to any interested party on request.

The Owner reserves the right to waive any irregularity and to reject any or all bids.

Unless otherwise required by law, no bidder may withdraw its bid for a period of ninety (90) days after the date set for the opening thereof or any authorized postponement thereof. The Owner reserves the right to take more than ninety (90) days to make a decision regarding the rejection of bids or the award of the Contract.

Advertise: 1st Publication Date _____
2nd Publication Date _____

By: _____
Its: _____

END OF DOCUMENT

DOCUMENT 00 21 13

INSTRUCTIONS TO BIDDERS

SECURING DOCUMENTS:

Drawings and Specifications are available at:

IBI Group
160 West Santa Clara Street, Suite 800
San Jose, CA 95113
408-924-0811

DEPOSIT:

A deposit of N/A Dollars ($ None) is required of each bidder securing Contract Documents. This deposit is a guarantee that the Contract Documents will be returned in good condition within fifteen (15) days from the bid date. If the Contract Documents have not been returned within fifteen (15) days of the bid date, the bidder's deposit will be forfeited.

BID FORMAT:

See section 00 11 16 Instructions to Bidders

PREQUALIFICATION:

This Project is subject to prequalification. If a bidder is not prequalified to bid on the Project, Owner will not accept the bid. See Appendix _____.

REGISTRATION:

The Owner shall not accept any bid as of March 1, 2015, or enter into any contract as of April 1, 2015, without proof of the bidder's current registration to perform public work under Labor Code section 1725.5.

The bidder shall not accept any subbid as of March 1, 2015, or enter into any subcontract as of April 1, 2015, without proof of the subcontractor's current registration to perform public work under Labor Code section 1725.5.

BIDS:

Bids to receive consideration shall be made in accordance with the following instructions:

1. Bids shall be made on a form therefor, obtained from the Architect or Owner. Bids not made on the proper form shall be disregarded. ***(ENTER SPECIFIC INFORMATION, IF ANY, E.G., BIDS BROKEN DOWN INTO PHASES.)*** Numbers must be stated in words and figures, and the signatures of all individuals must be in longhand.

2. No bid will be considered which makes exceptions, changes, or in any manner makes reservations to the terms of the drawings or specifications.

3. Questions regarding documents, discrepancies, omissions, or doubt as to meanings shall be referred immediately to the Architect who will send written instructions clarifying such questions to each bidder. Oral responses will not be binding on the Owner or Architect or any Construction Manager.

4. Each bid must give the full business address of the bidder and be signed by bidder with bidder's usual signature. Bids by partnerships must furnish the full name of all partners and must be signed in the partnership name by a general partner with authority to bind the partnership in such matters, followed by the signature and designation of the person signing. The name of the person signing shall also be typed or printed below the signature. Bids by corporations must be signed with the legal name of the corporation, followed by the name of the state of incorporation and by the signature and designation of the chairman of the board, president or any vice president, and then followed by a second signature by the secretary, assistant secretary, the chief financial officer or assistant treasurer. All persons signing must be authorized to bind the corporation in the matter. The name of each person signing shall also be typed or printed below the signature. Satisfactory evidence of the authority of the officer signing on behalf of a corporation shall be furnished.

5. Pursuant to the provisions of Sections 4100 to 4114, inclusive, of the Public Contract Code of the State of California, which are hereby incorporated and made a part hereof and these Instructions to Bidders, every bidder shall set forth in its bid:

   A. The name and location of the place of business and the California contractor's license number of each subcontractor who will perform work or labor or render service to the bidder in or about the construction of the work or improvement, or a subcontractor licensed by the State of California who, under subcontract to the bidder, specially fabricates and installs a portion of the Work or improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one-half (½) of one percent (1%) of the bidder's total bid. An inadvertent error in listing a California contractor's license number shall not be grounds for filing a bid protest or for considering the bid nonresponsive if the bidder submits the corrected contractor's license number to the Owner within 24 hours after the bid opening, or any

continuation thereof, so long as the corrected contractor's license number corresponds to the submitted name and location for that subcontractor.

B. The portion of the Work which will be done by each such subcontractor. If the bidder fails to specify a subcontractor for any portion of the Work to be performed under the Contract in excess of one-half (½) of one percent (1%) of the bidder's total bid, the bidder agrees to perform that portion itself. The successful bidder shall not, without the consent of the Owner:

1) Substitute any person as subcontractor in place of the subcontractor designated in the original bid.

2) Permit any subcontract to be assigned or transferred or allow it to be performed by anyone other than the original subcontractor listed in the bid.

3) Sublet or subcontract any portion of the Work in excess of one-half (½) of one percent (1%) of the total bid as to which the original bid did not designate a subcontractor.

6. The Director of Industrial Relations of the State of California, in the manner provided by law, has ascertained the general prevailing rate of per diem wages and the rate for legal holidays and overtime work. The Contractor must pay for any labor therein described or classified in an amount not less than the rates specified. Copies of the required rates are on file at the Owner's business office and are available to any interested party on request.

7. All bids must be accompanied by a completed Noncollusion Declaration and Sufficient Funds Declaration (Labor Code § 2810). All bids must be accompanied by an executed Fingerprinting Notice and Acknowledgment.

8. Bids must be accompanied by a certified check, cashier's check, or bidder's bond, for an amount not less than ten percent (10%) of the amount of the base bid, made payable to the order of the Owner. If a bidder's bond accompanies the bid, said bond shall be secured by an Admitted Surety (an insurance organization authorized by the Insurance Commissioner to transact business of insurance in the State of California during this calendar year). The surety insurer must, unless otherwise agreed to by Owner in writing, at the time of issuance of the bond, have a rating not lower than "A-" as rated by A.M. Best Company, Inc. or other independent rating companies. Owner reserves the right to approve or reject the surety insurer selected by Contractor and to require Contractor to obtain a bond from a surety insurer satisfactory to the Owner. Said check or bond shall be given as a guarantee that the bidder will enter into the Contract if awarded the Work, and in case of refusal or failure to enter into said Contract, the check or bond, as the case may be, shall be payable to the Owner and retained as liquidated damages.

9. Bids shall be sealed and filed as indicated in the Notice to Bidders. Irrespective of how a bidder chooses to deliver the bid and other documents to the Owner, the bidder is responsible for ensuring that the bid and other documents are actually received at the location designated in the Contract Documents for receipt of the bid and other documents prior to the time for the bid opening. Bids and other documents for any reason not actually received at the designated location prior to the time for the bid opening shall not be opened or considered.

10. **THIS CONTRACT "IS" SUBJECT TO THE DVBE REQUIREMENTS OF EDUCATION CODE SECTION 17076.11.**

WITHDRAWAL OF BIDS:

Bids may be withdrawn by bidders prior to the time fixed for the submittal of bids or any authorized postponement thereof. A successful bidder shall not be relieved of the bid unless by consent of the Owner or bidder's recourse to Public Contract Code §5100 et seq.

OPENING OF BIDS:

Opening of bids shall be as soon after the hour set as will be possible; opening and declaration to be as set forth in the Notice to Bidders. Any and all bidders will be permitted to attend.

EXAMINATION OF CONTRACT DOCUMENTS AND SITE:

Before submitting a bid, bidders shall examine the drawings, read the specifications, the form of Agreement between Contractor and Owner, and the other Contract Documents. Bidders shall visit the site of the proposed Work; examine the building, or buildings, if any, and any work that may have been done thereon. Bidders shall fully inform themselves of all conditions, in, at, and about the site, the building or buildings, if any, and any work that may have been done thereon.

Pursuant to Public Contract Code section 1104: 1) bidders shall not be required to assume responsibility for the completeness and accuracy of architectural or engineering plans and specifications, except on clearly designated design build projects; 2) however, bidders shall be required to review architectural or engineering plans and specifications prior to submission of their bids and to report any errors and omissions to the Architect or Owner; and 3) the review shall be confined to the bidder's capacity as a bidder and not as a licensed design professional.

FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR:

The form of Agreement between Owner and Contractor which the successful bidder will be required to execute, if awarded the Work, is a part of this Bid Package.

ADDENDA OR BULLETINS:

Any addenda or bulletins, issued during the time of bidding, shall form a part of the drawings and specifications loaned to the bidder for the preparation of its bid, shall be covered in the bid, and shall be made a part of the Contract Documents. All addenda or bulletins shall be signed by the Architect and approved by the Division of State Architect.

EVIDENCE OF RESPONSIBILITY:

Upon the request of Owner, a bidder shall submit promptly to the Owner or its designee satisfactory evidence showing the bidder's financial resources, the bidder's experience in the type of work required by the Owner, the bidder's organization available for the performance of the Contract, and any other required evidence of the bidder's or its subcontractor's qualifications to perform the proposed Contract. The Owner may consider such evidence before making its decision awarding the proposed Contract. Failure to submit evidence of the bidder's or its subcontractors' responsibility to perform the proposed Contract may result in rejection of the bid.

AWARD OF CONTRACT:

Rejection of any or all bids, to contract work with whomever and in whatever manner, to abandon work entirely, and/or to waive any informality in receiving of bids is reserved as the right of the Owner. Before the Contract is awarded, the Owner may at its sole discretion, require from the proposed Contractor on the Project further evidence of the reasonable qualifications of such contractor to faithfully, capably, and reasonably perform such proposed Contract and may consider such evidence before making its decision on the award of such proposed Contract.

The Contract shall be awarded to the lowest responsible and responsive bidder as interpreted by the Owner under California law and as specified herein and shall be entered into by the successful bidder within ten (10) days after mailing, faxing or delivery of the Notice of Award of Contract. Owner reserves the right, without any liability, to cancel the award of any bid for any reason at any time before the full execution of the Agreement between Owner and Contractor.

EXECUTION OF AGREEMENT BETWEEN OWNER AND CONTRACTOR:

The Agreement between Owner and Contractor shall be signed by the successful bidder in as many originals as the Owner deems necessary and returned, together with the required Contract bonds, insurance certificates, additional insured endorsement, declarations page, a Public Contract Code section 3006(a) Roof Project Certification, if required, and Independent Contractor Student Contact Form, within ten (10) days after the mailing, faxing or delivering of the Notice of Award of Contract. If the ten (10) day period would expire after the date for commencement of the Work, Contractor must submit the documents before the date of commencement of the Work. If the successful bidder does not comply with this paragraph, Owner may revoke and/or cancel the award

to the successful bidder and award the Contract to the next lowest bidder, or may otherwise proceed as allowed by law. A Roof Project Certification is not required if (1) the Owner has ADA (average daily attendance) of 2,500 or less, or (2) the Project involves repair of 25% or less of the roof, or costs $21,000 or less.

CONTRACT BONDS:

As required by the Contract Documents, two bonds, as itemized below and in the forms presented in these Contract Documents, shall be furnished by the successful bidder on the Project at the time of entering into the Contract and filed with the Owner before the successful bidder commences any work on the Project. They shall be in the form of surety bonds issued by Admitted Surety insurers (an insurance organization authorized by the Insurance Commissioner to transact business of insurance in the State of California during this calendar year). The surety insurers must, unless otherwise agreed to by Owner in writing, at the time of issuance of the bond, have a rating not lower than "A-" as rated by A.M. Best Company, Inc. or other independent rating companies. Owner reserves the right to approve or reject the surety insurers selected by Contractor and to require Contractor to obtain bonds from surety insurers satisfactory to the Owner.

Performance Bond in the amount of one hundred percent (100%) of the Contract Sum to insure Owner during construction, and for one year after completion and during any warranty or guaranty period, against faulty or improper materials or workmanship and to assure Owner of full and prompt performance of the Contract.

Payment Bond (Labor and Material) in the amount of one hundred percent (100%) of the Contract Sum in accordance with the laws of the State of California to secure payment of any and all claims for labor and materials used or consumed in performance of this Contract.

DRAWINGS, SPECIFICATIONS AND ADDENDA OR BULLETINS:

Return by each bidder of all drawings, specifications and addenda or bulletins in an unmutilated condition and without any marks or annotations is demanded within the time limit indicated under **DEPOSIT** in this section. (Revise to FTP site information)

SUBSTITUTION OF MATERIALS:

The Contractor must ensure that the proposed substitutions by the Contractor or its subcontractors are submitted to the Architect's office a minimum of fourteen (14) calendar days prior to the Bid Opening for review and possible approval of any equipment or materials thought to be equal to or better than those specified in the drawings or specifications. An addendum will be issued seven (7) calendar days prior to Bid Opening, including all equipment and materials deemed equivalent to those specified and approved by the Architect. Submittals shall include comparative spec-data of the specified equipment or material and the proposed substitution as set forth in the Contract Documents. Submittals without this information will be automatically rejected.

PAYMENTS:

Payments to the Contractor on account of the Contract shall be made in accordance with the terms of the Contract Documents.

TAXES:

The Owner is generally exempt from payment of Federal Excise Tax on materials. The Owner will furnish exemption certificates to the Contractor to be used to obtain materials ordinarily subject to Federal Excise Tax without payment of the tax. Bidder shall deduct Federal Excise Taxes from their bid prices before submitting bids, so that such taxes will not be included in the Contract Sum.

EARLY TERMINATION:

Notwithstanding any provision herein to the contrary, if for any fiscal year of this Contract the governing body of the Owner fails to appropriate or allocate funds for future periodic payments under the Contract after exercising reasonable efforts to do so, the Owner may upon thirty (30) days' notice, order work on the Project to cease. The Owner will remain obligated to pay for the work already performed but shall not be obligated to pay the balance remaining unpaid beyond the fiscal period for which funds have been appropriated or allocated and for which the work has not been done.

TIME OF COMPLETION AND LIQUIDATED DAMAGES:

Time of Completion for the Project shall be one hundred seventy-eight (178) calendar days from receipt of the Owner's Notice to Proceed.

Liquidated damages will accrue and may be assessed as provided in the Contract Documents. Should said Work not be Completed within the time limit as may be extended as herein provided (i.e., the Completion deadline), damages will be sustained by the Owner. It is understood and agreed that it is and will be impracticable or extremely difficult to determine the actual amount of damages which the Owner will sustain in the event of and by reason of such delay, and it is therefore agreed that the Contractor will

pay the Owner the sum of Two Thousand **Dollars ($2,000.00) per calendar day** for each and every day's delay beyond the Completion deadline as and for liquidated damages, during or as a result of each calendar day by which Completion of the Project is delayed beyond the Completion deadline; in case the Contractor fails to make such payment, the Owner may deduct the amount thereof from any money due or that may become due the Contractor under the Contract. Should such money not be sufficient, the Owner shall have the right to recover the balance from the Contractor or its sureties.

END OF DOCUMENT

DOCUMENT 00 31 00

SITE-VISIT CERTIFICATION

PROJECT: Cherrywood ES Modernization and F.I.S.

I certify that I visited the Site of the proposed Work and became fully acquainted with the conditions relating to construction and labor. I fully understand the facilities, difficulties, and restrictions attending the execution of the Work under contract.

Bidder fully indemnifies the Berryessa Union School District, its Architect, its Engineer, its Construction Manager, and all of their respective officers, agents, employees, and consultants from any damage, or omissions, related to conditions that could have been identified during my visit and/or the Bidder's representative's visit to the Site.

I certify under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: _____

Proper Name of Bidder: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

DOCUMENT 00 41 26

BID FORM

Berryessa Union School District
1376 Piedmont Road
San Jose, CA 95132

Dear Board Members:

The undersigned doing business under the firm name of:

_____

hereby propose and agree to enter into a Contract, to furnish any and all labor, materials, applicable taxes, equipment and services for the completion of Work described hereinafter and in the Contract Documents:

Cherrywood Elementary School Modernization & F.I.S.
2550 Greengate Drive
San Jose, CA 95132

prepared by:

IBI Group
160 West Santa Clara Street, Suite 800
San Jose, CA 95113

for the amount of:

TOTAL BASE BID:

_____dollars$ _____

11.1.6.1 HAZMAT UNIT PRICES

Contractor shall bid all quantities listed in the Appendix-A of the Asbestos Abatement and Lead Paint Stabilization Project Specifications under Base Bid. Any and all additional and/or deductions shall be based on the Abatement Unit Prices (Appendix-B) of the said specifications. Contractor is to attach the Unit Prices (Appendix-B) to this Bid Form.

11.1.6.2 COURSE-OF-CONSTRUCTION INSURANCE REQUIREMENTS

Contractor, during the progress of the Work and until final acceptance of the Work by Owner upon completion of the entire Contract, shall maintain Builder's Risk/Course-of-Construction insurance satisfactory to the Owner, issued on a completed value basis on all insurable Work included under the Contract Documents. This insurance shall insure against all risks, including but not limited to the following perils: vandalism, theft, malicious mischief, fire, sprinkler leakage, civil authority, sonic boom, explosion, collapse, flood, earthquake (for projects not solely funded through revenue bonds, limited to earthquakes equivalent to or under 3.5 on the Richter Scale in magnitude), wind, hail, lightning, smoke, riot or civil commotion, debris removal (including demolition) and reasonable compensation for the Architect's services and expenses required as a result of such insured loss. This insurance shall provide coverage in an amount not less than the full cost to repair, replace or reconstruct the Work. Such insurance shall include the Owner, the Architect, and any other person or entity with an insurable interest in the Work as an additional named insured.

The Contractor shall submit to the Owner for its approval all items deemed to be uninsurable under the Builder's Risk/Course-of Construction insurance. The risk of the damage to the Work due to the perils covered by the Builder's Risk/Course-of-Construction insurance, as well as any other hazard which might result in damage to the Work, is that of the Contractor and the surety, and no claims for such loss or damage shall be recognized by the Owner, nor will such loss or damage excuse the complete and satisfactory performance of the Contract by the Contractor.

If written notice of the Award of Contract is mailed, faxed, or delivered to the undersigned at any time before this bid is withdrawn, the undersigned shall, within ten (10) days after the date of such mailing, faxing, or delivering of such notice, execute and deliver an agreement in the form of agreement present in these Contract Documents and give Performance and Payment Bonds in accordance with the specifications and bid as accepted.

The undersigned hereby designates as the office to which such Notice of Award of Contract may be mailed, faxed, or delivered:

_____

_____

Our Public Liability and Property Damage Insurance is placed with:

_____

_____

Our Workers' Compensation Insurance is placed with:

_____

_____

Circular letters, bulletins, addenda, etc., bound with the specifications or issued during the time of bidding are included in the bid, and, in completing the Contract, they are to become a part thereof.

The receipt of the following addenda to the specifications is acknowledged:

Addendum No. _____ Date _____ Addendum No. _____ Date _____
Addendum No. _____ Date _____ Addendum No. _____ Date _____
Addendum No. _____ Date _____ Addendum No. _____ Date _____

This bid may be withdrawn at any time prior to the scheduled time for the opening of bids or any authorized postponement thereof.

A bidder shall not submit a bid unless the bidder's California contractor's license number appears clearly on the bid, the license expiration date and class are stated, and the bid contains a statement that the representations made therein are made under penalty of perjury. Any bid submitted by a contractor who is not licensed pursuant to Business and Professions Code section 7028.15 shall be considered nonresponsive and shall be rejected. Any bid not containing the above information may be considered nonresponsive and may be rejected.

NOTE: Each bid must give the full business address of the bidder and be signed by bidder with bidder's usual signature. Bids by partnerships must furnish the full name of all partners and must be signed in the partnership name by a general partner with authority to bind the partnership in such matters, followed by the signature and designation of the person signing. The name of the person signing shall also be typed or printed below the signature. Bids by corporations must be signed with the legal name of the corporation, followed by the name of the state of incorporation and by the signature and designation of the chairman of the board, president or any vice president, and then followed by a second signature by the secretary, assistant secretary, the chief financial officer or assistant treasurer. All persons signing must be authorized to bind the corporation in the matter. The name of each person signing shall also be typed or printed below the signature. Satisfactory evidence of the authority of the officer signing on behalf of a corporation shall be furnished.

The undersigned declares under penalty of perjury under the laws of the State of California that the representations made in this bid are true and correct.

Print or Type Name: _____

Title: _____

Name of Company as Licensed: _____

Business Address: _____

_____

Telephone Number: _____

California Contractor License No.: _____

Class and Expiration Date: _____

State of Incorporation, if Applicable: _____

( ) Evidence of authority to bind corporation is attached.

Dated: _____, _____

Signed: _____

END OF DOCUMENT

DOCUMENT 00 43 13

BID BOND

KNOW ALL MEN BY THESE PRESENTS that we the undersigned _____ as Principal and _____ as Surety, are hereby held and firmly bound unto the Berryessa Union School District ("Owner") in the sum of _____ Dollars ($_____) for payment of which sum, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that whereas the Principal has submitted to the Owner a certain bid, attached hereto and hereby made a part hereof, to enter into a Contract in writing for the construction of Noble Elementary School Flexible Instructional Space Alteration and Related Modernization in strict accordance with Contract Documents.

NOW, THEREFORE,

a. If said bid shall be rejected, or, in the alternative;

b. If said bid shall be accepted and the Principal shall execute and deliver a contract in the form of agreement attached hereto and shall execute and deliver Performance and Payment Bonds in the forms attached hereto (all properly completed in accordance with said bid), and shall in all other respects perform the agreement created by the acceptance of said bid;

Then this obligation shall be void, otherwise the same shall remain in full force and effect, it being expressly understood and agreed that the liability of the Surety for any and all default of the Principal hereunder shall be the amount of this obligation as herein stated.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract on the call for bids, or to the Work to be performed hereunder, or the specifications accompanying the same, shall in any way affect its obligation under this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of said Contract or the call for bids, or to the Work, or to the specifications.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under several seals this ____ day of , 2018, the name and corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body. In the presence of:

(Notary Seal)

_____
(Principal)

_____
(Business Address)

_____

_____
(Corporate Surety)

_____
Business Address)

By:_____

_____

The rate or premium of this bond is _____ per thousand, the total amount of premium charged, $_____.

(The above must be filled in by Corporate Surety).

END OF DOCUMENT

DOCUMENT 00 43 36

DESIGNATION OF SUBCONTRACTORS

Each bidder shall set forth below the name and the location of the place of business of each subcontractor and the California contractor license number of each subcontractor who will perform work or labor or render service to the Contractor in or about the construction of the Work or improvement, or to a subcontractor licensed by the State of California who, under subcontract to the Contractor, specially fabricates and installs a portion of the Work or improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one-half of 1 percent (0.5%) of the bidder's total bid, and the portion of the Work which will be done by each subcontractor. An inadvertent error in listing a California contractor's license number shall not be grounds for filing a bid protest or for considering the bid nonresponsive if the bidder submits the corrected contractor's license number to the Owner within 24 hours after the bid opening, or any continuation thereof, so long as the corrected contractor's license number corresponds to the submitted name and location for that subcontractor.

If the Contractor fails to specify a subcontractor for any portion of the Work to be performed under the Contract in excess of one-half of 1 percent (0.5%) of the Contractor's total bid, the Contractor shall be deemed to have agreed to perform such portion itself, and shall not be permitted to subcontract that portion of the Work except under the conditions hereinafter set forth.

Subletting or subcontracting of any portion of the Work as to which no subcontractor was designated in the original bid shall only be permitted in cases of public emergency or necessity, and then only after a finding reduced to writing as a public record of the legislative body of the Owner.

As of March 1, 2015, for any bid proposal submitted, and as of April 1, 2015, for any contract for public work entered into, an inadvertent error in listing a subcontractor who is not registered under Labor Code section 1725.5 shall not be grounds for filing a bid protest or grounds for considering the bid nonresponsive, provided that either: the subcontractor is registered prior to the bid opening; or the subcontractor is registered and has paid the penalty registration fee specified in Labor Code section 1725.5(a)(2)(E), if applicable, within 24 hours after the bid opening; or the subcontractor is replaced by another registered subcontractor under Public Contract Code section 4107. Failure of a listed subcontractor to be registered shall be grounds under Public Contract Code section 4107 for the Contractor, with the Owner's consent, to substitute a registered subcontractor for the unregistered subcontractor.

Failure to provide this information in a legible manner may result in the rejection of an otherwise acceptable bid.

NOTE: *Reproduce page two of this section for additional listings needed beyond the length of this form.*

Portion of Work	Name of Subcontractor & Phone No.	Location of Subcontractor	California Contractor License Number

Portion of Work	Name of Subcontractor & Phone No.	Location of Subcontractor	California Contractor License Number

I am the authorized representative of the Bidder _____submitting this Designation of Subcontractors and I declare that each subcontractor listed holds a valid and current contractor license in good standing in California to perform the portion of work for which the subcontractor is listed.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on , 2018, at _____ *[city]*, *[state]*. _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

DOCUMENT 00 43 40

SUFFICIENT FUNDS DECLARATION
(Labor Code section 2810)
TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

Owner: Berryessa Union School District

Project: Bid B-02-2018-19 Cherrywood Elementary School FIS + Modernization

I, _____, declare that I am the _____ of _____, the entity making and submitting the bid for the above Project that accompanies this Declaration, and that such bid includes sufficient funds to permit _____ *[insert name of entity]* to comply with all local, state or federal labor laws or regulations during the Project, including payment of prevailing wage, and that _____ *[the entity]* will comply with the provisions of Labor Code section 2810(d) if awarded the Contract.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and executed on _____20__, at _____ *[city]*, _____ *[state]*.

Date: _____ _____
Signature
Print Name: _____
Print Title: _____

END OF DOCUMENT

DOCUMENT 00 45 19

NON COLLUSION DECLARATION
TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

Owner: Berryessa Union School District

Project: Bid B-03-2018-19 Cherrywood Elementary FIS + Modernization

The undersigned declares:

I am the _____ of _____, the party making the foregoing bid.

The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. The bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder. All statements contained in the bid are true. The bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____, 201__, at _____ [*city*], _____ [*state*].

_____
Signature

_____
Print Name

END OF DOCUMENT

DOCUMENT 00 45 26

WORKERS' COMPENSATION CERTIFICATE

Labor Code Section 3700, in relevant part, provides:

> "Every employer except the state shall secure the payment of compensation in one or more of the following ways:
>
> (a) By being insured against liability to pay compensation in one or more insurers duly authorized to write compensation insurance in this state.
>
> (b) By securing from the Director of Industrial Relations a certificate of consent to self-insure either as an individual employer or as one employer in a group of employers. Said certificate may be given upon furnishing proof satisfactory to the Director of Industrial Relations of ability to self-insure and to pay any compensation that may become due to his or her employees, ... "

I am aware of the provisions of the Labor Code Section 3700 which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract. I shall supply the Owner with certificates of insurance evidencing that Workers' Compensation Insurance is in effect and providing that the Owner will receive thirty (30) days' notice of cancellation.

_____
Name of Contractor

_____
Signature

_____ _____
Print Name Date

(In accordance with Article 5 (commencing at Section 1860], Chapter 1, Part 7, Division 2 of the Labor Code, the above certificate must be signed and filed with the awarding body prior to performing any work under the contract.)

DRUG-FREE WORKPLACE CERTIFICATION

This Drug-Free Workplace Certification is required pursuant to Government Code Sections 8350 *et seq.*, the Drug-Free Workplace Act of 1990. The Drug-Free Workplace Act of 1990 requires that every person or organization awarded a contract or grant for the procurement of any property or services from any State agency must certify that it will provide a drug-free workplace by doing certain specified acts. In addition, the Act provides that each contract awarded by a State agency may be subject to suspension of payments or termination of the contract, or both, and the contractor may be subject to debarment from future contracting if the state agency determines that specified acts have occurred.

Pursuant to Government Code Section 8355, every person or organization awarded a contract or grant from a State agency shall certify that it will provide a drug-free workplace by doing all of the following:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensation, possession or use of a controlled substance is prohibited in the person's or organization's workplace and specifying actions which will be taken against employees for violations of the prohibition;

(b) Establishing a drug-free awareness program to inform employees about all of the following:

(1) The dangers of drug abuse in the workplace;
(2) The person's or organization's policy of maintaining a drug-free workplace;
(3) The availability of drug counseling, rehabilitation and employee-assistance programs;
(4) The penalties that may be imposed upon employees for drug abuse Violations;

(c) Requiring that each employee engaged in the performance of the contract or grant be given a copy of the statement required by subdivision (a) and that, as a condition of employment on the contract or grant, the employee agrees to abide by the terms of the statement.

I, the undersigned, agree to fulfill the terms and requirements of Government Code Section 8355 listed above and will publish a statement notifying employees concerning (a) the prohibition of controlled substance at the workplace, (b) establishing a drug-free awareness program, and (c) requiring that each employee engaged in the performance of the contract or grant be given a copy of the statement required by Section 8355(a) and requiring that the employee agree to abide by the terms of that statement.

I also understand that if the Owner determines that I have either (a) made a false certification herein, or (b) violated this certification by failing to carry out the requirements of Section 8355, that the contract or grant awarded herein is subject to suspension of payments, termination, or both. I further understand that should I violate the terms of the Drug-Free Workplace Act of 1990, I may be subject to debarment in accordance with the requirements of Section 8350 *et seq.*

I acknowledge that I am aware of the provisions of Government Code Section 8350 *et seq.* and hereby certify that I will adhere to the requirements of the Drug-Free Workplace Act of 1990.

_____
Name of Contractor

_____
Signature

_____ _____
Print Name Date

DOCUMENT 00 45 28

DRUG-FREE WORKPLACE CERTIFICATION

PROJECT/CONTRACT NO.: _____ for the _____ between Berryessa Union School District (the "District" or the "Owner") and _____ _____ (the "Contractor" or the "Bidder") for _____ (the "Contract" or the "Project").

This Drug-Free Workplace Certification form is required from the successful Bidder pursuant to Government Code section 8350 et seq., the Drug-Free Workplace Act of 1990. The Drug-Free Workplace Act of 1990 requires that every person or organization awarded a contract or grant for the procurement of any property or service from any state agency must certify that it will provide a drug-free workplace by doing certain specified acts. In addition, the Act provides that each contract or grant awarded by a state agency may be subject to suspension of payments or termination of the contract or grant, and the contractor or grantee may be subject to debarment from future contracting, if the contracting agency determines that specified acts have occurred.

The District is not a "state agency" as defined in the applicable section(s) of the Government Code, but the District is a local agency and public school district under California law and requires all contractors on District projects to comply with the provisions and requirements of Government Code section 8350 et seq., the Drug-Free Workplace Act of 1990.

Contractor shall certify that it will provide a drug-free workplace by doing all of the following:

a. Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited in the person's or organization's workplace and specifying actions which will be taken against employees for violations of the prohibition;

b. Establishing a drug-free awareness program to inform employees about all of the following:

   (1) The dangers of drug abuse in the workplace.
   (2) The person's or organization's policy of maintaining a drug-free workplace.
   (3) The availability of drug counseling, rehabilitation, and employee-assistance programs.
   (4) The penalties that may be imposed upon employees for drug abuse violations.

c. Requiring that each employee engaged in the performance of the contract or grant be given a copy of the statement required above, and that, as a condition of

employment on the contract or grant, the employee agrees to abide by the terms of the statement.

I, the undersigned, agree to fulfill the terms and requirements of Government Code section 8355 listed above and will publish a statement notifying employees concerning (a) the prohibition of controlled substance at the workplace, (b) establishing a drug-free awareness program, and (c) requiring that each employee engaged in the performance of the contract be given a copy of the statement required by section 8355(a), and requiring that the employee agree to abide by the terms of that statement.

I also understand that if the District determines that I have either (a) made a false certification herein, or (b) violated this certification by failing to carry out the requirements of section 8355, that the Contract awarded herein is subject to termination, suspension of payments, or both. I further understand that, should I violate the terms of the Drug-Free Workplace Act of 1990, I may be subject to debarment in accordance with the requirements of section 8350 et seq.

I acknowledge that I am aware of the provisions of Government Code section 8350 et seq. and hereby certify that I will adhere to the requirements of the Drug-Free Workplace Act of 1990.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

DOCUMENT 00 45 30

ROOF PROJECT CERTIFICATION

[*Public Contract Code §3006(a,)(b)*]

I, _____ [*name*], _____ [*name of employer*], certify that I have not offered, given , or agreed to give, received, accepted, or agreed to accept, any gift, contribution, or any financial incentive whatsoever to or from any person in connection with the roof project contract. As used in this certification, "person" means any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals. Furthermore, I, _____ [*name*], _____ [*name of employer*], certify that I do not have, and throughout the duration of the contract, I will not have, any financial relationship in connection with the performance of this contract with any architect, engineer, roofing, consultant, materials manufacturer, distributor, or vendor that is not disclosed below.

I, _____ [*name*], _____ [*name of employer*], have the following financial relationships, with an architect, engineer, roofing consultant, materials manufacturer, distributor, or vendor, or other person in connection with the following roof project contract:

_____

[*name and address of building, contract date and number*]

_____

[*name and address of building, contract date and number*]

_____

[*name and address of building, contract date and number*]

_____

[*name and address of building, contract date and number*]

I certify that to the best of my knowledge, the contents of this disclosure are true, or are believed to be true.

_____ Signature _____ Date

_____ Print Name

_____Print Name of Employer

END OF DOCUMENT

DOCUMENT 00 45 32

FINGERPRINTING NOTICE AND ACKNOWLEDGMENT

(Education Code Section 45125.2(a))

Note: This document must be executed and submitted with the bid.

Business entities entering into contracts with the Owner for the construction, reconstruction, rehabilitation or repair of a facility must comply with Education Code sections 45125.1 and 45125.2. Such entities are responsible for ensuring full compliance with the law and should therefore review all applicable statutes and regulations. The following information is provided simply to assist such entities with compliance with the law.

1. If the Owner determines your employee(s) will have more than limited contact with students, then you must take one or more of the following steps:

   a. Install a physical barrier at the worksite to limit contact with pupils.

   b. Have an employee, who the Department of Justice has ascertained has not been convicted of a violent or serious felony, continually monitor and supervise employees. The entity shall verify in the Independent Contractor Student Contact Form to the Owner that the employee charged with monitoring and supervising its employees has no such convictions. (See attached.)

   c. Arrange, with Owner's approval, for surveillance by Owner's personnel.

   If one or more of these steps is taken, you are not required to comply with Education Code section 45125.1.

2. If you are providing the services in an emergency or exceptional situation, you are not required to comply with Education Code section 45125.2. An "emergency or exceptional" situation is one in which pupil health or safety is endangered or when repairs are needed to make a facility safe and habitable. Owner shall determine whether an emergency or exceptional situation exists.

I have read the foregoing and agree to comply with the requirements of Education Code §§ 45125.1 and 45125.2 as applicable.

Dated: _____ _____

Signature

Name: _____ Title: _____

ATTACHMENT

Under Education Code section 45125.1, no employee of a contractor or subcontractor who has been convicted of or has criminal proceedings pending for a violent or serious felony may come into contact with any student. A violent felony is any felony listed in subdivision (c) of Section 667.5 of the Penal Code. Those felonies are presently defined as:

(1) Murder or voluntary manslaughter.

(2) Mayhem.

(3) Rape as defined in paragraph (2) or (6) of subdivision (a) of Section 261 or paragraph (1) or (4) of subdivision (a) of Section 262.

(4) Sodomy as defined in subdivision (c) or (d) of Section 286.

(5) Oral copulation as defined in subdivision (c) or (d) of Section 288a.

(6) Lewd or lascivious act as defined in subdivision (a) or (b) of Section 288.

(7) Any felony punishable by death or imprisonment in the state prison for life.

(8) Any felony in which the defendant inflicts great bodily injury on any person other than an accomplice which has been charged and proved as provided for in Section 12022.7, 12022.8, or 12022.9 on or after July 1, 1977, or as specified prior to July 1, 1977, in Sections 213, 264, and 461, or any felony in which the defendant uses a firearm which use has been charged and proved as provided in subdivision (a) of Section 12022.3, or Section 12022.5 or 12022.55.

(9) Any robbery.

(10) Arson, in violation of subdivision (a) or (b) of Section 451.

(11) Sexual penetration as defined in subdivision (a) or (j) of Section 289.

(12) Attempted murder.

(13) A violation of Section 18745, 18750, or 18755.

(14) Kidnapping.

(15) Assault with the intent to commit a specified felony, in violation of Section 220.

(16) Continuous sexual abuse of a child, in violation of Section 288.5.

(17) Carjacking, as defined in subdivision (a) of Section 215.

(18) Rape, spousal rape, or sexual penetration, in concert, in violation of Section 264.1.

(19) Extortion, as defined in Section 518, which would constitute a felony violation of Section 186.22 of the Penal Code.

(20) Threats to victims or witnesses, as defined in Section 136.1, which would constitute a felony violation of Section 186.22 of the Penal Code.

(21) Any burglary of the first degree, as defined in subdivision (a) of Section 460, wherein it is charged and proved that another person, other than an accomplice, was present in the residence during the commission of the burglary.

(22) Any violation of Section 12022.53.

(23) A violation of subdivision (b) or (c) of Section 11418.

A serious felony is any felony listed in subdivision (c) Section 1192.7 of the Penal Code. Those felonies are presently defined as:

(1) Murder or voluntary manslaughter; (2) Mayhem; (3) Rape; (4) Sodomy by force, violence, duress, menace, threat of great bodily injury, or fear of immediate and unlawful bodily injury on the victim or another person; (5) Oral copulation by force, violence, duress, menace, threat of great bodily injury, or fear of immediate and unlawful bodily injury on the victim or another person; (6) Lewd or lascivious act on a child under the age of 14 years; (7) Any felony punishable by death or imprisonment in the state prison for life; (8) Any felony in which the defendant personally inflicts great bodily injury on any person, other than an accomplice, or any felony in which the defendant personally uses a firearm; (9) Attempted murder; (10) Assault with intent to commit rape, or robbery; (11) Assault with a deadly weapon or instrument on a peace officer; (12) Assault by a life prisoner on a non-inmate; (13) Assault with a deadly weapon by an inmate; (14) Arson; (15) Exploding a destructive device or any explosive with intent to injure; (16) Exploding a destructive device or any explosive causing bodily injury, great bodily injury, or mayhem; (17) Exploding a destructive device or any explosive with intent to murder; (18) Any burglary of the first degree; (19) Robbery or bank robbery; (20) Kidnapping; (21) Holding of a hostage by a person confined in a state prison; (22) Attempt to commit a felony punishable by death or imprisonment in the state prison for life; (23) Any felony in which the defendant personally used a dangerous or deadly weapon; (24) Selling, furnishing, administering, giving, or offering to sell, furnish, administer, or give to a minor any heroin, cocaine, phencyclidine (PCP), or any

methamphetamine-related drug, as described in paragraph (2) of subdivision (d) of Section 11055 of the Health and Safety Code, or any of the precursors of methamphetamines, as described in subparagraph (A) of paragraph (1) of subdivision (f) of Section 11055 or subdivision (a) of Section 11100 of the Health and Safety Code; (25) Any violation of subdivision (a) of Section 289 where the act is accomplished against the victim's will by force, violence, duress, menace, or fear of immediate and unlawful bodily injury on the victim or another person; (26) Grand theft involving a firearm; (27)carjacking; (28) any felony offense, which would also constitute a felony violation of Section 186.22; (29) assault with the intent to commit mayhem, rape, sodomy, or oral copulation, in violation of Section 220; (30) throwing acid or flammable substances, in violation of Section 244; (31) assault with a deadly weapon, firearm, machine gun, assault weapon, or semiautomatic firearm or assault on a peace officer or firefighter, in violation of Section 245; (32) assault with a deadly weapon against a public transit employee, custodial officer, or school employee, in violation of Sections 245.2, 245.3, or 245.5; (33) discharge of a firearm at an inhabited dwelling, vehicle, or aircraft, in violation of Section 246; (34) commission of rape or sexual penetration in concert with another person, in violation of Section 264.1; (35) continuous sexual abuse of a child, in violation of Section 288.5; (36) shooting from a vehicle, in violation of subdivision (c) or (d) of Section 26100; (37) intimidation of victims or witnesses, in violation of Section 136.1; (38) criminal threats, in violation of Section 422; (39) any attempt to commit a crime listed in this subdivision other than an assault; (40) any violation of Section 12022.53; (41) a violation of subdivision (b) or (c) of Section 11418; and (42) any conspiracy to commit an offense described in this subdivision.

INDEPENDENT CONTRACTOR STUDENT CONTACT FORM

Contractor Name: _____
Supervisor/Foreman Name: _____
Start Date: _____
Completion Date: _____
Location of Work: _____
Hours of Work: _____
Length of Time on Grounds: _____
Number of Employees on the Job: _____

Yes No
[ ] [ ] Employees will have more than limited contact with students as determined by Owner, or if by Contractor, please explain:

_____
_____

If yes, the following steps will be taken to ensure student safety (check):

[ ] A physical barrier will be installed at the worksite to limit contact with pupils.

[ ] Employees will be continually monitored and supervised by an employee who has not been convicted of a violent or serious felony.

Name of Supervising Employee:

_____

Date of Department of Justice verification that supervising employee has not been convicted of a violent or serious felony:

_____

Name of employee who is the custodian of the Department of Justice verification information:

_____

[ ] Owner agrees: Employees will be surveilled by Owner's personnel.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Dated: _____

_____
Signature
Typed Name:_____
Title: _____

Note: This document must be executed and submitted with the executed Agreement between Owner and Contractor.

DOCUMENT 00 45 34

IRAN CONTRACTING ACT CERTIFICATION
(Public Contract Code sections 2202-2208)
TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

As required by Public Contract Code ("PCC") section 2204 for contracts of $1,000,000 or more, please insert bidder's or financial institution's name and Federal ID Number (if available) and complete **one** of the options below. Please note that California law establishes penalties for providing false certifications, including civil penalties equal to the greater of $250,000 or twice the amount of the contract for which the false certification was made; contract termination; and three-year ineligibility to bid on contracts. (PCC §2205.)

OPTION #1 - CERTIFICATION

I, the official named below, certify I am duly authorized to execute this certification on behalf of the bidder/financial institution identified below, and the bidder/financial institution identified below is **not** on the current list of persons engaged in investment activities in Iran created by California Department of General Services ("DGS") and is not a financial institution extending twenty million dollars ($20,000,000) or more in credit to another person/bidder, for 45 days or more, if that other person/bidder will use the credit to provide goods or services in the energy sector in Iran and is identified on the current list of persons engaged in investment activities in Iran created by DGS. (PCC §2204(a).)

Bidder Name/Financial Institution (Printed)	*Federal ID Number (or n/a)*
By (Authorized Signature)	
Printed Name and Title of Person Signing	
Date Executed	*Executed in*

OPTION #2 – EXEMPTION

Pursuant to Public Contract Code sections 2203(c) and (d), a public entity may permit a bidder/financial institution engaged in investment activities in Iran, on a case-by-case basis, to be eligible for, or to bid on, submit a proposal for, or enters into or renews, a contract for goods and services. If you have obtained an exemption from the certification requirement under the Iran Contracting Act, please fill out the information below, and attach documentation demonstrating the exemption approval.

Bidder Name/Financial Institution (Printed)	*Federal ID Number (or n/a)*
By (Authorized Signature)	
Printed Name and Title of Person Signing	*Date Executed*

DOCUMENT 00 50 50

NOTICE OF INTENT TO AWARD

DATE POSTED:

CONTRACT NUMBER:

PROJECT TITLE:

Bonny S Gregorius, the Purchasing and Contracts Manager of the Berryessa Union School District, intends to recommend to the Board of Trustees of the Berryessa Union School District the Award of the above-referenced Project to at the _____ meeting of the Board of Trustees.

Deliver to the District FOUR fully executed counterparts of Document 00 52 26 (Agreement). Each copy of Document 00 52 26 (Agreement) must bear your original signature on the signature page and your initials on each page. Please print as single sided copies.

You must provide a scanned signed copy of the agreement before 3:00pm on _____.
You must provide the original completed documents listed below by 2:00pm on_____.

FOR THE BERRYESSA UNION SCHOOL DISTRICT

By: _____

Bonny S Gregorius
Purchasing and Contracts Manager
408-923-1871 ofc
408-926-8329 fax
bgregorius@busd.net

END OF DOCUMENT

DOCUMENT 00 51 00

NOTICE OF AWARD

Attn:

CONTRACT NO.:
CONTRACT FOR:

The Contract Sum:
_____Dollars ($ _____)

1. One electronic copy of the proposed Contract Documents listed below accompanies this Notice of Intent to Award.

2. You must provide the original completed documents listed below by 2:00pm on_____.

   a. Deliver to District TWO originals of Document 00 61 13.13 (Construction Performance Bond), executed by you and your surety.

   b. Deliver to District TWO originals of Document 00 61 13.16 (Construction Labor and Material Payment Bond), executed by you and your surety.

   c. Deliver to District TWO original sets of the insurance certificates with endorsements required under Document 00 72 00 (General Conditions).

3. Failure to comply with these conditions within the time specified will entitle District to consider your Bid abandoned, to annul this Notice of Award, and to declare your Bid security forfeited.

4. Within 10 days after you comply with the conditions in Paragraph 2 of this Document 00 51 00, District will return to you one fully signed counterpart of Document 00 52 26 (Agreement).

5. Before you may start any Work at the Site, you must attend a preconstruction conference. The preconstruction conference may be arranged through Ricardo Reyes, Program Manager, Measure L Bond Program. Questions regarding bonds and insurance may be directed to Bonny S Gregorius, Purchasing Manager at 408-923-1871.

6. **SB 854 COMPLIANCE:** No contractor or subcontractor may be listed on a bid proposal for a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

   No contractor or subcontractor may be awarded a contract for public work on a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

   This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

7. **FURNISHING OF ELECTRONIC CERTIFIED PAYROLL RECORDS TO LABOR COMMISSIONER:**
   All contractors and subcontractors must furnish electronic certified payroll records directly to the Labor Commissioner (aka Division of Labor Standards Enforcement).

FOR THE BERRYESSA UNION SCHOOL DISTRICT

By: _____

Bonny S Gregorius
Purchasing and Contracts Manager

Board Approval Date: _____

END OF DOCUMENT

DOCUMENT 00 52 26

AGREEMENT BETWEEN OWNER AND CONTRACTOR

This Agreement effective _____, 201__, by and between Berryessa Union School District, Santa Clara County, California, hereinafter called the "Owner," and _____, hereinafter called the "Contractor."

WITNESSETH: That the Contractor and the Owner for the consideration hereinafter named agree as follows:

ARTICLE I. SCOPE OF WORK. The Contractor agrees to furnish all labor, equipment and materials, including tools, implements, and appliances required, and to perform all the work in a good and workmanlike manner, free from any and all liens and claims from mechanics, material suppliers, subcontractors, artisans, machinists, teamsters, freight carriers, and laborers required for:

Cherrywood Elementary School Modernization and F.I.S.

all in strict compliance with the plans, drawings and specifications therefore prepared by:

IBI Group

and other contract documents relating thereto.

ARTICLE II. CONTRACT DOCUMENTS. The Contractor and the Owner agree that all of the documents listed in Article 1.1.1 of the General Conditions form the Contract Documents which form the Contract.

ARTICLE III. TIME TO COMPLETE AND LIQUIDATED DAMAGES.

Time is of the essence in this contract, and the time of Completion for the Project shall be TBD (XXX) calendar days from receipt of the Owner's Notice to Proceed.

Failure to Complete the Project within the time and in the manner provided for by the Contract Documents (i.e., by the Completion deadline) shall subject the Contractor to liquidated damages. For purposes of liquidated damages, the concept of "substantial completion" shall not constitute Completion and is not part of the Contract Documents. The actual occurrence of damages and the actual amount of the damages which the Owner would suffer if the Project were not Completed by the Completion deadline are dependent upon many circumstances and conditions which could prevail in various combinations and, from the nature of the case, it is impracticable and extremely difficult to fix the actual damages. Damages which the Owner would suffer in the event of delay include, but are not limited to, loss of the use of the Project, disruption of activities, costs of administration, supervision and the incalculable inconvenience and loss suffered by the public.

Accordingly, the parties agree that the amount herein set forth shall be the amount of damages which the Owner shall directly incur upon failure of the Contractor to Complete the Project by the Completion deadline: $2,000.00, for each calendar day by which Completion of the Project is delayed beyond the Completion deadline as adjusted by change orders.

If the Contractor becomes liable under this section, the Owner, in addition to all other remedies provided by law, shall have the right to withhold any and all retained percentages of payments and/or progress payments, and to collect the interest thereon, which would otherwise be or become due the Contractor until the liability of the Contractor under this section has been finally determined. If the retained percentages and withheld progress payments appear insufficient to discharge all liabilities of the Contractor incurred under this Article, the Contractor and its sureties shall continue to remain liable to the Owner for such liabilities until all such liabilities are satisfied in full.

If the Owner accepts any work or makes any payment under this Agreement after a default by reason of delays, the payment or payments shall in no respect constitute a waiver or modification of any Agreement provisions regarding time of Completion and liquidated damages.

ARTICLE IV. PAYMENT AND RETENTION. The Owner agrees to pay the Contractor in current funds _____ dollars ($_____) for work satisfactorily performed after receipt of properly documented and submitted Applications for Payment and to make payments on account thereof, as provided in the General Conditions.

The retention amount on this Project is Five Percent (5%).

ARTICLE V. CHANGES. Changes in this Agreement or in the Work to be done under this Agreement shall be made as provided in the General Conditions.

ARTICLE VI. TERMINATION. The Owner or Contractor may terminate the Contract as provided in the General Conditions.

ARTICLE VII. PREVAILING WAGES. The Project is a public work, the Work shall be performed as a public work and pursuant to the provisions of Section 1770 et seq. of the Labor Code of the State of California, which are hereby incorporated by reference and made a part hereof, the Director of Industrial Relations has determined the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which the work is to be performed, for each craft, classification or type of worker needed to execute this Contract. Per diem wages shall be deemed to include employer payments for health and welfare, pension, vacation, apprenticeship or other training programs, and similar purposes. Copies of the rates are on file at the Owner's principal office. The rate of prevailing wage for any craft, classification or type of workmanship to be employed on this Project is the rate established by the applicable collective bargaining agreement which rate so provided is hereby adopted by reference and shall be effective for the life of this Agreement or until

the Director of the Department of Industrial Relations determines that another rate be adopted. It shall be mandatory upon the Contractor and on any subcontractor to pay not less than the said specified rates to all workers employed in the execution of this Agreement.

The Contractor and any subcontractor under the Contractor as a penalty to the Owner shall forfeit not more than Two Hundred Dollars ($200.00) for each calendar day or portion thereof for each worker paid less than the stipulated prevailing rates for such work or craft in which such worker is employed. The difference between such stipulated prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the stipulated prevailing wage rate shall be paid to each worker by the Contractor.

The Contractor and each Subcontractor shall keep or cause to be kept an accurate record for work on this Project showing the names, addresses, social security numbers, work classification, straight time and overtime hours worked and occupations of all laborers, workers and mechanics employed by them in connection with the performance of this Contract or any subcontract thereunder, and showing also the actual per diem wage paid to each of such workers, which records shall be open at all reasonable hours to inspection by the Owner, its officers and agents and to the representatives of the Division of Labor Law Enforcement of the State Department of Industrial Relations. The Contractor and each subcontractor shall furnish a certified copy of all payroll records directly to the Labor Commissioner _____ [*insert time period less than monthly if desired or delete blank space]*.

For public works contracts awarded on and after January 1, 2015, those public works projects shall be subject to compliance monitoring and enforcement by the Department of Industrial Relations.

As of March 1, 2015, a contractor or subcontractor shall not be qualified to submit a bid or to be listed in a bid proposal subject to the requirements of Public Contract Code section 4104 unless currently registered and qualified under Labor Code section 1725.5 to perform public work as defined by Division 2, Part 7, Chapter 1 (§§1720 et seq.) of the Labor Code.

As of April 1, 2015, a contractor or subcontractor shall not be qualified to enter into, or engage in the performance of, any contract of public work (as defined by Division 2, Part 7, Chapter 1 (§§1720 et seq.) of the Labor Code) unless currently registered and qualified under Labor Code section 1725.5 to perform public work.

ARTICLE VIII. WORKING HOURS. In accordance with the provisions of Sections 1810 to 1815, inclusive, of the Labor Code of the State of California, which are hereby incorporated and made a part hereof, the time of service of any worker employed by the Contractor or a Subcontractor doing or contracting to do any part of the Work contemplated by this Agreement is limited and restricted to eight hours during any one calendar day and forty hours during any one calendar week, provided, that work may be

performed by such employee in excess of said eight hours per day or forty hours per week provided that compensation for all hours worked in excess of eight hours per day, and forty hours per week, is paid at a rate not less than one and one-half (1½) times the basic rate of pay. The Contractor and every Subcontractor shall keep an accurate record showing the name of and the actual hours worked each calendar day and each calendar week by each worker employed by them in connection with the Work. The records shall be kept open at all reasonable hours to inspection by representatives of the Owner and the Division of Labor Law Enforcement. The Contractor shall as a penalty to the Owner forfeit Twenty-five Dollars ($25.00) for each worker employed in the execution of this Agreement by the Contractor or by any subcontractor for each calendar day during which such worker is required or permitted to work more than eight hours in any one calendar day, and forty hours in any one calendar week, except as herein provided.

ARTICLE IX. APPRENTICES. The Contractor agrees to comply with Chapter 1, Part 7, Division 2, Sections 1777.5 and 1777.6 of the California Labor Code, which are hereby incorporated and made a part hereof. These sections require that contractors and subcontractors employ apprentices in apprenticeable occupations in a ratio of not less than one hour of apprentice's work for each five hours of work performed by a journeyman (unless an exemption is granted in accordance with Section 1777.5) and that contractors and subcontractors shall not discriminate among otherwise qualified employees as indentured apprentices on any public works solely on the ground of sex, race, religious creed, national origin, ancestry or color. Only apprentices as defined in Labor Code Section 3077, who are in training under apprenticeship standards and who have signed written apprentice agreements, will be employed on public works in apprenticeable occupations. The responsibility for compliance with these provisions is fixed with the Contractor for all apprenticeable occupations.

ARTICLE X. DSA OVERSIGHT PROCESS. The Contractor must comply with the applicable requirements of the Division of State Architect ("DSA") Construction Oversight Process ("DSA Oversight Process"), including but not limited to (a) notifying the Owner's Inspector of Record/Project Inspector ("IOR") upon commencement and completion of each aspect of the work as required under DSA Form 156; (b) coordinating the Work with the IOR's inspection duties and requirements; (c) submitting verified reports under DSA Form 6-C; and (d) coordinating with the Owner, Owner's Architect, any Construction Manager, any laboratories, and the IOR to meet the DSA Oversight Process requirements without delay or added costs to the Project.

Contractor shall be responsible for any additional DSA fees related to review of proposed changes to the DSA-approved construction documents, to the extent the proposed changes were caused by Contractor's wrongful act or omissions. If inspected work is found to be in non-compliance with the DSA-approved construction documents or the DSA-approved testing and inspection program, then it must be removed and corrected. Any construction that covers unapproved or uninspected work is subject to removal and correction, at Contractor's expense, in order to permit inspection and approval of the covered work in accordance with the DSA Oversight Process.

ARTICLE XI. INDEMNIFICATION AND INSURANCE. The Contractor will defend, indemnify and hold harmless the Owner, its governing board, officers, agents, trustees, employees and others as provided in the General Conditions.

By this statement the Contractor represents that it has secured the payment of Workers' Compensation in compliance with the provisions of the Labor Code of the State of California and during the performance of the work contemplated herein will continue so to comply with said provisions of said Code. The Contractor shall supply the Owner with certificates of insurance evidencing that Workers' Compensation Insurance is in effect and providing that the Owner will receive thirty (30) days' notice of cancellation.

Contractor shall provide the insurance set forth in the General Conditions. The amount of general liability insurance shall be $1,000,000.00 per occurrence for bodily injury, personal injury and property damage and a minimum of $2,000,000.00 aggregate. The amount of automobile liability insurance shall be $1,000,000.00 per accident for bodily injury and property damage combined single limit.

ARTICLE XII. ENTIRE AGREEMENT. The Contract constitutes the entire agreement between the parties relating to the Project, and supersedes any prior or contemporaneous agreement between the parties, oral or written, including the Owner's award of the Project to Contractor, unless such agreement is expressly incorporated herein. The Owner makes no representations or warranties, express or implied, not specified in the Contract. The Contract is intended as the complete and exclusive statement of the parties' agreement pursuant to Code of Civil Procedure section 1856.

ARTICLE XIII. EXECUTION OF OTHER DOCUMENTS. The parties to this Agreement shall cooperate fully in the execution of any and all other documents and in the completion of any additional actions that may be necessary or appropriate to give full force and effect to the terms and intent of the Contract.

ARTICLE XIV. EXECUTION IN COUNTERPARTS. This Agreement may be executed in counterparts such that the signatures may appear on separate signature pages. A copy, or an original, with all signatures appended together, shall be deemed a fully executed Agreement.

ARTICLE XV. BINDING EFFECT. Contractor, by execution of this Agreement, acknowledges that Contractor has read this Agreement and the other Contract Documents, understands them, and agrees to be bound by their terms and conditions. The Contract shall inure to the benefit of and shall be binding upon the Contractor and the Owner and their respective successors and assigns.

ARTICLE XVI. SEVERABILITY; GOVERNING LAW; CHOICE OF FORUM. If any provision of the Contract shall be held invalid or unenforceable by a court of competent jurisdiction, such holding shall not invalidate or render unenforceable any other provision hereof. The Contract shall be governed by the laws of the State of California. Any action or proceeding seeking any relief under or with respect to this Agreement shall be brought solely in the Superior Court of the State of California for the

County of Santa Clara, subject to transfer of venue under applicable State law, provided that nothing in this Agreement shall constitute a waiver of immunity to suit by Owner.

ARTICLE XVII. AMENDMENTS. The terms of the Contract shall not be waived, altered, modified, supplemented or amended in any manner whatsoever except by written agreement signed by the parties and approved or ratified by the Governing Board.

ARTICLE XVIII. ASSIGNMENT OF CONTRACT. The Contractor shall not assign or transfer by operation of law or otherwise any or all of its rights, burdens, duties or obligations without the prior written consent of the surety on the payment bond, the surety on the performance bond and the Owner.

ARTICLE XIX. WRITTEN NOTICE. Written notice shall be deemed to have been duly served if delivered in person to the individual or member of the firm or to an officer of the corporation for whom it was intended, or if delivered at or sent by registered or certified or overnight mail to the last business address known to the person who gives the notice.

(CONTRACTOR)	**(OWNER)**
	_____
_____	_____
SIGNED BY (Contractor)	_____
	_____(Title)
_____	
CALIFORNIA CONTRACTOR'S LICENSE NO.	
_____	
LICENSE EXPIRATION DATE	

NOTE: Contractor must give the full business address of the Contractor and sign with Contractor's usual signature. Partnerships must furnish the full name of all partners and the Agreement must be signed in the partnership name by a general partner with authority to bind the partnership in such matters, followed by the signature and designation of the person signing. The name of the person signing shall also be typed or printed below the signature. Corporations must sign with the legal name of the corporation, followed by the name of the state of incorporation and by the signature and designation of the chairman of the board, president or any vice president, and then followed by a second signature by the secretary, assistant secretary, the chief financial officer or assistant treasurer. All persons signing must be authorized to bind the corporation in the matter. The name of each person signing shall also be typed or printed below the

signature. Satisfactory evidence of the authority of the officer signing on behalf of a corporation shall be furnished.

END OF DOCUMENT

DOCUMENT 00 54 00

ESCROW BID DOCUMENTATION

1. **Requirement to Escrow Bid Documentation**

   a. Contractor shall submit, within seven (7) days after the date of the Notice of Award, one copy of all documentary information received or generated by Contractor in preparation of bid prices for this Contract, and additional documentary information about the preparation of bid prices as required herein. This material is referred to herein as "Escrow Bid Documentation." The Escrow Bid Documentation of the Contractor will be held in escrow for the duration of the Contract.

   b. Contractor agrees, as a condition of award of the Contract, that the Escrow Bid Documentation constitutes all written information used in the preparation of its bid, and that no other written bid preparation information shall be considered in resolving disputes or claims. Contractor also agrees that nothing in the Escrow Bid Documentation shall change or modify the terms or conditions of the Contract Documents.

   c. The Escrow Bid Documentation will not be opened by District except as indicated herein. The Escrow Bid Documentation will be used only for the resolution of change orders and claims disputes.

   d. Contractor's submission of the Escrow Bid Documentation, as with the bonds and insurance documents required, is considered an essential part of the Contract award. Should the Contractor fail to make the submission within the allowed time specified above, District may deem the Contractor to have failed to enter into the Contract, and the Contractor shall forfeit the amount of its bid security, accompanying the Contractor's bid, and District may award the Contract to the next lowest responsive responsible bidder.

   e. NO PAYMENTS WILL BE MADE, NOR WILL DISTRICT ACCEPT PROPOSED CHANGE ORDERS UNTIL THE ABOVE REQUIRED INFORMATION IS SUBMITTED AND APPROVED.

   f. The Escrow Bid Documentation shall be submitted in person by an authorized representative of the Contractor to the District.

2. **Ownership of Escrow Bid Documentation**

   a. The Escrow Bid Documentation is, and shall always remain, the property of Contractor, subject to review by District, as provided herein.

b. The Escrow Bid Documentation constitutes trade secrets (i) not known outside Contractor's business, (ii) known only to a limited extent and only by a limited number of employees of Contractor's business, (iii) safeguarded while in Contractor's possession, (iv) extremely valuable to Contractor, and (v) potentially extremely valuable to Contractor's competitors by virtue of it reflecting Contractor's contemplated techniques of construction. Subject to the provisions herein, District agrees to safeguard the Escrow Bid Documentation, and all information contained therein, against disclosure to the fullest extent permitted by law, except that District shall not be obligated to seek a protective order from a court, or otherwise incur any costs in relation to court proceedings, related to a request for disclosure. In the event that the District is required to participate in a court proceeding related to a request for disclosure of the Escrow Bid Documentation, or in the event that the District is requested by Contractor to participate in such a court proceeding, Contractor shall pay for any and all attorneys' fees and costs incurred by the District in connection with such proceeding.

3. **Format and Contents of Escrow Bid Documentation**

a. Contractor may submit Escrow Bid Documentation in its usual cost-estimating format; a standard format is not required. The Escrow Bid Documentation shall be submitted in the language (e.g., English) of the specification.

b. Escrow Bid Documentation must clearly itemize the estimated costs of performing the work of each bid item contained in the bid schedule, separating bid items into sub-items as required to present a detailed cost estimate and allow a detailed cost review. The Escrow Bid Documentation shall include all subcontractor bids or quotes, supplier bids or quotes, quantity takeoffs, crews, equipment, calculations of rates of production and progress, copies of quotes from subcontractors and suppliers, and memoranda, narratives, add/deduct sheets, and all other information used by the Contractor to arrive at the prices contained in the bid proposal. Estimated costs should be broken down into Contractor's usual estimate categories such as direct labor, repair labor, equipment ownership and operation, expendable materials, permanent materials, and subcontract costs as appropriate. Plant and equipment and indirect costs should be detailed in the Contractor's usual format. The Contractor's allocation of indirect costs, contingencies, markup, and other items to each bid item shall be identified.

c. All costs shall be identified. For bid items amounting to less than $10,000, estimated unit costs are acceptable without a detailed cost estimate, provided that labor, equipment, materials, and subcontracts, as applicable, are included and provided that indirect costs, contingencies, and markup, as applicable, are allocated.

d. Bid Documentation provided by District should not be included in the Escrow Bid Documentation unless needed to comply with the following requirements.

4. **Submittal of Escrow Bid Documentation**

a. The Escrow Bid Documentation shall be submitted by the Contractor in a sealed container within seven (7) days after the date of the Notice of Award. The container shall be clearly marked on the outside with the Contractor's name, date of submittal, project name and the words "Escrow Bid Documentation – Intended to be opened in the presence of Authorized Representatives of Both District and Contractor".

b. By submitting Escrow Bid Documentation, Contractor represents that the material in the Escrow Bid Documentation constitutes all the documentary information used in preparation of the bid and that the Contractor has personally examined the contents of the Escrow Bid Documentation container and has found that the documents in the container are complete.

c. If Contractor's proposal is based upon subcontracting any part of the work, each subcontractor whose total subcontract price exceeds 5 percent of the total contract price proposed by Contractor, shall provide separate Escrow Documents to be included with those of Contractor. Those documents shall be opened and examined in the same manner and at the same time as the examination described above for Contractor.

d. If Contractor wishes to subcontract any portion of the Work after award, District retains the right to require Contractor to submit Escrow Documents for the Subcontractor before the subcontract is approved.

5. **Storage, Examination and Final Disposition of Escrow Bid Documentation**

a. The Escrow Bid Documentation will be placed in escrow, for the life of the Contract, in a mutually agreeable institution. The cost of storage will be paid by Contractor for the duration of the project until final Contract payment. The storage facilities shall be the appropriate size for all the Escrow Bid Documentation and located conveniently to both District's and Contractor's offices.

b. The Escrow Bid Documentation shall be examined by both District and Contractor, at any time deemed necessary by either District or Contractor, to assist in the negotiation of price adjustments and change orders or the settlement of disputes and claims. In the case of legal proceedings between District and Contractor, Escrow Bid Documentation shall be used subject to the terms of an appropriate protective order if requested by Contractor and ordered by a court of competent jurisdiction. Examination of the Escrow Bid Documentation is subject to the following conditions:

(1) As trade secrets, the Escrow Bid Documentation is proprietary and confidential to the extent allowed by law.

(2) District and Contractor shall each designate, in writing to the other party seven (7) days prior to any examination, the names of representatives who are authorized to examine the Escrow Bid Documentation. No other person shall have access to the Escrow Bid Documentation.

(3) Access to the documents may take place only in the presence of duly designated representatives of the District and Contractor. If Contractor fails to designate a representative or appear for joint examination on seven (7) days notice, then the District representative may examine the Escrow Bid Documents alone upon an additional three (3) days notice if a representative of the Contractor does not appear at the time set.

(4) If a subcontractor has submitted sealed information to be included in the Escrow Bid Documents, access to those documents may take place only in the presence of a duly designated representative of the District, Contractor and that subcontractor. If that subcontractor fails to designate a representative or appear for joint examination on seven (7) days notice, then the District representative and/or the Contractor may examine the Escrow Bid Documentation without that subcontractor present upon an additional three (3) days notice if a representative of that subcontractor does not appear at the time set.

c. The Escrow Bid Documentation will be returned to Contractor at such time as the Contract has been completed and final settlement has been achieved.

END OF DOCUMENT

DOCUMENT 00 54 26

This is a fiduciary account created by statute, Public Contract Code section 22300. The funds deposited in this account shall not be released to Contractor or any other person or entity, other than Owner, including pursuant to any purported lien or writ of attachment or execution, without the prior written, express approval of Owner.

ESCROW AGREEMENT FOR SECURITY DEPOSITS IN LIEU OF RETENTION

This Escrow Agreement is made and entered into by and between the Berryessa Union School District, whose address is 1376 Piedmont Road, San Jose, California 95132 (hereinafter called "Owner"); _____, whose address is_____ (hereinafter called "Contractor"); and _____, a state or federally chartered bank in California whose address is _____(hereinafter called "Escrow Agent").

For the consideration hereinafter set forth, the Owner, Contractor, and Escrow Agent agree as follows:

1. Pursuant to section 22300 of the Public Contract Code of the State of California, Contractor has the option to deposit securities with Escrow Agent as a substitute for retention earnings required to be withheld by the Owner pursuant to the Contract entered into between the Owner and Contractor in the amount of _____ Dollars ($_____), and dated _____, ____, (the "Contract"). Alternatively, on written request of the Contractor, the Owner shall make payments of the retention earnings directly to the Escrow Agent. When Contractor deposits the securities as a substitute for retention earnings, the Escrow Agent shall notify the Owner within ten (10) calendar days of the deposit. The market value of the securities at the time of the substitution, as valued by the Owner, shall be at least equal to the cash amount then required to be withheld as retention under the terms of the Contract between the Owner and Contractor. If the Owner determines that the securities are not adequate it will notify Contractor and Escrow Agent, and Contractor shall deposit additional security as further determined by the Owner. Securities shall be held in the name of the Owner and shall designate the Contractor as the beneficial owner.

2. Thereafter, Owner shall make progress payments to the Contractor for such funds which otherwise would be withheld from progress payments pursuant to the Contract provisions, provided that the Escrow Agent holds securities in the form and amount specified above.

3. Pursuant to Public Contract Code section 22300, as an alternative to the procedures set forth above, Contractor may request in writing that the Owner pay

retention amounts directly to Escrow Agent. When the Owner makes payment of retentions earned directly to the Escrow Agent, the Escrow Agent shall hold them for benefit of the Contractor until such time as the escrow created under this Escrow Agreement is terminated. The Contractor may direct the investment of the payments into securities. All terms and conditions of this Escrow Agreement and the rights and responsibilities of the parties shall be equally applicable and binding when the Owner pays the Escrow Agent directly.

4. The Contractor shall be responsible for paying all fees for the expenses incurred by Escrow Agent in administering the Escrow Account and all expenses of the Owner. These expenses and payment terms shall be determined by the Owner, Contractor and Escrow Agent.

5. The interest earned on the securities or the money market accounts held in escrow and all interest earned on that interest shall be for the sole account of Contractor and shall be subject to withdrawal by Contractor at any time and from time to time without notice to the Owner.

6. Contractor shall have the right to withdraw all or any part of the principal in the Escrow Account only by written notice to Escrow Agent accompanied by written authorization from Owner to the Escrow Agent that Owner consents to the withdrawal of the amount sought to be withdrawn by Contractor.

7. The Owner shall have the right to draw upon the securities or any amount paid directly to Escrow Agent in the event of default by the Contractor. Upon seven (7) days written notice to the Escrow Agent from the Owner of the default, the Escrow Agent shall immediately convert the securities to cash and shall distribute the cash, including any amounts paid directly to Escrow Agent pursuant to Section 3 above, as instructed by Owner. Escrow Agent shall not be concerned with the validity of any notice of default given by Owner pursuant to this paragraph, and shall promptly comply with Owner's instructions to pay over said escrowed assets. Escrow Agent further agrees to not interplead the escrowed assets in response to a conflicting demand and hereby waives any present or future opportunity of interpleader.

8. Upon receipt of written notification from the Owner certifying that the Contract is final and complete, and that the Contractor has complied with all requirements and procedures applicable to the Contract, Escrow Agent shall release to Contractor all securities and interest on deposit less escrow fees and charges of the Escrow Account. The escrow shall be closed immediately upon disbursement of all moneys and securities on deposit and payment of fees and charges.

9. Escrow Agent shall rely on the written notifications from the Owner and Contractor pursuant to Sections (4), (5), (6), (7) and (8) of this Agreement and the

Owner and Contractor shall hold Escrow Agent harmless from Escrow Agent's release and disbursement of the securities and interest as set forth above.

10. The names of the persons who are authorized to give written notice or to receive written notice on behalf of the Owner, the Contractor and the Escrow Agent in connection with the foregoing, and exemplars of their respective signatures are as follows:

ON BEHALF OF OWNER:

_____
Signature

_____
Typewritten Name

_____
Title

ON BEHALF OF CONTRACTOR:

_____
Signature

_____
Typewritten Name

_____
Title

ON BEHALF OF ESCROW AGENT:

_____
Signature

_____
Typewritten Name

_____
Title

IN WITNESS WHEREOF, the parties have executed this Agreement by their proper officers on the date first set forth above.

OWNER:

_____
Signature

_____
Typewritten Name

_____
Title

CONTRACTOR:

_____
Signature

_____
Typewritten Name

_____
Title

ESCROW AGENT:

_____
Signature

_____
Typewritten Name

_____
Title

At the time the Escrow Account is opened, the Owner and Contractor shall deliver to the Escrow Agent a fully executed counterpart of this Agreement.

END OF DOCUMENT

DOCUMENT 00 55 00

NOTICE TO PROCEED

Dated: _____, 20___

TO: _____
(Contractor)

ADDRESS: _____

PROJECT: _____

PROJECT/CONTRACT NO.: _____between the Berryessa Union School District and Contractor ("Contract").

You are notified that the Contract Time under the above Contract will commence to run on _____, 20___. By that date, you are to start performing your obligations under the Contract Documents. In accordance with the Agreement executed by Contractor, the date of completion is _____, 20___.

You must submit the following documents by 5:00 p.m. of the **TENTH (10TH)** calendar day following the date of this Notice to Proceed:

a. Contractor's preliminary schedule of construction.

b. Contractor's preliminary schedule of values for all of the Work.

c. Contractor's preliminary schedule of submittals, including Shop Drawings, Product Data, and Samples submittals

d. Contractor's Safety Plan specifically adapted for the Project.

e. A complete subcontractors list, including the name, address, telephone number, facsimile number, California State Contractors License number, classification, and monetary value of all Subcontracts.

Thank you. We look forward to a very successful Project.

Berryessa Union School District

BY: _____

NAME: _____

TITLE: _____

END OF DOCUMENT

DOCUMENT 00 61 13.13

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS that we, _____ _____ as Principal and _____ as Surety, are held and firmly bound unto Berryessa Union School District, in the County of Santa Clara, State of California (""Owner") in the sum of _____ Dollars ($_____) for the payment of which sum well and truly made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, to the Owner for the full performance of a certain contract with the Owner, the terms of which are incorporated herein by reference, dated _____, 201__, for construction of:

Cherrywood Elementary School
Modernization and F.I.S.
2550 Greengate Dr.

The condition of this obligation is such that, if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term of said Contract and any extensions thereof that may be granted by the Owner, with or without notice to the Surety, and for the period of time specified in the Contract after completion for correction of faulty or improper materials and workmanship and during the life of any guaranty or warranty required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreement of any and all duly authorized modifications of said Contract that may hereafter be made, then this obligation is to be void, otherwise to remain in full force and virtue.

And the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed thereunder or the specifications accompanying the same, shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract, or to the Work, or to the specifications.

No further agreement between Surety and Owner shall be required as a prerequisite to the Surety performing its obligations under this bond.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals this _____ day of _____, 201__ hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

(To be signed by)
(Principal and Surety,)
(and acknowledged and)
(Notarial Seal attached)

(Affix Corporate Seal)

_____
(Individual Principal)

_____
(Business Address)

(Affix Corporate Seal)

_____
(Corporate Principal)

_____
(Business Address)

(Affix Corporate Seal)

_____
(Corporate Surety)

_____
(Business Address)

_____

By:_____

_____

The rate of premium on this bond is _____ per thousand.

The total amount of premium charged is _____.

The above must be filled in by Corporate Surety.

END OF DOCUMENT

DOCUMENT 00 61 13.16

PAYMENT BOND
(Labor and Material)

KNOW ALL MEN BY THESE PRESENTS:

That WHEREAS, Berryessa Union School District (the "Owner" of the public works project described below) and _____,
hereinafter designated as the "Principal," have entered into a Contract for the furnishing of all materials and labor, services and transportation, necessary, convenient, and proper to construct:

Cherrywood Elementary School
Modernization and F.I.S.
2550 Greengate Dr.
San Jose, CA 95132

Which said agreement dated _____, 201__, and all of the Contract Documents are hereby referred to and made a part hereof; and

WHEREAS, the Principal is required, before entering upon the performance of the work, to file a good and sufficient bond with the body by whom the Contract is awarded to secure the claims arising under said agreement.

NOW, THEREFORE, THESE PRESENTS WITNESSETH:

That the said Principal and the undersigned _____ ("Surety") are held and firmly bound unto all laborers, material men, and other persons, and bound for all amounts due, referred to in Civil Code section 9554, subdivision (b), in the sum of _____ Dollars ($_____) which sum well and truly be made, we bind ourselves, our heirs, executors, administrators, successors, or assigns, jointly and severally, by these presents.

The condition of this obligation is that if the said Principal or any of its subcontractors, or the heirs, executors, administrators, successors, or assigns of any, all, or either of them, shall fail to pay any of the persons named in Civil Code section 9100, or any of the amounts due, as specified in Civil Code section 9554, subdivision (b), that said Surety will pay the same in an amount not exceeding the amount hereinabove set forth, and also in case suit is brought upon this bond, will pay costs and reasonable attorney's fees to be awarded and fixed by the Court, and to be taxed as costs and to be included in the judgment therein rendered.

It is hereby expressly stipulated and agreed that this bond shall inure to the benefit of any and all persons, companies, and corporations entitled to file claims so as to give a right of action to them or their assigns in any suit brought upon this bond.

Should the condition of this bond be fully performed, then this obligation shall become null and void, otherwise it shall be and remain in full force and effect.

And the said Surety, for value received, thereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of said contract or the specifications accompanying the same shall in any manner affect its obligations on this bond, and it does hereby waive notice of any such change, extension, alteration, or addition.

IN WITNESS WHEREOF, this instrument has been duly executed by the Principal and Surety this _____ day of _____, 201__.

(To be signed by)
(Principal and Surety,)
(and acknowledged and)
(Notarial Seal attached)

_____
Principal

_____

_____
Surety

_____

By:_____
Attorney-in-Fact

_____

The above bond is accepted and approved this ____ day of _____.

END OF DOCUMENT

DOCUMENT 00 72 00

GENERAL CONDITIONS

for

CONTRACT OF CONSTRUCTION

Cherrywood Elementary School
Modernization and F.I.S.

BERRYESSA UNION SCHOOL DISTRICT

December 7, 2017

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ARTICLE 1

GENERAL CONDITIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The "Contract Documents" consist of the Agreement between Owner and Contractor (hereinafter the Agreement), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, addenda issued prior to bid, Instructions to Bidders, Notice to Bidders, the Bid Form, Payment Bond, Performance Bond, required insurance certificates, additional insured endorsement and declarations page, Designation of Subcontractors, Noncollusion Declaration, Roof Project Certification (where applicable), Sufficient Funds Declaration (Labor Code section 2810) and the Fingerprinting Notice and Acknowledgment and Independent Contractor Student Contact Form, other documents referred to in the Agreement, and Modifications issued after execution of the Agreement. A Modification is a written amendment to the Contract signed by both parties, a Change Order, a Construction Change Directive, or a written order for a minor change in the Work issued by the Owner. The Contract Documents are complementary, and each obligation of the Contractor, Subcontractors, material or equipment suppliers in any one shall be binding as if specified in all.

1.1.2 THE CONTRACT

The Contract Documents form the Contract. The "Contract" represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a written Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between the Architect and Contractor, between the Owner and any Subcontractor or Sub-subcontractor, or between any persons or entities other than the Owner and the Contractor. The terms of the Contract shall not be waived, altered, modified, supplemented or amended in any manner whatsoever except by written agreement signed by the parties and approved or ratified by the Governing Board.

1.1.3 THE WORK

The "Work" shall include all labor, materials, services and equipment necessary for the Contractor to fulfill all of its obligations pursuant to the Contract Documents, including but not limited to punch list items. It shall include the initial obligation of any Contractor or Subcontractor, who performs any portion of the Work, to visit the Site of the proposed Work with Owner's representatives, a continuing obligation after the commencement of the Work to fully acquaint and familiarize itself with the conditions as they exist and the character of the operations to be carried on under the Contract Documents, and make such investigation as it may see fit so that it shall fully understand the facilities, physical conditions, and restrictions attending the Work under the Contract Documents. Each such Contractor or Subcontractor shall also thoroughly examine and become familiar with the Drawings, Specifications, and associated

bid documents. The "Site" refers to the grounds of the Project as defined in the Contract Documents and such adjacent lands as may be directly affected by the performance of the Work. The Work shall constitute a "work of improvement" under Civil Code section 8050 and Public Contract Code section 7107.

1.1.4 THE PROJECT

The "Project" is the total construction of the Work performed in accordance with the Contract Documents in whole or in part and which may include construction by the Owner or by separate contractors.

1.1.5 THE DRAWINGS

The "Drawings" are graphic and pictorial portions of the Contract Documents prepared for the Project and approved changes thereto, wherever located and whenever issued, showing the design, location, and scope of the Work, generally including plans, elevations, sections, details, schedules, and diagrams as drawn or approved by the Architect.

1.1.6 THE SPECIFICATIONS

The "Specifications" are that portion of the Contract Documents consisting of the written requirements for material, equipment, construction systems, instructions, quality assurance standards, workmanship, and performance of related services.

1.1.7 THE PROJECT MANUAL

The "Project Manual" is the volume usually assembled for the Work which may include, without limitation, the bidding requirements, sample forms, Agreement, Conditions of the Contract, and Specifications.

1.1.8 OR

"Or" shall include "and/or."

1.1.9 COMPLETION OR COMPLETE

Statutory definitions of "completion" and "complete" shall apply for those statutory purposes. For accrual of liquidated damages, Claim and warranty purposes, "completion" and "complete" mean the point in the Project where (1) Contractor has fully and correctly performed all Work in all parts and requirements, including corrective and punch list work, and (2) Owner's representatives have conduced a final inspection that confirmed this performance. Substantial, or any other form of partial or non-compliant, performance of the Work shall not constitute "completion" or "complete" under the Contract Documents.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 **CORRELATION AND INTENT**

1.2.1.1 ***Documents Complementary and Inclusive.*** The Contract Documents are complementary and are intended to include all items required for the proper execution and completion of the Work. Any item of work mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be provided by Contractor as if shown or mentioned in both.

1.2.1.2 ***Coverage of the Drawings and Specifications.*** The Drawings and Specifications generally describe the work to be performed by Contractor. Generally, the Specifications describe work which cannot be readily indicated on the Drawings and indicate types, qualities, and methods of installation of the various materials and equipment required for the Work. It is not intended to mention every item of Work in the Specifications, which can be adequately shown on the Drawings, or to show on the Drawings all items of Work described or required by the Specifications even if they are of such nature that they could have been shown. All materials or labor for Work, which is shown on the Drawings or the Specifications (or is reasonably inferable therefrom as being necessary to complete the Work), shall be provided by the Contractor whether or not the Work is expressly covered in the Drawings or the Specifications. It is intended that the Work be of sound, quality construction, and the Contractor shall be responsible for the inclusion of adequate amounts to cover installation of all items indicated, described, or implied in the portion of the Work to be performed by Contractor.

1.2.1.3 ***Conflicts.*** Without limiting Contractor's obligation to identify conflicts for resolution by the Owner, it is intended that the more stringent, higher quality, and greater quantity of Work shall apply.

1.2.1.4 ***Conformance With Laws.*** Each and every provision of law required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon application of either party the Contract shall be amended in writing to make such insertion or correction.

Before commencing any portion of the Work, Contractor shall check and review the Drawings and Specifications for such portion for conformance and compliance with all laws, ordinances, codes, rules and regulations of all governmental authorities and public utilities affecting the construction and operation of the physical plant of the Project, all quasi-governmental and other regulations affecting the construction and operation of the physical plant of the Project, and other special requirements, if any, designated in the Contract Documents. In the event Contractor observes any violation of any law, ordinance, code, rule or regulation, or inconsistency with any such restrictions or special requirements of the Contract Documents, Contractor shall promptly notify Architect and Owner in writing of same and shall ensure that any such violation or inconsistency shall be corrected in the manner provided hereunder prior to the construction of that portion of the Project. Where requirements of the Contract Documents exceed those of the applicable building codes and ordinances, the Contract Documents shall govern. Contractor shall comply with all applicable Federal, State and local laws.

If, as and to the extent that Public Contract Code section 1104 is deemed to apply after the Award of the Contract, Contractor shall not be required to assume responsibility for the completeness and accuracy of architectural or engineering plans and specifications, notwithstanding any other provision in the Contract Documents, except to the extent that Contractor discovered or should have discovered and reported any errors and omissions to the Architect or Owner, including but not limited to as the result of any review of the plans and specifications by Contractor required by the Instructions to Bidders or other Contract Documents, whether or not actually performed by Contractor.

1.2.1.5 ***Ambiguity.*** Before commencing any portion of the Work, Contractor shall carefully examine all Drawings and Specifications and other information given to Contractor as to materials and methods of construction and other Project requirements. Contractor shall immediately notify Architect and Owner in writing of any perceived or alleged error, inconsistency, ambiguity, or lack of detail or explanation in the Drawings and Specifications in the manner provided herein. If the Contractor or its Subcontractors, material or equipment suppliers, or any of their officers, agents, and employees performs, permits, or causes the performance of any Work under the Contract Documents, which it knows or should have known to be in error, inconsistent, or ambiguous, or not sufficiently detailed or explained, Contractor shall bear any and all costs arising therefrom including, without limitation, the cost of correction thereof without increase or adjustment to the Contract Sum or the time for performance. If Contractor performs, permits, or causes the performance of any Work under the Contract Documents prepared by or on behalf of Contractor which is in error, inconsistent or ambiguous, or not sufficiently detailed or explained, Contractor shall bear any and all resulting costs, including, without limitation, the cost of correction, without increase to or adjustment in the Contract Sum or the time for performance. In no case shall any Subcontractor proceed with the Work if uncertain without the Contractor's written direction and/or approval.

1.2.1.6 ***Execution.*** Execution of the Agreement Between Owner and Contractor by the Contractor is a representation that the Contractor has visited the site, become familiar with the local conditions under which the Work is to be performed and has correlated personal observations with the requirements of the Contract Documents.

1.2.2 ADDENDA AND DEFERRED APPROVALS

1.2.2.1 ***Addenda.*** Subsequent addenda issued shall govern over prior addenda only to the extent specified. In accordance with Title 24, California Code of Regulations, addenda shall be approved by the Division of the State Architect ("DSA").

1.2.2.2 ***Deferred Approvals.*** The requirements approved by the DSA on any item submitted as a deferred approval in accordance with Title 24, California Code of Regulations, shall take precedence over any previously issued addenda, drawing or specification.

1.2.3 SPECIFICATION INTERPRETATION

1.2.3.1 ***Titles.*** The Specifications are separated into titled sections for convenience only and not to dictate or determine the trade or craft involved. Organization of the Specifications

into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of work to be performed by any trade.

1.2.3.2 ***As Shown, Etc.*** Where "as shown," "as indicated," "as detailed," or words of similar import are used, reference is made to the Drawings accompanying the Specifications unless otherwise stated. Where "as directed," "as required," "as permitted," "as authorized," "as accepted," "as selected," or words of similar import are used, the direction, requirement, permission, authorization, approval, acceptance, or selection by Architect is intended unless otherwise stated.

1.2.3.3 ***Provide.*** "Provide" means "provided complete in place," that is, furnished, installed, tested, and ready for operation and use.

1.2.3.4 ***General Conditions.*** The General Conditions and any supplementary general conditions are a part of each and every section of the Specifications.

1.2.3.5 ***Abbreviations.*** In the interest of brevity, the Specifications are written in an abbreviated form and may not include complete sentences. Omission of words or phrases such as "Contractor shall," "shall be," etc., are intentional. Nevertheless, the requirements of the Specifications are mandatory. Omitted words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the Drawings.

1.2.3.6 ***Plural.*** Words in the singular shall include the plural whenever applicable or the context so indicates.

1.2.3.7 ***Metric.*** The Specifications may indicate metric units of measurement as a supplement to U.S. customary units. When indicated thus: 1" (25 mm), the U. S. customary unit is specific, and the metric unit is nonspecific. When not shown with parentheses, the unit is specific. The metric units correspond to the "International System of Units" (SI) and generally follow ASTM E 380, "Standard for Metric Practice."

1.2.3.8 ***Standard Specifications.*** Any reference to standard specifications of any society, institute, association, or governmental authority is a reference to the organization's standard specifications, which are in effect as of the date the Notice to Bidders is first published. If applicable specifications are revised prior to completion of any part of the Work, the Contractor may, if acceptable to Owner and Architect, perform such Work in accordance with the revised specifications. The standard specifications, except as modified in the Specifications for the Project, shall have full force and effect as though printed in the Specifications. Architect will furnish, upon request, information as to how copies of the standard specifications referred to may be obtained.

1.2.3.9 ***Absence of Modifiers.*** In the interest of brevity, the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

1.3 OWNERSHIP AND USE OF ARCHITECT'S DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS

The Drawings, Specifications, and other documents prepared on behalf of the Owner are instruments of the services of the Architect and its consultants and are the property of the Owner. The Contractor may retain one contract record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor, or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications, and other documents prepared by the Architect, and unless otherwise indicated the Architect shall be deemed the author of them. All copies of them, except the Contractor's record set, shall be returned or suitably accounted for to the Owner, upon request upon completion of the Work. The Drawings, Specifications, and other documents prepared by the Architect, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor, or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner and the Architect. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications, and other documents prepared by the Architect appropriate to and for use in the execution of their Work under the Contract Documents. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Owner's property interest or other reserved right. All copies made under this license shall bear appropriate attribution and the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect.

ARTICLE 2

OWNER

2.1 DEFINITION

The term "Owner" means the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Owner" means the Owner and/or the Owner's authorized representatives, including but not limited to architects and construction managers. To the extent the Contract Documents indicate that Owner has assigned duties to particular representatives of the Owner (such as the architect, or any construction manager), Owner reserves the right at all times to reassign such duties to different Owner representatives.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 INTENTIONALLY LEFT BLANK

2.2.2 SITE SURVEY

When required by the scope of the Project, the Owner will furnish, at its expense, a legal description or a land survey of the Site, giving, as applicable, grades and lines of streets, alleys, pavements, adjoining property, rights-of-way, restrictions, easements, encroachments, zoning, deed restrictions, boundaries, and contours of the Site. Surveys to determine locations of construction, grading, and site work shall be provided by the Contractor.

2.2.3 SOILS

2.2.3.1 ***Owner Furnished Services.*** When required by the scope of the Project, the Owner will furnish, at its expense, the services of geotechnical engineers or consultants when reasonably required or as required by local or state codes. Such services with reports and appropriate professional recommendations shall include test boring, test pits, soil bearing values, percolation tests, air and water pollution tests, and ground corrosion and resistivity tests, including necessary operations for determining subsoil, air, and water conditions.

2.2.3.2 ***Contractor Reliance.*** Test borings and soils reports for the Project have been made for the Owner to indicate the subsurface materials that might be encountered at particular locations on the Project. The Owner has made these documents available to the Contractor and the Contractor has studied the results of such test borings and information that it has as to the subsurface conditions and Site geology as set forth in the test borings and soils reports. The Owner does not assume any responsibility whatsoever with respect to the sufficiency or accuracy of the borings made, or of the logs of the test borings, or of other investigations, or of the soils reports furnished pursuant hereto, or of the interpretations to be made beyond the location or depth of the borings. There is no warranty or guarantee, either express or implied that the conditions indicated by such investigations, borings, logs, soil reports or other information are representative of those existing throughout the Site of the Project, or any part thereof, or that unforeseen developments may not occur. At the Owner's request, the Contractor shall make available to the Owner the results of any Site investigation, test borings, analyses, studies or other tests conducted by or in the possession of the Contractor of any of its agents. Nothing herein contained shall be deemed a waiver by the Contractor to pursue any available legal right or remedy it may have at any time against any third party who may have prepared any report and/or test relied upon by the Contractor.

2.2.4 UTILITY SURVEY

When required by the scope of the Project, the Owner will furnish, at its expense, all information regarding known existing utilities on or adjacent to the Site, including location, size, inverts, and depths.

2.2.5 INFORMATION

Upon the request of the Contractor, Owner will make available such existing information regarding utility services and Site features, including existing construction, related to the Project as is available from Owner's records. The Contractor may not rely upon the accuracy of any such information, other than that provided under Sections 2.2.2 and 2.2.4 (except that the Contractor may not rely upon and must question in writing to the Owner and the Architect any

information which appears incorrect based upon Contractor's Site inspection, knowledge of the Project, and prior experience with similar projects), unless specifically stated in writing that the Contractor may rely upon the designated information.

2.2.6 EXISTING UTILITY LINES; REMOVAL, RELOCATION

2.2.6.1 ***Removal, Relocation.*** Pursuant to Government Code section 4215, the Owner assumes the responsibility for removal, relocation, and protection of utilities located on the Site at the time of commencement of construction under this Contract with respect to any such utility facilities which are not identified in the drawings and specifications made part of the invitation to bid. The Contractor shall not be assessed for liquidated damages for delay in completion of the Project caused by failure of the Owner to provide for removal or relocation of such utility facilities. Owner shall compensate the Contractor for the costs of locating, repairing damage not due to the failure of the Contractor to exercise reasonable care, removing or relocating such utility facilities, and for equipment necessarily idle during such work.

2.2.6.2 ***Assessment.*** These subparagraphs shall not be construed to preclude assessment against the Contractor for any other delays in completion of the Work. Nothing in these subparagraphs shall be deemed to require the Owner to indicate the presence of existing service laterals or appurtenances whenever the presence of such utilities on the Site can be inferred from the presence of other visible facilities, such as buildings, or meter junction boxes on or adjacent to the Site.

2.2.6.3 ***Notification.*** If the Contractor, while performing work under this Contract, discovers utility facilities not identified by the Owner in the Contract plans or specifications, Contractor shall immediately notify the Owner and the utility in writing.

2.2.6.4 ***Underground Utility Clearance.*** It shall be Contractor's sole responsibility to timely notify all public and private utilities serving the Site prior to commencing work. The Contractor shall notify and receive clearance from any cooperative agency, such as Underground Service Alert, in accordance with Government Code section 4216, et seq. Contractor shall promptly provide a copy of all such notifications to the Owner.

2.2.7 EASEMENTS

Owner shall secure and pay for easements for permanent structures or permanent changes in existing facilities, if any, unless otherwise specified in the Contract or Contract Documents.

2.2.8 REASONABLE PROMPTNESS

Information or services under Owner's control will be furnished by the Owner with reasonable promptness. The Owner shall not be liable for any delays caused by factors beyond the Owner's control including but not limited to DSA's or any other local, State or federal agency's review of bids, change order requests, RFI's or any other documents.

2.2.9 COPIES FURNISHED

The Contractor will be furnished such copies of Drawings and Project Manuals as are stated in the Contract Documents.

2.2.10 **DUTIES CUMULATIVE**

The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein, and especially those in Article 6 (Construction by Owner or by Separate Contractors), Article 9 (Payments and Completion), and Article 11 (Insurance and Bonds).

2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents, or persistently fails to carry out Work in accordance with the Contract Documents, the Owner, after providing Notice pursuant to paragraph 2.4, may order the Contractor to stop the Work or any portion thereof, until the Contractor corrects the deficiencies. The right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Article 6.

2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor fails or refuses to carry out the Work in accordance with the Contract Documents, Owner may correct such deficiencies by whatever reasonable method the Owner may deem expedient without prejudice to other remedies the Owner may have, including but not limited to having another contractor perform some or all of the Work without terminating the Contract with Contractor. Owner may exercise this right at any time during the Contractor's Work.

Owner shall first provide written notice to Contractor of Contractor's failure or refusal to perform. The notice will provide the time period within which Contractor must begin correction of the failure or refusal to perform. If the Contractor fails to begin correction within the stated time, or fails to continue correction, the Owner may proceed to correct the deficiencies. In the event the Owner bids the work, Contractor shall not be eligible for the award of the contract. The Contractor may be invoiced the cost to Owner of the work, including compensation for additional professional and internally generated services and expenses made necessary by Contractor's failure or refusal to perform. Owner may withhold that amount from the retention, or progress payments due the Contractor, pursuant to Section 9.5. If retention and payments withheld then or thereafter due the Contractor are not sufficient to cover that amount, the Contractor shall pay the difference to the Owner.

ARTICLE 3

THE CONTRACTOR

3.1 DEFINITION

The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative. To the extent that any portion of the Work is provided with the Contractor's own forces, any reference to Subcontractors shall be equally applicable to the Contractor.

3.2 SUPERVISION AND CONSTRUCTION PROCEDURES

3.2.1 CONTRACTOR

The Contractor shall supervise and direct the Work using the Contractor's best skill and attention, which shall meet or exceed the standards in the industry. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, procedures, and coordinating all portions of the Work under the Contract, unless Contract Documents give other specific instructions concerning these matters. If any of the Work is performed by contractors retained directly by the Owner, Contractor shall be responsible for the coordination and sequencing of the Work of those other contractors so as to avoid any impact on the Project Schedule pursuant to the requirements of Article 6. Specific duties of the Contractor shall be in accordance with Title 24 of the California Code of Regulations. Contractor shall fully comply with any and all reporting requirements of Education Code sections 17309 and 81141 in the manner prescribed by Title 24.

3.2.2 CONTRACTOR RESPONSIBILITY

The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors, material and equipment suppliers, and their agents, employees, invitees, and other persons performing portions of the Work under direct or indirect contract with the Contractor or any of its Subcontractors.

3.2.3 OBLIGATIONS NOT CHANGED BY ARCHITECT'S ACTIONS

The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents by the activities or duties of the Owner's representatives, including but not limited to any construction manager and the Architect, or the Inspector of Record; or by tests, inspections, or approvals required or performed by persons other than the Contractor.

3.2.4 CONTRACTOR RESPONSIBILITY FOR READINESS FOR WORK

The Contractor shall be responsible for inspection of Work already performed under the Contract Documents to determine that such portions are in proper condition to receive subsequent work.

3.2.5 PROJECT MEETINGS

Contractor shall attend Owner's Project meetings as scheduled by the Contract Documents, or as otherwise instructed by Owner, to discuss the current status of the Project and the future progress

of the Work. Contractor shall have five (5) days after receipt of Owner's Project meeting minutes to provide written objections and suggested corrections.

3.3 SUPERINTENDENT

3.3.1 FULL TIME SUPERINTENDENT

The Contractor shall provide a competent superintendent and assistants as necessary, all of whom shall be reasonably proficient in speaking, reading and writing English and, who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

3.3.2 STAFF

The Contractor and each Subcontractor shall: furnish a competent and adequate staff as necessary for the proper administration, coordination, supervision, and superintendence of its portion of the Work; organize the procurement of all materials and equipment so that the materials and equipment will be available at the time they are needed for the Work; and keep an adequate force of skilled workers on the job to complete the Work in accordance with all requirements of the Contract Documents.

3.3.3 RIGHT TO REMOVE

Owner shall have the right, but not the obligation, to require the removal from the Project of any superintendent, staff member, agent, or employee of any Contractor, Subcontractor, material or equipment supplier, etc., for cause.

3.4 LABOR AND MATERIALS

3.4.1 CONTRACTOR TO PROVIDE

Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, material, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

3.4.2 QUALITY

Unless otherwise specified, all materials and equipment to be permanently installed in the Project shall be new and shall be of such quality as required to satisfy the standards of the Contract Documents. The Contractor shall, if requested, promptly furnish satisfactory evidence as to kind and quality of all materials and equipment. All labor shall be performed by workers skilled in their respective trades, and the quality of their work shall meet whichever is the higher standard for their work: the standard in the industry or the standard in the Contract Documents.

3.4.3 REPLACEMENT

Any work, materials, or equipment, which does not conform to these standards may be disapproved and rejected by the Owner, in which case, they shall be removed and replaced by the Contractor at no cost to the Owner.

3.4.4 DISCIPLINE

The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract in accordance with paragraph 5.5.1 including, but not limited to, Subcontractors, and material or equipment suppliers retained for the Project.

3.5 WARRANTY

For the period of one (1) year after completion of the Work (see Sections 9.7.1 and 12.2.5), the Contractor warrants to the Owner that material and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty does not cover damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

3.6 TAXES

Contractor will pay all applicable Federal, State, and local taxes on all materials, labor, or services furnished by it, and all taxes arising out of its operations under the Contract Documents. Owner is exempt from Federal Excise Tax, and a Certificate of Exemption shall be provided upon request.

3.7 PERMITS, FEES AND NOTICES

3.7.1 PAYMENT

The Contractor shall secure and pay for all permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Work which are customarily secured after execution of the Contract and are legally required by any authority having jurisdiction over the Project, except those required by the Division of the State Architect (DSA). Owner shall be responsible for all testing and inspection as required by the DSA on-Site or within the distance limitations set forth in paragraph 13.5.2, unless a different mileage range is specified in the Contract Documents.

3.7.2 COMPLIANCE

The Contractor shall comply with and give notices required by any law, ordinance, rule, regulation, and lawful order of public authorities bearing on performance of the Work.

3.7.3 CONTRACT DOCUMENTS

It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with any applicable law, statute, ordinance, building codes, rule, or regulation. However, if the Contractor knew, or should have known, or observes that portions of the Contract Document are at variance therewith, the Contractor shall promptly notify the Architect, any construction manager, and Owner in writing, and necessary changes shall be accomplished by appropriate modification.

3.7.4 RESPONSIBILITY

If the Contractor performs Work that it knows, or should have known, is contrary to any law, statute, ordinance, building code, rule or regulation, the Contractor shall assume full responsibility for such Work, for all delays attributable thereto, and shall bear the attributable cost of correction or Project delay.

3.8 ALLOWANCES

3.8.1 CONTRACT

The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities against whom the Contractor makes reasonable and timely objection.

3.8.2 SCOPE

3.8.2.1 ***Prompt Selection.*** Materials and equipment under an allowance shall be selected promptly by the Owner to avoid delay to the Work.

3.8.2.2 ***Cost.*** Allowances shall cover the cost to the Contractor of materials and equipment delivered at the Site and all required taxes, less applicable trade discounts, etc., as delineated in paragraph 7.7.4.

3.8.2.3 ***Cost Included in Contract Sum.*** Contractor's costs for unloading and handling at the Site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum and not in the allowances.

3.8.2.4 ***Contract Sum Adjustment.*** Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect the difference between actual cost and the allowances under paragraph 3.8.2.2 and the change in the Contractor's costs under paragraph 3.8.2.3.

3.9 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.9.1 REQUIREMENTS

Before the Contractor's commencement of Work on the Project Site or within two (2) weeks of award of the Contract, whichever is earlier, Contractor shall prepare and submit for the Owner's, and any construction manager's, information the construction schedule for the Work, which shall conform to the Contract Documents' requirements.

Contractor shall submit a monthly updated schedule that will include an accurate as-built schedule and the current as-planned schedule, both of which shall conform to the Contract Documents' requirements. Contractor shall submit its daily logs for the prior month with the updated schedule.

The schedule and updates shall conform, at a minimum, to industry standards for critical path scheduling and to facilitate Owner's Project management and evaluation of Contractor Claims for additional money or time.

The schedule and updates shall not exceed time limits (including milestone deadlines) under the Contract Documents and shall comply with the Contract Documents scheduling requirements and with any scheduling requirements the Owner provides to the Contractor at the beginning of the Work. The original schedule and all updates shall accurately reflect work performed to date, all construction tasks (including procurement), the critical path schedule for completion of the remainder of the Project, and the percentage of the Work completed. The original schedule and updates shall include all delay days for weather not unusually severe, even though that weather will not entitle Contractor to additional time or money.

The construction schedule shall be in the form of either a tabulation, chart, or graph, unless otherwise stated in Division 1 of the Specifications, and shall be in sufficient detail to show the chronological relationship of all activities of the Project including, but not limited to, estimated starting and completion dates of various activities, (including early and late dates and reasonable float for each activity), procurement of materials, the critical path, and scheduling of equipment. Float suppression techniques such as preferential sequencing, special lead/lag logic restraints, extended activity durations, or imposed dates shall be apportioned for the benefit of the Project. Whenever in the Contract Documents Contractor is required to provide a schedule and/or schedule updates, the Contractor shall provide the schedule and updates in electronic format as well as hard copy. Contractor shall be solely responsible for the accuracy, utility and reasonableness of all of its schedules. Owner's acceptance, approval or non-rejection of Contractor's schedules shall not affect Contractor's responsibility for its schedules.

The Contractor and Owner shall use any float on a "first come, first served" basis. The original schedule and updates shall reflect Contractor's and Owner's use of float. Float is not for the exclusive use or benefit of either Owner or Contractor, but it is a jointly owned expiring Project resource available to both parties as needed to meet schedule milestones. For the original schedule and updates, Contractor shall use a critical path network format with the critical paths clearly indicated. Contractor shall use an MS Project, Primavera, or an equivalent or better program. Contractor shall provide schedule conversion to MS Project or as directed by District. Contractor shall include reports that sort and list the activities in order of increasing float and by early and late start dates. Contractor shall endeavor to label ten to thirty percent (10-30%) of the tasks as critical, but shall not label less than five (5%) or more than fifty (50%) as critical. Contractor shall use calendar days.

If any change in Contractor's method of operations will cause a change in the construction schedule, Contractor shall submit to Owner, Architect and any construction manager, a revised construction schedule within seven (7) days of the change, unless a different time period is stated in Division 1 of the Specifications.

If, in the Owner's opinion, the Contractor is not prosecuting the Work at a rate sufficient to meet the Project schedule, a contractual milestone or the Project completion date (as adjusted by change orders) or if the Contractor's actual progress falls behind the Project schedule or it is apparent to Owner or Contractor that Contractor will not meet contractual milestones or the Project completion date (as adjusted by change orders), the Owner may require that the Contractor prepare and submit a recovery plan. Contractor must submit a recovery plan within seven (7) days of a demand for the plan, unless a different time period is stated in Division 1 of the Specifications. At a minimum, the recovery plan must include a revised schedule that gets the Work back on schedule and completes all Work by the contractual milestones and Project completion date (as adjusted by change orders) or by other dates Owner specifies in the demand for a recovery plan. The recovery plan shall state the corrective actions Contractor will undertake to implement it. The recovery plan shall also list any additional money that Contractor believes it should receive if Owner orders Contractor to fully or partially implement the recovery plan. If the Owner orders Contractor to implement the recovery plan, Contractor shall do so, but the order shall not act constitute an admission by Owner that Contractor is entitled to additional money. To recover additional money, Contractor must comply with General Conditions Articles 4.5, 7 and 8.

All schedules Contractor submits shall be certified as true and correct, as follows:

> I, [name of declarant], declare the following:
>
> [Contractor company name] has contracted with [public entity name] for the [name of project] Project. [Contractor company name] authorized me to prepare schedules for [public entity name] for this Project, and I prepared the attached schedule. I am the most knowledgeable person at [contractor company name] regarding the scheduling of this Project.

The attached schedule does not breach the Contract between [contractor company name] and [public entity name] for this Project, does not violate any applicable law, satisfies all provisions of the Contract applicable to submission of the Claim, only contains truthful and accurate as-built and as-planned dates of work on the Project (including supporting data), and is not a false claim.

The attached schedule is submitted in compliance with all laws applicable to submission of a Claim, including but not limited to California Penal Code section 72 (Fraudulent Claims), Government Code sections 12650 et seq. (False Claims Act; for example, Government Code section 12651(a)(7)), and Business and Professions Code sections 17200 et seq. (Unfair Business Practices Act). I am aware that submission or certification of false claims, or other Claims that violate law or the Contract, may lead to fines, imprisonment, and/or other serious legal consequences for myself and/or [contractor company name].

While preparing this declaration and schedule I consulted with others (including attorneys, consultants, or others who work for [contractor company name]) when necessary to ensure that the statements were true and correct.

I declare under the penalty of perjury under the laws of the State of California that the foregoing is true and correct. Executed _____, 20__, at _____, California.

_____
[name of declarant]

3.9.2 DSA OVERSIGHT PROCESS

In connection with the DSA Construction Oversight Process which includes inspection cards and review of changes to the DSA-approved construction documents, the Contractor must (a) include specific tasks in its baseline schedule to take into account these procedures since they are critical path issues; and (b) include a reasonable amount of float in the baseline schedule to accommodate the additional time required by these DSA procedures.

3.9.3 FAILURE TO MEET REQUIREMENTS

Failure of the Contractor to provide proper schedules may, at the sole discretion of Owner, constitute either grounds to withhold, in whole or in part, progress payments to the Contractor, or a breach of contract allowing Owner to terminate the Contract.

3.10 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the Site for the Owner one applicable copy of Titles 19 and 24 and record copy of the Drawings, Specifications, Addenda, Change Orders, and other Modifications, in good order and marked currently to record changes and selections made during construction. In addition, the Contractor shall maintain at the Site approved Shop Drawings, Product Data, Samples, and similar required submittals. These documents shall be available to the Owner and shall be delivered to the Architect for delivery to the Owner upon completion of the Work.

3.11 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

3.11.1 SUBMITTALS DEFINED

3.11.1.1 ***Shop Drawings.*** The term "shop drawings" as used herein means drawings, diagrams, schedules, and other data, which are prepared by Contractor, Subcontractors, manufacturers, suppliers, or distributors illustrating some portion of the Work, and includes: illustrations; fabrication, erection, layout and setting drawings; manufacturer's standard drawings; schedules; descriptive literature, instructions, catalogs, and brochures; performance and test data including charts; wiring and control diagrams; and all other drawings and descriptive data pertaining to materials, equipment, piping, duct and conduit systems, and methods of construction as may be required to show that the materials, equipment, or systems and their position conform to the requirements of the Contract Documents. The Contractor shall obtain and submit with the shop drawings all seismic and other calculations and all product data from equipment manufacturers. "Product data" as used herein are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work. As used herein, the term "manufactured" applies to standard units usually mass-produced, and "fabricated" means items specifically assembled or made out of selected materials to meet individual design requirements. Shop drawings shall: establish the actual detail of all manufactured or fabricated items, indicate proper relation to adjoining work, amplify design details of mechanical and electrical systems and equipment in proper relation to physical spaces in the structure, and incorporate minor changes of design or construction to suit actual conditions.

3.11.1.2 ***Samples.*** The term "samples" as used herein are physical examples furnished by Contractor to illustrate materials, equipment, or quality and includes natural materials, fabricated items, equipment, devices, appliances, or parts thereof as called for in the Specifications, and any other samples as may be required by the Owner to determine whether the kind, quality, construction, finish, color, and other characteristics of the materials, etc., proposed by the Contractor conform to the required characteristics of the various parts of the Work. All Work shall be in accordance with the approved samples.

3.11.1.3 ***Contractor's Responsibility.*** Contractor shall obtain and shall submit to Architect all required shop drawings and samples in accordance with Contractor's "Schedule for Submission of Shop Drawings and Samples" provisions in Division 1 of the Specifications and

in accordance with the Contractor's original and updated schedules, and with such promptness as to cause no delay in its own Work or in that of any other contractor, Owner or subcontractor but in no event later than fifteen (15) days after the execution of the Agreement. Contractor may be assessed $100 a day for each day it is late in submitting a shop drawing or sample. No extensions of time will be granted to Contractor or any Subcontractor because of its failure to have shop drawings and samples submitted in accordance with the Schedule. Each Subcontractor shall submit all shop drawings, samples, and manufacturer's descriptive data for the review of the Owner, the Contractor, and the Architect through the Contractor. By submitting shop drawings, product data, and samples, the Contractor or submitting party (if other than Contractor) represents that it has determined and verified all materials, field measurements, field conditions, catalog numbers, related field construction criteria, and other relevant data in connection with each such submission, and that it has checked, verified, and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. At the time of submission, any deviation in the shop drawings, product data, or samples from the requirements of the Contract Documents shall be narratively described in a transmittal accompanying the submittal. However, submittals shall not be used as a means of requesting a substitution, the procedure for which is defined in paragraph 3.11.4, "Substitutions." Review by Owner and Architect shall not relieve the Contractor or any Subcontractor from its responsibility in preparing and submitting proper shop drawings in accordance with the Contract Documents. Contractor shall stamp, sign, and date each submittal indicating its representation that the submittal meets all of the requirements of the Contract Documents. Any submission, which in Owner's or Architect's opinion is incomplete, contains numerous errors, or has been checked only superficially by Contractor will be returned unreviewed for resubmission by the Contractor.

3.11.1.4 ***Extent of Review.*** In reviewing shop drawings, the Owner will not verify dimensions and field conditions. The Architect will review and approve shop drawings, product data, and samples for aesthetics and for conformance with the design concept of the Work and the information given in the Contract Documents. The Architect's review shall neither be construed as a complete check nor relieve the Contractor, Subcontractor, manufacturer, fabricator, or supplier from responsibility for any deficiency that may exist or from any departures or deviations from the requirements of the Contract Documents unless the Contractor has, in writing, called the Architect's attention to the deviations at the time of submission and the Architect has given specific written approval. The Architect's review shall not relieve the Contractor or Subcontractors from responsibility for errors of any sort in shop drawings or schedules, for proper fitting of the Work, or from the necessity of furnishing any Work required by the Contract Documents, which may not be indicated on shop drawings when reviewed. Contractor and Subcontractors shall be solely responsible for determining any quantities, whether or not shown on the shop drawings.

3.11.2 **DRAWING SUBMISSION PROCEDURE**

3.11.2.1 ***Transmittal Letter and Other Requirements.*** All shop drawings must be properly identified with the name of the Project and dated, and each lot submitted must be accompanied by a letter of transmittal referring to the name of the Project and to the Specification section number for identification of each item clearly stating in narrative form, as

well as "clouding" on the submissions, all qualifications, departures, or deviations from the Contract Documents, if any. Shop drawings, for each section of the Work, shall be numbered consecutively, and the numbering system shall be retained throughout all revisions. All Subcontractor submissions shall be made through the Contractor. Each drawing shall have a clear space for the stamps of Architect and Contractor. Only shop drawings required to be submitted by the Contract Documents shall be reviewed.

3.11.2.2 ***Copies Required.*** Each submittal shall include one (1) legible, reproducible and five (5) legible prints and one (1) electronic copy of each drawing, including fabrication, erection, layout and setting drawings, and such other drawings as required under the various sections of the Specifications until final acceptance thereof is obtained. Subcontractor shall submit copies, in an amount as requested by the Contractor, of: manufacturers' descriptive data for materials, equipment, and fixtures, including catalog sheets showing dimensions, performance, characteristics, and capacities; wiring diagrams and controls; schedules; all seismic calculations and other calculations; and other pertinent information as required.

3.11.2.3 ***Corrections.*** The Contractor shall make any corrections required by Architect and shall resubmit as required by Architect the required number of corrected copies of shop drawings or new samples until approved. Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than the corrections required by the Architect on previous submissions. Professional services required for more than one (1) re-review of required submittals of shop drawings, product data, or samples are subject to charge to the Contractor pursuant to paragraph 4.4.

3.11.2.4 ***Approval Prior to Commencement of Work.*** No portion of the Work requiring a shop drawing or sample submission shall be commenced until the submission has been reviewed by Owner and approved by Architect unless specifically directed in writing by the Owner. All such portions of the Work shall be in accordance with approved shop drawings and samples.

3.11.3 **SAMPLE SUBMISSIONS PROCEDURE**

3.11.3.1 ***Samples Required.*** In case a considerable range of color, graining, texture, or other characteristics may be anticipated in finished products, a sufficient number of samples of the specified materials shall be furnished by the Contractor to indicate the full range of characteristics, which will be present in the finished products; and products delivered or erected without submittal and approval of full range samples shall be subject to rejection. Except for range samples, and unless otherwise called for in the various sections of the Specifications, samples shall be submitted in duplicate. All samples shall be marked, tagged, or otherwise properly identified with the name of the submitting party, the name of the Project, the purpose for which the samples are submitted, and the date and shall be accompanied by a letter of transmittal containing similar information, together with the Specification section number for identification of each item. Each tag or sticker shall have clear space for the review stamps of Contractor and Architect.

3.11.3.2 ***Labels and Instructions.*** Samples of materials, which are generally furnished in containers bearing the manufacturers' descriptive labels and printed application instructions,

shall, if not submitted in standard containers, be supplied with such labels and application instructions.

3.11.3.3 ***Architect's Review.*** The Architect will review and, if appropriate, approve submissions and will return them to the Contractor with the Architect's stamp and signature applied thereto, indicating the appropriate action in compliance with the Architect's standard procedures.

3.11.3.4 ***Record Drawings and Annotated Specifications.*** The Contractor will prepare and maintain on a current basis an accurate and complete set of Record Drawings showing clearly all changes, revisions, and substitutions during construction, including, without limitation, field changes and the final location of all mechanical equipment, utility lines, ducts, outlets, structural members, walls, partitions, and other significant features, and Annotated Specifications showing clearly all changes, revisions, and substitutions during construction. A copy of such Record Drawings and Annotated Specifications will be delivered to Owner in accordance with the Schedule prepared by Contractor. In the event of a specification that allows Contractor to elect one of several brands, makes, or types of material or equipment, the annotations shall show which of the allowable items the Contractor has furnished. The Contractor will update the Record Drawings and Annotated Specifications as often as necessary to keep them current but no less often than weekly. The Record Drawings and Annotated Specifications shall be kept at the Site and available for inspection by the Owner, Inspector of Record and the Architect. On completion of the Contractor's portion of the Work and prior to Application for Final Progress Payment, the Contractor will provide one complete set of Record Drawings and Annotated Specifications to the Owner, certifying them to be a complete and accurate reflection of the actual construction conditions of the Work.

3.11.3.5 ***Equipment Manuals.*** Contractor shall obtain and furnish three (3) complete sets of manuals containing the manufacturers' instructions for maintenance and operation of each item of equipment and apparatus furnished under the Contract Documents and any additional data specifically requested under the various sections of the Specifications for each division of the Work. The manuals shall be arranged in proper order, indexed, and placed in three-ring binders. At the completion of its Work, the Contractor shall certify, by endorsement thereon, that each of the manuals is complete, accurate, and covers all of its Work. Prior to submittal of Contractor's Application for Final Progress Payment, and as a further condition to its approval by the Architect, each Subcontractor shall deliver the manuals, arranged in proper order, indexed, endorsed, and placed in three-ring binders, to the Contractor, who shall assemble these manuals for all divisions of the Work, review them for completeness, and submit them to the Owner through the Architect.

3.11.3.6 ***Owner's Property.*** All shop drawings and samples submitted shall become the Owner's property.

3.11.4 **SUBSTITUTIONS**

3.11.4.1 ***One Product Specified.*** Unless the Specifications state that no substitution is permitted, whenever in the Contract Documents any specific article, device, equipment, product, material, fixture, patented process, form, method, or type of construction is indicated or specified by name, make, trade name, or catalog number, with or without the words "or equal," such specification shall be deemed to be used for the purpose of facilitating description of material, process, or article desired and shall be deemed to be followed by the words "or equal." Contractor may, unless otherwise stated, offer any material, process, or article, which shall be substantially equal or better in every respect to that so indicated or specified and will completely accomplish the purpose of the Contract Documents.

3.11.4.2 ***Two or More Products Specified.*** When two or more acceptable products are specified for an item of the Work, the choice will be up to the Contractor. Contractor shall utilize the same product throughout the Project. If a timely substitution request as set forth in Section 3.11.4.3 is not provided and an "or equal" substitution is requested, the Owner may consider the substitution if the product specified is no longer commercially available. If the Owner allows the substitution to be proposed pursuant to such an untimely request, the Contractor will be responsible for the professional fees incurred by the Architect or Architect's consultants in reviewing the proposed substitution which fees may be withheld from progress payments and/or retention.

3.11.4.3 ***Substitution Request Form.*** Requests for substitutions of products, materials, or processes other than those specified must be made on the Substitution Request form available from the Owner prior to the date of the bid opening. Any Requests submitted less than fourteen (14) days prior to the date of the bid opening will not be considered, except as noted in paragraph 3.11.4.2. A Substitution Request must be accompanied by evidence as to whether or not the proposed substitution: is equal in quality and serviceability to the specified item; will entail no changes in detail and construction of related work; will be acceptable in consideration of the required design and artistic effect; will provide no cost disadvantage to Owner; and will require no excessive or more expensive maintenance, including adequacy and availability of replacement parts. The burden of proof of these facts shall be upon the Contractor. The Contractor shall furnish with its request sufficient information to determine whether the proposed substitution is equivalent including but not limited to all drawings, specifications, samples, performance data, calculations, and other information as may be required to assist the Architect and the Owner in determining whether the proposed substitution is acceptable. The final decision shall be the Owner's. The written approval of the Owner, consistent with the procedure for Change Orders, shall be required for the use of a proposed substitute material. Owner may condition its approval of the substitution upon delivery to Owner of an extended warranty or other assurances of adequate performance of the substitution. All risks of delay due to the Division of the State Architect's, or any other governmental agency having jurisdiction, approval of a requested substitution shall be on the requesting party.

3.11.4.4 ***List of Manufacturers and Products Required.*** The Subcontractor shall prepare and submit to the Contractor within thirty (30) days of execution of the Subcontract comprehensive lists, in quadruplicate, of the manufacturers and products proposed for the Project, including information on materials, equipment, and fixtures required by the Contract Documents, as may be required for Contractor's or Architect's preliminary approval. Approval

of such lists of products shall not be construed as a substitute for the shop drawings, manufacturer's descriptive data, and samples, which are required by the Contract Documents, but rather as a base from which more detailed submittals shall be developed for the final review of the Contractor and the Architect.

3.11.5 DEFERRED APPROVALS

Deferred approvals shall be submitted and processed pursuant to the requirements of Division 1 of the Specifications. All risks of delay due to the Division of the State Architect's, or any other governmental agency having jurisdiction, approval of a deferred approval shall be on the requesting party.

3.12 CUTTING AND PATCHING

3.12.1 SCOPE

The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly.

3.12.2 CONSENT

The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work. All cutting shall be done promptly, and all repairs shall be made as necessary.

3.12.3 STRUCTURAL MEMBERS

New or existing structural members and elements, including reinforcing bars and seismic bracing, shall not be cut, bored, or drilled except by written authority of the Architect and DSA. Work done contrary to such authority is at the Contractor's risk, subject to replacement at its own expense and without reimbursement under the Contract. Agency approvals shall be obtained by the Architect, not by the Contractor.

3.12.4 SUBSEQUENT REMOVAL

Permission to patch any areas or items of the Work shall not constitute a waiver of the Owner's or the Architect's right to require complete removal and replacement of the areas of items of the Work if, in the opinion of the Architect or the Owner, the patching does not satisfactorily restore quality and appearance of the Work or does not otherwise conform to the Contract Documents. Any costs caused by defective or ill-timed cutting or patching shall be borne by the person or entity responsible.

3.13 CLEANING UP

3.13.1 CONTRACTOR'S RESPONSIBILITY

The Contractor shall keep the Site and surrounding area free from accumulation of waste material or rubbish caused by operations under the Contract. The Site shall be maintained in a neat and orderly condition. All crates, cartons, paper, and other flammable waste materials shall be removed from Work areas and properly disposed of at the end of each day. The Contractor shall continuously remove from and about the Site the waste materials, rubbish, tools, construction equipment, machinery, and materials no longer required for the Work.

3.13.2 FAILURE TO CLEANUP

If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so, without prior notice to the Contractor and the cost thereof shall be invoiced to the Contractor and withheld from progress payments and/or retention. Each Subcontractor shall have the responsibility for the cleanup of its own Work. If the Subcontractor fails to clean up, the Contractor must do so.

3.13.3 CONSTRUCTION BUILDINGS

When directed by the Owner or the Architect, Contractor and Subcontractor shall dismantle temporary structures, if any, and remove from the Site all construction and installation equipment, fences, scaffolding, surplus materials, rubbish, and supplies belonging to Contractor or Subcontractor. If the Contractor does not remove the tools, equipment, machinery, and materials within fifteen (15) days after completion of its Work, then they shall be deemed abandoned, and the Owner can dispose of them for its own benefit in whatever way it deems appropriate. Contractor shall pay for any costs to dispose of the items.

3.14 ACCESS TO WORK

The Contractor shall provide the Owner, the Architect, and the Inspector of Record, access to the Work in preparation and progress wherever located.

3.15 ROYALTIES AND PATENTS

3.15.1 PAYMENT AND INDEMNITY

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims of infringement of patent rights and shall hold the Owner and the Architect harmless and indemnify them, to the extent not caused by the Owner's active negligence, sole negligence or willful misconduct, from loss on account thereof but shall not be responsible for such defense or loss when a particular design, process, or product of a particular manufacturer is required by the Contract Documents. However, if the Contractor has reason to believe the required design,

process, or product is an infringement of a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Owner and Architect.

3.15.2 REVIEW

The review by the Owner or Architect of any method of construction, invention, appliance, process, article, device, or material of any kind shall be for its adequacy for the Work and shall not be an approval for the use by the Contractor in violation of any patent or other rights of any person or entity.

3.16 INDEMNIFICATION

3.16.1 SCOPE: CONTRACTOR

To the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless the Owner, the construction manager, Architect, Architect's consultants, the Inspector of Record, the State of California, and their respective agents, employees, officers, volunteers, Boards of Trustees, members of the Boards of Trustees, and directors ("Indemnitees"), from and against claims, actions, damages, liabilities, losses (including but not limited to injury or death of persons, property damage, and compensation owed to other parties), and expenses (including but not limited to attorneys' fees and costs including fees of consultants) alleged by third parties against Indemnitees arising out of or resulting from the following: Contractor's, its Subcontractors', or its suppliers' performance of the Work, including but not limited to the Contractor's or its Subcontractors' use of the Site; the Contractor's or its Subcontractors' construction of the Project, or failure to construct the Project, or any portion thereof; the use, misuse, erection, maintenance, operation, or failure of any machinery or equipment including, but not limited to, scaffolds, derricks, ladders, hoists, and rigging supports, whether or not such machinery or equipment was furnished, rented, or loaned by any of the Indemnitees; or any act, omission, negligence, or willful misconduct of the Contractor or its Subcontractors or their respective agents, employees, material or equipment suppliers, invitees, or licensees but only to the extent caused in whole or in part by the acts or omissions of the Contractor, its Subcontractors, its suppliers, anyone directly or indirectly employed by any of them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity, which would otherwise exist as to a party, person, or entity described in this paragraph. The obligation to defend, indemnify and hold harmless includes any claims or actions by third parties arising out of or resulting from Labor Code section 2810. Contractor shall have no obligation to defend or indemnify the Indemnitees against claims, actions, damages, liabilities, losses, and expenses caused by the active negligence, sole negligence or willful misconduct of Indemnitees. This indemnification shall apply to all liability, as provided for above, regardless of whether any insurance policies are applicable, and insurance policy limits do not act as a limitation upon the amount of the indemnification to be provided by the Contractor.

3.16.2 SCOPE: SUBCONTRACTORS

3.16.2.1 ***Indemnity.*** The Subcontractors shall defend, indemnify, and hold harmless the Indemnitees from and against claims, actions, damages, liabilities, and losses (including but not limited to injury or death of persons, property damage, and compensation owed to other parties), and expenses (including but not limited to attorneys' fees and costs including fees of consultants) alleged by third parties against Indemnitees arising out of or resulting from the following: Subcontractors' performance of the Work, including but not limited to the Subcontractors' use of the Site; the Subcontractors' construction of the Project or failure to construct the Project or any portion thereof; the use, misuse, erection, maintenance, operation, or failure of any machinery or equipment, including, but not limited to, scaffolds, derricks, ladders, hoists, and rigging supports, whether or not such machinery or equipment was furnished, rented, or loaned by any of the Indemnitees; or any act, omission, negligence, or willful misconduct of the Subcontractors or their respective agents, employees, material or equipment suppliers, invitees, or licensees but only to the extent caused in whole or in part by the acts or omissions of the Subcontractors, anyone directly or indirectly employed by any of them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity, which would otherwise exist as to a party, person, or entity described in this paragraph. This obligation to defend, indemnify and hold harmless includes any claims or actions by third parties arising out of or resulting from Labor Code section 2810. Subcontractors shall have no obligation to defend or indemnify the Indemnitees against claims, actions, damages, liabilities, losses, and expenses caused by the active negligence, sole negligence or willful misconduct of Indemnitees. This indemnification shall apply to all liability, as provided for above, regardless of whether any insurance policies are applicable, and insurance policy limits do not act as a limitation upon the amount of the indemnification to be provided by the Subcontractors.

3.16.2.2 ***Joint and Several Liability.*** In the event more than one Subcontractor is connected with an accident or occurrence covered by this indemnification, then all such Subcontractors shall be jointly and severally responsible to each of the Indemnitees for indemnification, and the ultimate responsibility among such indemnifying Subcontractors for the loss and expense of any such indemnification shall be resolved without jeopardy to any Indemnitee. The provisions of the indemnity provided for herein shall not be construed to indemnify any Indemnitee for its own negligence if not permitted by law or to eliminate or reduce any other indemnification or right which any Indemnitee has by law or equity.

3.16.3 **NO LIMITATION**

The Contractor's and the Subcontractor's obligation to indemnify and defend the Indemnitees hereunder shall include, without limitation, any and all claims, damages, and costs: for injury to persons and property (including loss of use), and sickness, disease or death of any person; for breach of any warranty, express or implied; for failure of the Contractor or the Subcontractor to comply with any applicable governmental law, rule, regulation, or other requirement; and for products installed in or used in connection with the Work.

3.17 OWNER AS INTENDED BENEFICIARY

The Owner is an intended beneficiary of any architectural or engineering work secured by, or performed by, the Contractor to fulfill its obligations under the Contract. Contractor shall state in its contracts with architectural or engineering consultants that their work is for the intended benefit of the Owner.

3.18 NOTICE OF EXCUSE FOR NONPERFORMANCE

If Contractor believes that acts or omissions of Owner (including but not limited to Owner caused delay) have prevented Contractor from performing the Work as required by the Contract Documents and Contractor intends to rely on Owner's acts or omissions and Civil Code section 1511(1) as reasons to excuse Contractor's nonperformance or to support, among other things, Contractor's requests for time extensions under General Conditions section 4.5, Contractor shall provide written notice of the excuse within five (5) days of the Owner's acts or omissions. If Contractor fails to timely submit the written notice Contractor shall have waived any right to later rely on the acts or omissions as a defense to Contractor's nonperformance, regardless of the merits of the defense. Contractor will not have satisfied a condition precedent or exhausted administrative remedies. Contractor acknowledges that these written notices are of critical importance to the Owner's Project management and the mitigation of Project costs and delays.

ARTICLE 4

ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

4.1.1 DEFINITION

The Architect is the person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative, and shall also refer to all consultants under the Architect's direction and control.

4.1.2 MODIFICATION

To the extent the Contract Documents indicate that Owner has assigned duties or responsibilities to the Architect, Owner reserves the right at all times to reassign such duties or responsibilities to different Owner representatives.

4.1.3 TERMINATION

In the case of the termination of the Architect, the Owner may appoint an architect or another construction professional or may perform such functions with its own licensed professional personnel. The status of the replacement Architect under the Contract Documents shall be that of the former architect.

4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

4.2.1 STATUS

The Architect will provide administration of the Contract and may be one of several Owner's representatives during construction, through release of all retention, and during the one (1) year period following the commencement of any warranties. The Architect will advise and consult with the Owner. The Architect will have authority to act on behalf of the Owner only to the extent set forth in the Owner/Architect agreement. The Architect will have all responsibilities and power established by law, including California Code of Regulations, Title 24, to the extent set forth in the Owner/Architect agreement.

4.2.2 SITE VISITS

The Architect will visit the Site at intervals necessary in the judgment of the Architect or as otherwise agreed by the Owner and the Architect in writing to become generally familiar with the progress and quality of the completed Work and to determine in general if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents.

4.2.3 LIMITATIONS OF CONSTRUCTION RESPONSIBILITY

The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract Documents, or by tests, inspections, or approvals required or performed by persons other than the Contractor.

4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

The Owner and the Contractor shall communicate through the Architect, unless there is a construction manager for the Project or the Owner directs otherwise. Communications between Owner and Subcontractors or material or equipment suppliers shall be through the Contractor.

4.2.5 PAYMENT APPLICATIONS

The Contractor shall submit payment applications to the Architect, unless there is a construction manager for the Project or the Owner directs otherwise.

4.2.6 REJECTION OF WORK

The Architect, Inspector of Record, any construction manager and others may recommend to the Owner that the Owner reject Work which does not conform to the Contract Documents or that the Owner require additional inspection or testing of the Work in accordance with paragraph 13.5.5, whether or not the Work is fabricated, installed, or completed. However, no recommendation shall create a duty or responsibility to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work.

4.2.7 CHANGE ORDERS

The Architect will prepare change orders and construction change directives and may authorize minor changes in the Work.

4.2.8 WARRANTIES UPON COMPLETION

The Architect in conjunction with the Inspector of Record, or as otherwise directed by Owner, will conduct field reviews of the Work to determine the date of completion, shall receive and forward to the Owner for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor. The handling by the Architect of such warranties, maintenance manuals, or similar documents shall not diminish or transfer to the Architect any responsibilities or liabilities required by the Contract Documents of the Contractor or other entities, parties, or persons performing or supplying the Work.
Except as may be otherwise directed by Owner, the Architect will conduct a field review of the Contractor's comprehensive list of items to be completed or corrected for development of a punch list and one (1) follow-up field review if required. The cost incurred by the Owner for further field reviews or the preparation of further punch lists by the Architect shall be invoiced to the Contractor and withheld from payment and/or retention.

4.2.9 INTERPRETATION

The Architect, Inspector of Record, any construction manager, the Owner or any independent consultant of Owner, as Owner deems appropriate, will interpret and decide matters concerning performance under and requirements of the Contract Documents on written request of the Contractor. The Owner's response to such requests will be made with reasonable promptness, while allowing sufficient time to permit adequate review and evaluation of the request.

4.2.10 ADDITIONAL INSTRUCTIONS

4.2.10.1 ***Architect's Interpretations and Decisions.*** Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations of and decisions regarding the Contract Documents, the Architect will endeavor to secure faithful performance under the Contract Documents by both the Owner and the Contractor and will not show partiality to either. The Work shall be executed in conformity with, and the Contractor shall do no work without, approved drawings, Architect's clarifying instructions, and/or submittals.

4.2.10.2 ***Typical Parts and Sections.*** Whenever typical parts or sections of the Work are completely detailed on the Drawings, and other parts or sections which are essentially of the same construction are shown in outline only, the complete details shall apply to the Work which is shown in outline.

4.2.10.3 ***Dimensions.*** Dimensions of Work shall not be determined by scale or rule. Figured dimensions shall be followed at all times. If figured dimensions are lacking on Drawings, Architect shall supply them on request. The Owner's decisions on matters relating to aesthetic effect will be final if consistent with the Contract Documents.

4.3 INSPECTOR OF RECORD

4.3.1 GENERAL

One or more Project inspectors ("Inspector of Record") employed by the Owner and approved by the Division of the State Architect will be assigned to the Work in accordance with the requirements of Title 24 of the California Code of Regulations. The Inspector of Record's duties will be as specifically defined in Title 24.

4.3.2 INSPECTOR OF RECORD'S DUTIES

All Work shall be under the observation of or with the knowledge of the Inspector of Record. The Inspector of Record shall have free access to any or all parts of the Work at any time. The Contractor shall furnish the Inspector of Record such information as may be necessary to keep the Inspector of Record fully informed regarding progress and manner of work and character of materials. Such observations shall not, in any way, relieve the Contractor from responsibility for full compliance with all terms and conditions of the Contract, or be construed to lessen to any degree the Contractor's responsibility for providing efficient and capable superintendence. The Inspector of Record is not authorized to make changes in the drawings or specifications nor shall the Inspector of Record's approval of the Work and methods relieve the Contractor of responsibility for the correction of subsequently discovered defects, or from its obligation to comply with the Contract Documents.

4.3.3 INSPECTOR OF RECORD'S AUTHORITY TO REJECT OR STOP WORK

The Inspector of Record shall have the authority to reject work that does not comply with the provisions of the Contract Documents. In addition, the Inspector of Record may stop any work which poses a probable risk of harm to persons or property. The Contractor shall instruct its employees, Subcontractors, material and equipment suppliers, etc., accordingly. The absence of any Stop Work order or rejection of any portion of the Work shall not relieve the Contractor from any of its obligations pursuant to the Contract Documents.

4.3.4 INSPECTOR OF RECORD'S FACILITIES

Within seven (7) days after notice to proceed, the Contractor shall provide the Inspector of Record with the temporary facilities as required under Division 1 of the Specifications.

4.4 RESPONSIBILITY FOR ADDITIONAL CHARGES INCURRED BY THE OWNER FOR PROFESSIONAL SERVICES

If at any time prior to the completion of the requirements under the Contract Documents, through no fault of its own, the Owner is required to provide or secure additional professional services for any reason by any act or omission of the Contractor, the Contractor shall be invoiced by the Owner for any actual costs incurred for any such additional services, which costs may, among other remedies, be withheld from the progress payments and/or retention. Such invoicing shall be independent from any other Owner remedies, including but not limited to liquidated damages. If payments then or thereafter due to the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. Additional services shall include, but shall not be limited to, the following:

A. Services made necessary by the default of the Contractor.

B. Services made necessary due to the defects or deficiencies in the Work of the Contractor.

C. Services required by failure of the Contractor to perform according to any provision of the Contract Documents.

D. Services in connection with evaluating substitutions of products, materials, equipment, Subcontractors proposed by the Contractor, and making subsequent revisions to drawings, specifications, and providing other documentation required (except for the situation where the specified item is no longer manufactured or available).

E. Services for evaluating and processing Claims submitted by the Contractor in connection with the Work outside the established Change Order process.

F. Services required by the failure of the Contractor to prosecute the Work in a timely manner in compliance within the specified time of completion.

G. Services in conjunction with the testing, adjusting, balancing and start-up of equipment other than the normal amount customarily associated for the type of Work involved.

H. Services in conjunction with more than one (1) re-review of required submittals of shop drawings, product data, and samples.

4.5 NOTICES OF POTENTIAL CHANGE, CHANGE ORDER REQUESTS, AND CLAIMS

If the Contractor identifies the potential for extra work, delay in the critical path schedule, or the need for additional money or time, or if the Contractor requests additional money or time, or if

the Contractor believes that Owner has failed to pay amounts due or otherwise breached the Contract, or otherwise believes that it is entitled to a modification of the Contract terms and conditions, then Contractor shall follow the procedures in this Section 4.5 and Article 7, otherwise Contractor shall have waived its rights to pursue those issues and any later attempts to recover money or obtain a modification shall be barred. Contractor specifically acknowledges the Owner's and public's interest in, and need to know of, potential changes and disputes as early as possible so Owner can investigate, mitigate and resolve adverse cost and time impacts, if any. It is Contractor's obligation to know and comply with the requirements of Section 4.5 and Article 7, and Owner has no obligation to notify Contractor of any failure to comply with those requirements.

4.5.1 NOTICE OF POTENTIAL CHANGE

Contractor shall submit a written Notice of Potential Change for extra work, critical path delay, or additional money or time. Contractor shall submit written Notices of Potential Change to Owner within five (5) days of Contractor becoming aware of the issues creating the potential for change, unless the issues are, or may soon be, adversely affecting the costs or critical path of the Work, in which case the Contractor must submit the written notice without delay so the Owner may take immediate action to mitigate cost and schedule impacts of the change, if any. The written notice shall explain the nature of the potential change so the Owner may take action to mitigate costs and schedule impacts, if necessary.

When submitting a written Notice of Potential Change based on extra work, Contractor shall not perform the extra work until directed in writing to do so by Owner. When submitting a written Notice of Potential Change for an issue of critical path delay, Contractor shall proactively mitigate the effects of the alleged delay as much as reasonably possible so as to minimize any impact to the schedule, until otherwise directed by Owner.

Failure to timely submit a written Notice of Potential Change shall constitute a complete waiver by Contractor of any right to later submit a change order request or pursue a Claim on that issue, or to later pursue any additional money or time extensions in any manner related to that issue, regardless of the merits. Contractor will not have satisfied a condition precedent or exhausted administrative remedies. Contractor acknowledges that these written notices are of critical importance to the Owner's Project management and the mitigation of Project costs and delays.

4.5.2 CHANGE ORDERS REQUESTS

If, after submitting a written Notice of Potential Change pursuant to Section 4.5.1, Contractor continues to believes that it is entitled to additional money or time (including but not limited to grant of a time extension; payment of money or damages arising from work done by, or on behalf of, the Contractor, payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to; or an amount the payment of which is disputed by the Owner) based on an issue, then Contractor shall submit a Change Order Request ("COR") to Owner within twenty (20) days of (i) becoming aware of the issues creating a potential change, or (ii) the date by which it should have become aware of the issues creating a potential change.

A rejection at any time or a lack of a rejection by Owner of a Notice of Potential Change does not affect the timeline for submitting a COR.

Failure to timely submit a COR related to an issue, or failure to comply with any of the COR requirements in the Contract shall constitute a complete waiver by Contractor of any right to later submit a COR or Claim on that issue, or to later pursue any additional money (including time extensions) in any manner related to that issue, regardless of the merits. Contractor will not have satisfied a condition precedent or exhausted administrative remedies.

The COR shall state the grounds for the additional money or time requested and the amount of money or time requested, and Contractor shall include all information supporting the COR.

Contractor shall certify the COR using the form set forth in Section 4.5.5.1, except that every reference to "Claim" shall be changed to "COR." If a COR is submitted without certification, a certification can still be submitted within the timelines set forth in the first paragraph of section 4.5.2. If the COR is not timely certified, Contractor will have completely waived its rights to any money or time for that issue. Contractor will not have satisfied a condition precedent or exhausted administrative remedies.

The Owner may accept the entire COR, accept part of the COR and reject the remainder, reject the entire COR, or request additional information. If the Owner does not respond within thirty (30) days by accepting the entire COR, accepting part of the COR and rejecting the remainder, or requesting additional information, the entire COR shall be deemed rejected as of the thirtieth (30th) day. If the Owner requests additional information, then the Contractor shall submit the information within fifteen (15) days of the date of the request and the Owner shall have fifteen (15) days after the receipt of the additional information to accept or reject (in whole or in part) the COR. If the Owner fails to respond within fifteen (15) days after the submission of additional information, the entire COR shall be deemed rejected as of the fifteenth (15th) day.

4.5.3 DEFINITION OF CLAIM

A "Claim" is a separate demand by the Contractor for (a) a time extension, (b) payment of money or damages arising from work done by, or on behalf of, the Contractor, payment of which is not otherwise expressly provided for or the claimant is not otherwise entitled to, or (c) an amount the payment of which is disputed by the Owner. A claim includes any claim within the scope of Public Contract Code section 20104 et seq. Resubmittal in any manner of a COR which was previously rejected under Section 4.5.2 constitutes a Claim, whether the COR was rejected in whole or in part, and whether the COR was rejected expressly or deemed rejected by Owner inaction. A Claim includes any dispute Contractor may have with the Owner, including one which does not require a Notice of Potential Change or COR under Sections 4.5.1 and 4.5.2, and includes an alleged breach of contract by the Owner. A Claim under this Article 4.5 shall also constitute a claim for purposes of the California False Claims Act. In the event of a conflict between a Claims provision in Division 1 of the Specifications and Section 4.5, Section 4.5 shall take precedence.

The Notice of Potential Change and COR procedures above are less formal procedures which precede the more formal Claim. A Notice of Potential Change does not constitute a Claim. A COR does not constitute a Claim; **except that** if insufficient time remains before the Claim deadline (see Article 4.5.4) for Contractor to submit a COR and for Owner to process and reject the COR under Article 4.5.2, then either (1) Contractor may submit a COR which Owner shall treat as a Claim, but only if the COR complies with all requirements in this Article 4.5 and Article 7 for COR's and Claims, or (2) a COR is not required so long as a Claim complying with this Article 4.5 is timely submitted.

A Claim does not include vouchers, invoices, progress payment applications, or other routine or authorized forms of requests for progress payments on the Contract; however, those documents remain "claims" for purposes of the California False Claims Act. A Claim does not include a Government Code Claim. ("Government Code Claim" means a claim under Government Code sections 900 et seq. and 910 et seq.)

4.5.4 TIME FOR SUBMITTING CLAIM; WAIVER

Contractor shall submit a Claim to the Owner's construction manager (or in the absence of a construction manager, to Architect and Owner) on or before the date of the Final Progress Payment. Owner's rejection, or lack of rejection, of a COR at any time does not affect the deadline for filing a Claim.

In addition, on or before submitting its request for a final progress payment based on 100% completion of the work, Contractor shall submit to Owner, in writing, a summary of all Claims for money or time extensions under or arising out of this Contract which were timely filed and which were fully compliant with the Contract's requirements for Claims. The submission of an Application for Payment for the Final Progress Payment shall constitute a complete waiver of all Claims against Owner under or arising out of this Contract, except those identified in the above summary. Contractor will not have satisfied a condition precedent or exhausted administrative remedies. This Claim summary requirement shall not extend the time for submitting a Claim.

Failure to timely submit a Claim, failure to include a Claim in the Claim summary, or failure to comply with any of the Claim requirements in the Contract, including but not limited to this Article 4, will act as a complete waiver of Contractor's rights to (a) recover money or time on the issues for which a Claim was required, (b) submit a Government Code Claim for the money or time (see Section 4.5.6.4), and (c) initiate any action, proceeding or litigation for the money or time, regardless of the merits. Contractor will not have satisfied a condition precedent or exhausted administrative remedies. Owner does not have an obligation to reject the Claim for a failure to comply with any of the Claim requirements in the Contract, including the lack of certification, and any failure by Owner to reject, or any delay in rejecting, a Claim on that basis does not waive the Owner's right to reject the Claim on that basis at a later time. In no event may the Contractor reserve its rights to assert a Claim for a time extension or additional money beyond the timelines set forth in this provision unless the Owner agrees in writing to allow the reservation.

4.5.5 CONTENT OF CLAIM

4.5.5.1 ***Claim Format; Waiver.***Every Claim shall be in writing. All money or time extensions sought must be stated and itemized in the Claim at the time submitted. The responsibility to substantiate Claims shall rest with the Contractor. In addition, the Contractor shall include a certification with each and every Claim at the time of submission, as follows:

> I, [name of declarant], declare the following:
>
> [Contractor company name] has contracted with Berryessa Union School District for the Northwood Elementary School Flexible Instructional Space Alteration and Related Modernization Project. ([Contractor company name]) authorized me to prepare the attached Claim for money and/or time extension) for Berryessa Union School District regarding this Project (dated _____, 20__, entitled _____, and requesting $_____ and/or ___ additional days), and I prepared the attached Claim. I am the most knowledgeable person at [contractor company name] regarding this Claim.
>
> The attached Claim complies with all laws applicable to submission of a Claim, including but not limited to California Penal Code section 72, Government Code sections 12650 et seq. (False Claims Act), and Business and Professions Code sections 17200 et seq. (Unfair Business Practices Act). I am aware that submission or certification of false claims, or other claims that violate law or the Contract, may lead to fines, imprisonment, and/or other serious legal consequences for myself or [contractor company name].
>
> The attached Claim does not breach the Contract between [contractor company name] and Berryessa Union School District for this Project, is not a false claim, does not violate any applicable law, satisfies all provisions of the Contract applicable to submission of the Claim, only contains truthful and accurate supporting data, and only requests money and/or time extensions that accurately reflect the adjustments to money and time for which I believe that Berryessa Union School District is responsible under its Contract with [contractor company name].
>
> While preparing this declaration and Claim I consulted with others (including attorneys, consultants, or others who work for [Contractor company name]) when necessary to ensure that the statements were true and correct.
>
> Contractor understands and agrees that any Claim submitted without this certification does not meet the terms of the Contract Documents; that Owner, or Owner's representatives, may reject the Claim on that basis; and that unless Contractor properly and timely files the Claim with the certification, Contractor cannot further pursue the Claim in any forum and all rights to additional money or time for the issues covered by the Claim are waived due to a condition precedent not having been satisfied.

I declare under the penalty of perjury under the laws of the State of California that the foregoing is true and correct. Executed _____, 2___, at _____, California.

_____
[name of declarant]

Contractor's failure to timely submit a certification will constitute a complete waiver of Contractor's rights to (a) recover money or time on the issues for which a Claim was required, (b) submit a Government Code Claim (see Section 4.5.6.4) for the money or time, and (c) initiate any action, proceeding or litigation for the money or time. Contractor will not have satisfied a condition precedent or exhausted administrative remedies.

4.5.5.2 ***Claims for Additional Money.*** Each Claim for additional money (including but not limited to those described in (b) and (c) of the first paragraph of Section 4.5.3) must include all facts supporting the Claim, including but not limited to all supporting documentation plus a written analysis as to (a) why the claimed cost was incurred, (b) why Contractor could not mitigate its costs, (c) why the claimed cost is the responsibility of the Owner, and (d) why the claimed cost is a reasonable amount. In no event will the Contractor be allowed to reserve its rights to assert a Claim for money at a later time, unless the Owner expressly agrees in writing to allow the reservation. Any costs, direct or indirect, not asserted shall be waived. A Claim may not include any costs incurred in preparation of the Claim or in preparation of any underlying COR, including but not limited to costs of delay analysis.

4.5.5.3 ***Claims for Additional Time***

4.5.5.3.1 ***Notice of Extent of Claim.*** If the Contractor wishes to make a Claim for an increase in the Contract Time (including but not limited to Section 4.5.3(a)), the Claim shall include, but not be limited to, all facts supporting the Claim, all documentation of such facts, all information required by the Contract Documents, and a current schedule and delay analysis explaining (a) the nature of the delay, (b) the Owner's responsibility for the claimed delay, (c) the claimed delay's impact on the critical path, (d) the claimed delay's impact on completion date (including an analysis of any float still remaining and whether the alleged delay in work exceeds such remaining float), and (e) why Contractor could not mitigate the delay impacts.

In the case of a continuing delay, only one (1) initial Claim is necessary that is based on estimates of when the continuing delay will end, but within thirty (30) days of the end of the continuing delay an updated final Claim must be submitted, which shall also be certified. In no event will the Contractor be allowed to reserve its rights to assert a Claim for a time extension, unless the Owner expressly agrees in writing to allow the reservation. Any time extension not asserted shall be waived.

4.5.5.3.2 ***Unusually Severe Weather Claims.*** If unusually severe weather is the basis for a Claim for additional time, Contractor must provide Owner data and facts showing that the weather conditions were abnormal for the period of time, could not have been reasonably anticipated or mitigated, and had an adverse effect on the critical path of the scheduled construction.

4.5.5.4 ***"Pass Through" Claims.*** A Subcontractor or supplier to Contractor may not submit a request for additional time or money directly to the Owner. If a subcontractor or supplier submits a request for additional money or time to Contractor and Contractor wishes to pass it through to Owner, then Contractor must comply with all requirements of Section 4.5, including Notices of Potential Change, Change Order Requests, and Claims. Contractor must prepare and submit its own analysis of the Subcontractor's request, and the Claim must include a copy of the Subcontractor's request along with any other necessary supporting documentation.

The Contractor's analysis of the Subcontractor's request must include Contractor's detailed explanation as to why the Subcontractor or supplier's request is the Owner's responsibility, including Contractor's analysis of (a) why the amount of damages the Subcontractor or supplier requests is justified and appropriate, (b) how Contractor's breach of the subcontract caused the Subcontractor or supplier to incur these damages, and (c) how the Owner's breach of the Contract caused the Contractor's breach of the subcontract. Any Contractor Claim that fails to include the above information, or that states that Owner is responsible for the Subcontractor's request only in the event that Contractor is found to owe money to Subcontractor, shall act as a complete waiver of Contractor's rights to (a) recover money or time on the issues for which a Claim was required, (b) submit a Government Code Claim (see Section 4.5.6.4) for the money or time, and (c) initiate any action, proceeding or litigation for the money or time. Contractor will not have satisfied a condition precedent or exhausted administrative remedies.

4.5.6 PROCEDURES FOR CLAIMS LESS THAN OR EQUAL TO $375,000 (PUBLIC CONTRACT CODE SECTION 20104.2)

Claims less than or equal to $375,000 are subject to this section 4.5.6, as well as the separate procedures and substantive provisions of Sections 4.5.1 through 4.5.5.

4.5.6.1 ***Claims for Less Than $50,000.*** For Claims of less than fifty thousand dollars ($50,000), the Owner shall respond in writing to any written Claim within 45 days of receipt of the Claim, or may request, in writing, within 30 days of receipt of the Claim, any additional documentation supporting the Claim or relating to defenses to the claim the Owner may have against the Contractor.

If additional information is thereafter required, it shall be requested and provided pursuant to this subsection, upon mutual agreement of the Owner and Contractor. If Owner and Contractor cannot reach mutual agreement, Contractor's failure to provide any reasonably-requested information within fifteen (15) days after the request, shall act as a complete waiver of Contractor's rights to (a) recover money or time on the issues for which a Claim was required, (b) submit a Government Code Claim (see Section 4.5.6.4) for the money or time, and (c) initiate

any action, proceeding or litigation for such money or time. Contractor will not have satisfied a condition precedent or exhausted administrative remedies.

The Owner's written response to the Claim, as further documented, shall be submitted to the Contractor within 15 days after receipt of the further documentation, or within a period of time no greater than that taken by the Contractor in producing the additional information, whichever is greater.

4.5.6.2 ***Claims Over $50,000 and Less Than or equal to $375,000.*** For claims over fifty thousand dollars ($50,000) and less than or equal to three hundred seventy-five thousand dollars ($375,000), the Owner shall respond in writing to all written Claims within 60 days of receipt of the Claim, or may request, in writing, within 30 days of receipt of the Claim, any additional documentation supporting the Claim or relating to defenses to the Claim the Owner may have against the Contractor.

If additional information is thereafter required, it shall be requested and provided pursuant to this subsection, upon mutual agreement of the Owner and Contractor. If Owner and Contract cannot reach mutual agreement, Contractor's failure to provide any reasonably-requested information within thirty (30) days after the request, shall act as a complete waiver of Contractor's rights to (a) recover money or time on the issues for which a Claim was required, (b) submit a Government Code Claim (see Section 4.5.6.4) for such money or time, and (c) initiate any action, proceeding or litigation for such money or time. Contractor will not have satisfied a condition precedent or exhausted administrative remedies.

The Owner's written response to the Claim, as further documented, shall be submitted to the Contractor within 30 days after receipt of the further documentation, or within a period of time no greater than that taken by the Contractor in producing the additional information or requested documentation, whichever is greater.

4.5.6.3 ***Meet and Confer.*** If the Contractor disputes the Owner's written response, or the Owner fails to respond within the time prescribed, the Contractor may so notify the Owner, in writing, either within 15 days of receipt of the Owner's response or within 15 days of the Owner's failure to respond within the time prescribed, respectively, and demand an informal conference to meet and confer for settlement of the issues in dispute. Upon a demand, the Owner shall schedule a meet and confer conference for settlement of the dispute, which shall take place within 30 days of the demand. Upon written agreement of the Owner and Contractor, the conference may take place during regularly scheduled Project meetings.

If Contractor fails to timely notify the Owner that it wishes to meet and confer pursuant to the previous paragraph, then Contractor will have waived all rights to (a) recover money or time on the issues for which a Claim was required, (b) submit a Government Code Claim (see Section 4.5.6) for such money or time, and (c) initiate any action, proceeding or litigation for such money or time. Contractor will not have satisfied a condition precedent or exhausted administrative remedies.

If a Claim, or any portion of a Claim, over $100,000 remains in dispute after the meet and confer and Contractor wishes to pursue it, Contractor must demand non-binding mediation in writing within fifteen (15) days. If Contractor fails to timely notify the Owner in writing that it wishes to mediate pursuant to this paragraph, Contractor will have waived all right to further pursue the Claim pursuant to section 4.5.4. The parties shall reasonably cooperate to schedule and attend a mediation as soon as reasonably possible.

4.5.6.4 ***Government Code Claim.*** If the Claim or any portion remains in dispute after the meet and confer conference and Contractor wishes to pursue it, the Contractor **must** file a timely and proper Government Code Claim. The filing of a Government Code Claim is specifically required in addition to all contractual procedures described in Sections 4.5 through 4.5.6.3. The above contractual procedures do not act as a substitute for the Government Code Claim process, and the two sets of procedures shall be sequential with the contractual procedures coming first.

Failure to timely file a Government Code Claim shall act as complete waiver of Contractor's rights to (a) recover money or time on the issues for which a Government Code Claim was required, and (b) initiate any action, proceeding or litigation for such money or time. Contractor will not have satisfied a condition precedent or exhausted administrative remedies.

Owner and Contractor shall proceed with the Government Code Claim according to Government Code, Section 900 et seq., and as otherwise permitted by law. For purposes of the applicable Government Code provisions, and as provided in Public Contract Code section 20104.2(e), the running of the time period within which a Contractor must file a Government Code Claim shall be tolled from the time the Contractor submits a written Claim under Article 4.5 until the time that the Claim is denied, in whole or in part, as a result of the meet and confer process in Section 4.5.6.3, including any period of time utilized by the meet and confer process.

4.5.7 PROCEDURES FOR CLAIMS OVER $375,000

Contractor and Owner shall proceed with Claims over $375,000 pursuant to Section 4.5.6, except as follows: (a) Section 4.5.6.1, shall not be applicable; (b) for Section 4.5.6.2, Owner shall respond in writing to all written Claims within 90 days of receipt of the Claim, or may request, in writing, within 45 days of receipt of the Claim, any additional documentation supporting the Claim or relating to defenses to the Claim the Owner may have against the Contractor; (c) for Section 4.5.6.2, Owner shall respond within 45 days after receipt of the further documentation, or within a period of time no greater than that taken by the Contractor in producing the additional information or documentation, whichever is greater; and (d) for Section 4.5.6.3, following the meet and confer conference, if the Claim or any portion of it remains in dispute and Contractor wishes to pursue it, Contractor must demand in writing within fifteen (15) days that the parties mediate (non-binding). If Contractor fails to timely notify the Owner in writing that it wishes to mediate pursuant to this paragraph, then Contractor will have waived all rights to further pursue the Claim pursuant to Section 4.5.4. The parties shall reasonably cooperate to schedule and attend a mediation as soon as reasonably possible.

4.5.8 CONTINUING CONTRACT PERFORMANCE

Despite submission or rejection of a Notice of Potential Change, COR or Claim, the Contractor shall proceed diligently with performance of the Contract as directed by Owner, and the Owner shall continue to make any undisputed payments in accordance with the Contract.

4.5.9 CLAIMS FOR CONCEALED OR UNKNOWN CONDITIONS

4.5.9.1 ***Trenches or Excavations Less Than Four Feet Below the Surface.*** If Contractor encounters conditions at the Site which are subsurface or otherwise concealed physical conditions, which differ materially from those indicated in the Contract Documents, or unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall give notice to the Owner promptly before conditions are disturbed and in no event later than ten (10) days after first observance of the conditions. If Contractor believes that such conditions differ materially and will cause an increase in the Contractor's cost of, time required for, or performance of any part of the Work, Contractor must comply with the provisions above for Notice of Potential Change, Change Order Request, and Claims (beginning with Section 4.5.1).

4.5.9.2 ***Trenches or Excavations Greater Than Four Feet Below the Surface.*** Pursuant to Public Contract Code section 7104, when any excavation or trenching extends greater than four feet below the surface:

4.5.9.2.1 The Contractor shall promptly, and before the following conditions are disturbed, notify the public entity, in writing, of any:

(1) Material that the Contractor believes may be material that is hazardous waste, as defined in Section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with the provisions of existing law.

(2) Subsurface or latent physical conditions at the site differing from those indicated by information about the site made available to bidders prior to the deadline for submitting bids.

(3) Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

4.5.9.2.2 The public entity shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the Contractor's cost of, or the time required for, performance of any part of the work shall issue a change order under the procedures described in the Contract.

4.5.9.2.3 In the event that a dispute arises between the public entity and the Contractor whether the conditions materially differ, or involve hazardous waste, or cause a decrease or

increase in the Contractor's cost of, or time required for, performance of any part of the work, the Contractor shall not be excused from any scheduled completion date provided for by the Contract, but shall proceed with all work to be performed under the Contract. The Contractor shall retain any and all rights provided either by Contract or by law which pertain to the resolution of disputes and protests between the contracting parties.

4.5.10 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, any of the other party's employees or agents, or others for whose acts such party is legally liable, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding ten (10) days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. For a Notice of Potential Change, COR and Claim for additional cost or time related to this injury or damage, Contractor shall follow Section 4.5.

ARTICLE 5

SUBCONTRACTORS

5.1 DEFINITIONS

5.1.1 SUBCONTRACTOR

A Subcontractor is a person or entity, who has a contract with the Contractor to perform a portion of the Work at the Site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor. To the extent that the term Trade Contractor is utilized in the Contract Documents, it shall have the same meaning as the term "Subcontractor."

5.1.2 SUB-SUBCONTRACTOR

A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the Site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

5.1.3 SPECIALTY CONTRACTORS

If a Subcontractor is designated as a "Specialty Contractor" as defined in section 7058 of the Business and Professions Code, all of the Work outside of that Subcontractor's specialty shall be performed in compliance with the Subletting and Subcontracting Fair Practices Act, Public Contract Code sections 4100, et seq.

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 ASSIGNMENT OR SUBSTITUTION - CONSENT OF OWNER

In accordance with Public Contract Code sections 4107 and 4107.5, no Contractor whose bid is accepted shall, without the written consent of the Owner: substitute any person or entity as a Subcontractor in place of the Subcontractor designated in the original bid; permit any such Subcontract to be assigned or transferred, or allow it to be performed by any person or entity other than the original Subcontractor listed in the original bid; sublet or subcontract any portion of the Work in excess of one-half of one percent (0.5%) of the Contractor's total bid as to which its original bid did not designate a Subcontractor. Any assignment or substitution made without the prior written consent of the awarding authority shall be void, and the assignees shall acquire no rights in the Contract. Any consent, if given, shall not relieve Contractor or its Subcontractors from their obligations under the terms of the Contract Documents.

5.2.2 GROUNDS FOR SUBSTITUTION

Pursuant to Public Contract Code section 4107 and the procedure set forth therein, no Contractor whose bid is accepted may request to substitute any person or entity as a Subcontractor in place of a Subcontractor listed in the original bid except in the following instances:

A. When the Subcontractor listed in the bid after having a reasonable opportunity to do so, fails or refuses to execute a written Contract for the scope of work specified in the subcontractor's bid and at the price specified in the subcontractor's bid, when that written Contract, based upon the general terms, conditions, plans and specifications for the Project involved or the terms of that Subcontractor's written bid, is presented to the Subcontractor by the prime contractor;

B. When the listed Subcontractor becomes insolvent or the subject of an order for relief in bankruptcy;

C. When the listed Subcontractor fails or refuses to perform his or her Subcontract;

D. When the listed Subcontractor fails or refuses to meet the bond requirements of the prime contractor set forth in Public Contract Code section 4108.

E. When the Contractor demonstrates to the awarding authority, or its duly authorized officer, subject to the further provisions of Public Contract Code section 4107.5, that the name of the Subcontractor was listed as the result of inadvertent clerical error;

F. When the listed Subcontractor is not licensed pursuant to the Contractors License Law; or

G. When the awarding authority, or its duly authorized officer, determines that the Work being performed by the listed Subcontractor is substantially unsatisfactory and not in substantial accordance with the plans and specifications, or the Subcontractor is substantially delaying or disrupting the progress of the Work.

H. When the listed Subcontractor is ineligible to work on a public works project pursuant to Section 1777.1 of the Labor Code.

I. When the awarding authority determines that a listed Subcontractor is not a responsible contractor.

5.2.2.1 ***No Change in Contract.*** Any substitutions of Subcontractors shall not result in any increase in the Contract Sum or result in the granting of any extension of time for the completion of the Project.

5.2.2.2 ***Substitution Due to Clerical Error.*** The Contractor, as a condition of asserting a claim of inadvertent clerical error in the listing of a Subcontractor, shall, pursuant to Public Contract Code section 4107.5, within two (2) working days after the time of the prime bid opening by the awarding authority, give written notice to the awarding authority and copies of such notice to both the Subcontractor it claims to have listed in error, and the intended Subcontractor who had bid to the Contractor prior to bid opening. Any listed Subcontractor who has been notified by the Contractor in accordance with the provisions of this section as to an inadvertent clerical error, shall be allowed six (6) working days from the time of the prime bid opening within which to submit to the awarding authority and to the Contractor written objection to the Contractor's claim of inadvertent clerical error.

In all other cases, the Contractor must make a request in writing to the awarding authority for the substitution of a subcontractor, giving reasons therefore. The awarding authority shall mail a written notice to the listed Subcontractor giving reasons for the proposed substitution. The listed Subcontractor shall have five (5) working days from the date of such notice within which to file with the awarding authority written objections to the substitution.

Failure to file written objections pursuant to the provisions of this section within the times specified herein shall constitute a complete waiver of objection to the substitution by the listed Subcontractor and, where the ground for substitution is an inadvertent clerical error, an agreement by the listed Subcontractor that an inadvertent clerical error was made.

If written objections are filed, the awarding authority shall give five (5) days notice to the Contractor and to the listed Subcontractor of a hearing by the awarding authority on the Contractor's request for substitution as provided in Public Contract Code section 4107. The determination by the awarding authority shall be final.

5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be

bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all obligations and responsibilities, which the Contractor, by the Contract Documents, assumes toward the Owner. Each subcontract agreement shall preserve and protect the rights of the Owner under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound. Upon written request of the Subcontractor, the Contractor shall identify to the Subcontractor the terms and conditions of the proposed subcontract agreement, which may be at variance with the Contract Documents. Subcontractors shall similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that:

A. Assignment is effective only after termination of the Contract with the Contractor by the Owner for cause pursuant to Article 14 and only for those subcontract agreements which the Owner accepts by notifying the Subcontractor in writing; and

B. Assignment is subject to the prior rights of the surety, if any, obligated under any bond relating to the Contract.

5.5 SUBCONTRACTOR'S RESPONSIBILITIES

Every Subcontractor is bound to the following provisions, unless specifically noted to the contrary in the Subcontractor's contract subject to the limitations of section 5.3.

5.5.1 SUPERVISION BY SUBCONTRACTORS

Subcontractors shall efficiently supervise their Work, using their best skill and attention. Each of them shall carefully study and compare all Drawings, Specifications, and other instructions, shall at once report to Contractor any error or omission which any of them may discover, and shall subsequently proceed with the Work in accordance with instructions from the Contractor concerning such error or omission. Each Subcontractor shall be fully responsible for and shall bear the full risk of loss of all of its property.

5.5.2 DISCIPLINE AND ORDER

Each Subcontractor shall at all times enforce strict discipline and good order among its Subcontractors, material or equipment suppliers, or their agents, employees, and invitees, and shall establish and maintain surveillance over the activities of each of the foregoing to minimize any disturbance, damage, pollution, or unsightly conditions relative to property areas adjacent to or in the vicinity of the Site. The Contractor shall have the right to remove from the Work any employee of a Subcontractor for any reason including, without limitation, incompetence or carelessness.

5.5.3 DEFECTS DISCOVERED

Should the proper and accurate performance of the Work depend upon the proper and accurate performance of other work not included in its Contract, each Subcontractor shall use all necessary means to discover any defect in such other work and shall allow the Contractor, the Owner and Architect, or other Subcontractors as Contractor elects, a reasonable amount of time to remedy such defects. If the Subcontractor should proceed with its Work, it shall be considered to have accepted such other work, unless the Subcontractor shall have proceeded pursuant to instructions in writing by the Contractor over its written objection.

5.5.4 SUBCONTRACTOR INFORMATION

Each Subcontractor shall submit to the Owner, the Contractor, or the Architect, as the case may be, promptly when requested by any of the foregoing, information with respect to the names, responsibilities, and titles of the principal members of its staff, the adequacy of the Subcontractor's equipment and the availability of necessary materials and supplies. Subcontractor shall fully cooperate with Contractor in its periodic review of the adequacy of Subcontractor's supervision, personnel, and equipment, and the availability of necessary materials and supplies and shall promptly comply with the requirements of the Contractor with respect thereto.

5.5.5 TEMPORARY STRUCTURES

Each Subcontractor shall furnish at its expense its own temporary facilities and storage except those specifically agreed to be furnished to it by the Contractor in the Subcontract Agreement. Subcontractor's material storage rooms and field offices, etc., will be placed in locations designated by the Contractor. When it becomes necessary due to the progress of the Project for the Subcontractor to relocate its field operations, it will do so in an expeditious manner and at no additional cost to Contractor or Owner. The construction of material storage rooms and field offices, etc., will be of fire resistive material only, such as concrete or gypsum block, rated drywall, or sheet metal.

5.5.6 CHARGES TO SUBCONTRACTOR

Each Subcontractor may be subject to the Contractor's reasonable charges for hoisting, repair to other work caused by the fault or negligence of Subcontractor, removal of Subcontractor's rubbish, and clean-up occasioned by Subcontractor.

5.5.7 FINES IMPOSED

Subcontractor shall comply with and pay any fines or penalties imposed for violation of any applicable law, ordinance, rule, regulation, Environmental Impact Report mitigation requirement, and lawful order of any public authority, including, without limitation, all OSHA and California OSHA requirements and those of other authorities having jurisdiction of the safety of persons or property.

5.5.8 PROJECT SIGNS

Each Subcontractor shall not display on or about the Project any sign, trademark, or other advertisement. The Owner will permit a single Project sign, which shall be subject to the Owner's prior and sole discretion and approval, as to all matters including, without limitation, size, location, material, colors, style and size of printing, logos and trademarks (if any), text, and selection of names to be displayed.

5.5.9 REMEDIES FOR FAILURE TO PERFORM

Without limitation of any other right or remedy available to Contractor under the Contract Documents or at law, should: the Subcontractor fail to perform its portion of the Work in a skilled and expeditious manner in accordance with the terms of the Contract Documents with sufficient labor, materials, equipment, and facilities; delays the progress of the job or otherwise fail in any of its obligations; or either a receiver is appointed for the Subcontractor or the Subcontractor is declared to be bankrupt or insolvent, and such appointment, bankruptcy, or insolvency proceedings or declaration is not set aside within thirty (30) days, then the Contractor, upon three (3) days notice to the Subcontractor (subject to the requirements of Pub. Contracts Code, § 4107), may provide such labor, materials, or perform such work and recover the cost plus profit and overhead from monies due or to become due thereafter to the Subcontractor. The Contractor may terminate the employment of the Subcontractor, taking possession of its tools, materials, and equipment related to the Work and cause the entire portion of the Subcontractor's Work to be finished either by another Subcontractor or through the Contractor's own forces.

5.5.10 DISPUTES NOT TO AFFECT WORK

In the event of any dispute as to whether or not any portion of the Work is within the scope of the Work to be performed by a Subcontractor, or any dispute as to whether or not the Subcontractor is entitled to a Change Order for any Work requested of it or entitled to payment, the Subcontractor shall continue to proceed diligently with the performance of the Work. Regardless of the size or nature of the dispute, the Subcontractor shall not under any circumstances cease or delay performance of its portion of the Work during the existence of the dispute. The Contractor shall continue to pay the undisputed amounts called for under the Subcontract Agreement during the existence of the dispute. Any party stopping or delaying the

progress of the Work because of a dispute shall be responsible in damages to the Owner, the Architect, and the Contractor for any losses suffered as a result of the delay.

5.5.11 APPLICATION FOR PAYMENT

Contractor agrees to advise the Subcontractor if any documentation in connection with the Subcontractor's application for payment has not been accepted or is in any way unsatisfactory.

5.5.12 COMPLIANCE WITH PROCEDURES

Each Subcontractor shall comply with all procedures established by the Contractor for coordination among the Owner, the Owner's consultants, Architect, Contractor, and the various Subcontractors for coordination of the Work with all local municipal authorities, government agencies, utility companies, and any other agencies with jurisdiction over all or any portion of the Work. The Subcontractor shall cooperate fully with all of the foregoing parties and authorities.

5.5.13 ON-SITE RECORD KEEPING

Subcontractor shall comply with all on-Site record keeping systems established by the Contractor and shall, upon the request of the Contractor, provide the Contractor with such information and reports as the Contractor may deem appropriate. Without limitation of the foregoing, the Subcontractor shall assemble all required permits and certificates so that they are readily accessible at the Site.

5.5.14 NON-EXCLUSIVE OBLIGATIONS

The specific requirements of Article 5 are not intended to exclude the obligation of the Subcontractor to comply with any of the other provisions of the General Conditions and the other Contract Documents which are relevant to the proper performance of its portion of the Work.

ARTICLE 6

CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

6.1.1 OWNER'S RIGHTS

The Owner reserves the right to perform work related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the Site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance. Upon the election to perform work with its own forces or by separate contracts, the Owner shall notify the Contractor. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall proceed pursuant to Section 4.5 in the Contract Documents.

6.1.2 DESIGNATION AS CONTRACTOR

When separate contracts are awarded for different portions of the Project or other construction or operations on the Site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner/Contractor Agreement.

6.1.3 CONTRACTOR DUTIES

The Contractor shall have overall responsibility for coordination and scheduling of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule and Contract Sum deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors, and the Owner until subsequently revised.

6.1.4 OWNER OBLIGATIONS

Unless otherwise provided in the Contract Documents, when the Owner performs work related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations, and to have the same rights, which apply to the Contractor under the General Conditions, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10 and 12.

6.2 MUTUAL RESPONSIBILITY

6.2.1 DELIVERY AND STORAGE

The Contractor shall afford the Owner and separate contractor's reasonable opportunity for delivery and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the separate contractors' construction and operations with theirs as required by the Contract Documents.

6.2.2 NOTICE BY CONTRACTOR

If part of the Contractor's Work depends upon proper execution or results from work by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Owner patent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor to so report shall constitute an acknowledgment that the Owner's or separate contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

6.2.3 COSTS INCURRED

Costs, expenses, and damages caused by delays, improperly timed activities, defective construction, or damages to another's work/Work or property shall be borne by the party responsible. Should Contractor/any contractor cause damage to the work/Work or property of any separate contractor on the Project, or cause any delay to any such contractor, the Contractor shall defend, indemnify and hold Owner harmless for such damage or delay under section 3.16. Owner may withhold from progress payments and/or retention the cost of delay or damage to another contractor's work or damage to another contractor's property caused by Contractor.

6.2.4 CORRECTION OF DAMAGE

The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors.

6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish as described in Section 3.13, the Owner may clean up and allocate the cost among those responsible as the Owner determines to be just.

ARTICLE 7

CHANGES IN THE WORK

7.1 CHANGES

7.1.1 NO CHANGES WITHOUT AUTHORIZATION

The Owner reserves the right to change the Work by making such alterations, deviations, additions to, or deletions from the plans and specifications, as may be deemed by the Owner to be necessary or advisable for the proper completion or construction of the Work contemplated, and Owner reserves the right to require Contractor to perform such work. No adjustment will be

made in the Contract unit price of any Contract item regardless of the quantity ultimately required.

Owner shall compensate Contractor with money or grant extra time for any extra work ordered by the Owner to be performed. Contractor shall follow the provisions of 7.6 and 7.7 when requesting additional money or additional time. Contractor shall expeditiously perform all extra work upon direction, even if no agreement has been reached on extra time or money. For all such changes resulting in a credit to Owner, Contractor shall follow 7.5 and 7.7 in providing the credit to Owner. Contractor shall bring all potential credits to the Owner's attention.

There shall be no change whatsoever in the drawings, specifications, or in the Work or payments under the Contract Documents without an executed Change Order, Construction Change Directive, or order by the Owner pursuant to Section 7.1.2. Owner shall not be liable for the cost of any extra work or any substitutions, changes, additions, omissions, or deviations from the Drawings and Specifications unless the same shall have been properly requested under Section 4.5 and authorized by, and the cost thereof approved in writing by, Change Order or Construction Change Directive. No extension of time for performance of the Work shall be allowed hereunder unless request for such extension is properly made under Section 4.5 and such time is thereof approved in writing by Change Order or Construction Change Directive. The provisions of the Contract Documents shall apply to all such changes, additions, and omissions with the same effect as if originally embodied in the Drawings and Specifications.

7.1.2 AUTHORITY TO ORDER MINOR CHANGES

The Owner has authority to order minor changes in the Work not involving any adjustment in the Contract Sum, an extension of the Contract Time, or a change which is inconsistent with the intent of the Contract Documents. Such changes shall be effected by written Construction Change Directive and shall be binding on the Contractor. The Contractor shall carry out such written orders promptly.

7.2 CHANGE ORDERS ("CO")

A CO is a written instrument signed by the Owner and the Contractor, stamped (or sealed) and signed by Architect, and approved by the Owner's Governing Board and DSA where required, stating the agreement of Owner and Contractor upon all of the following:

A. A change in the Work;

B. The amount of the adjustment in the Contract Sum, if any; and

C. The extent of the adjustment in the Contract Time, if any.

Unless expressly stated otherwise in the CO, any CO executed by Owner and Contractor constitutes and includes full and complete money and time (including but not limited to, adjustments to money and time) for all costs and effects caused by any of the changes described within it. Unless expressly stated otherwise in the CO, in consideration for the money received

for the changes described in the CO, Contractor waives all Claims for all costs and effects caused by any of the changes, including but not limited to labor, equipment, materials, delay, extra work, overhead (home and field), profit, direct costs, indirect costs, acceleration, disruption, impaired productivity, time extensions, and any the costs and effects on Subcontractors and suppliers of any tier.

7.3 CONSTRUCTION CHANGE DIRECTIVES ("CCD")

7.3.1 DEFINITION

A CCD is a written unilateral order signed by the Owner, and if necessary by the Architect, directing a change in the Work and stating an adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by CCD, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions pursuant to Section 7.1.1.

7.3.2 USE TO DIRECT CHANGE

A CCD shall be used in the absence of agreement on the terms of a CO. If Contractor disagrees with the terms of a CCD, it shall nevertheless perform the work directed by the CCD, but it may pursue the Notice of Potential Change, COR and Claim procedures of Section 4.5 if Contractor believes it is entitled to changes in the Contract Sum or Contract Time.

7.4 REQUEST FOR INFORMATION ("RFI")

7.4.1 DEFINITION

An RFI is a written request prepared by the Contractor asking the Owner to provide additional information necessary to clarify an item which the Contractor feels is not clearly shown or called for in the drawings or specifications, or to address problems which have arisen under field conditions.

7.4.2 SCOPE

The RFI shall reference all the applicable Contract Documents including specification section, detail, page numbers, drawing numbers, and sheet numbers, etc. The Contractor shall make suggestions and/or interpretations of the issue raised by the RFI. An RFI cannot modify the Contract Sum, Contract Time, or the Contract Documents.

7.4.3 RESPONSE TIME

Unless Owner expressly directs otherwise in writing, Contractor shall submit RFIs directly to the Architect, with copies forwarded to the Owner. Contractor shall submit a revised and updated priority schedule with each RFI. The Architect shall endeavor to follow the Contractor's

requested order of priorities. The Owner and Contractor agree that an adequate time period for the Architect (or other designated recipient of the RFI) to respond to an RFI is generally fourteen (14) calendar days after the Architect's receipt of an RFI, unless the Owner and Contractor agree otherwise in writing. However, in all cases, the Architect shall take such time, whether more or less than 14 days, as is necessary in the Architect's professional judgment to permit adequate review and evaluation of the RFI. If Contractor informs the Architect that it needs a response to an RFI expedited to avoid delay to the critical path, the Architect shall provide a response as quickly as reasonably possible. The total time required for the Architect to respond is subject to the complexity of the RFI, the number of RFI's submitted concurrently and the reprioritization of pending RFI's submitted by the Contractor, among other things. If Contractor believes that the Architect's response results in a change in the Work that warrants additional money or time, or that Architect's response was unreasonably delayed and caused delay to the Project's critical path, Contractor shall follow the procedures for additional money or time under Section 4.5. No presumption shall arise as to the timeliness of the response if the response is more than fourteen (14) days after the Architect's receipt of the RFI. Contractor shall review the Contract Documents before submitting an RFI to ensure that the information is not already in the Contract Documents. To compensate the Owner for time and costs incurred for each time the information was already in the Contract Documents, Owner may withhold $100 from progress payments or retention in addition to any other remedies which Owner may have the right to pursue.

7.4.4 COSTS INCURRED

The Contractor shall be invoiced by the Owner for any costs incurred for professional services, which shall be withheld from progress payments or retention, if an RFI requests an interpretation or decision of a matter where the information sought is equally available to the party making such request.

7.5 REQUEST FOR PROPOSAL ("RFP")

7.5.1 DEFINITION

An RFP is Owner's written request asking the Contractor to submit to the Owner an estimate of the effect, including credits, of a proposed change on the Contract Sum and the Contract Time.

7.5.2 SCOPE

An RFP shall contain adequate information, including any necessary drawings and specifications, to enable Contractor to provide the cost breakdowns required by section 7.7. The Contractor shall not be entitled to any additional money for preparing a response to an RFP, whether ultimately accepted or not.

7.6 CHANGE ORDER REQUEST ("COR")

7.6.1 DEFINITION

A COR is a written request prepared by the Contractor asking the Owner for additional money or time.

7.6.2 CHANGES IN PRICE

A COR shall include breakdowns per section 7.7 to validate any proposed change in Contract Sum.

7.6.3 CHANGES IN TIME

Where a change in Contract Time is requested, a COR shall also include delay analysis to validate any proposed change to the Contract Time, and shall meet all requirements in these General Conditions, including but not limited to Section 8.4. Any additional time requested shall not be the number of days to make the proposed change, but must be based upon the impact to the Project Schedule as defined in section 3.9 and Division 1 of the Specifications.

7.7 PRICE OF CHANGE ORDERS

7.7.1 SCOPE

Any COR shall provide in writing to the Owner, the Architect and any construction manager, the effect of the proposed CO upon the Contract Sum and the actual cost of construction, which shall include a complete itemized cost breakdown of all labor and material showing actual quantities, hours, unit prices, wage rates, required for the change, and the effect upon the Contract Time of such CO.

7.7.2 DETERMINATION OF COST

The amount of the increase or decrease in the Contract Sum resulting from a CO, if any, shall be determined in one or more of the following ways as applicable to a specific situation:

A. Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

B. Unit prices stated in the Contractor's original bid, the Contract Documents, or subsequently agreed upon between the Owner and the Contractor;

C. Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

D. By cost of material and labor and percentage of overhead and profit. If the value is determined by this method the following requirements shall apply:

1. **Daily Reports by Contractor.**

a) General: At the close of each working day, the Contractor shall submit a daily report to the Inspector of Record and any construction manager,

on forms approved by the Owner, together with applicable delivery tickets, listing all labor, materials, and equipment involved for that day, the location of the work, and for other services and expenditures when authorized concerning extra work items. An attempt shall be made to reconcile the report daily, and it shall be signed by the Inspector of Record and the Contractor. In the event of disagreement, pertinent notes shall be entered by each party to explain points which cannot be resolved immediately. Each party shall retain a signed copy of the report. Reports by Subcontractors or others shall be submitted through the Contractor.

b) Labor: Show names of workers, classifications, and hours worked.

c) Materials: Describe and list quantities of materials used.

d) Equipment: Show type of equipment, size, identification number, and hours of operation, including, if applicable, loading and transportation.

e) Other Services and Expenditures: Describe in such detail as the Owner may require.

2. **Basis for Establishing Costs.**

a) Labor will be the actual cost for wages prevailing locally for each craft or type of workers at the time the extra work is done, plus employer payments of payroll taxes and insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State, or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. The use of a labor classification, which would increase the extra work cost, will not be permitted unless the Contractor establishes the necessity for such additional costs. Labor costs for equipment operators and helpers shall be reported only when such costs are not included in the invoice for equipment rental.

b) Materials shall be at invoice or lowest current price at which such materials are locally available and delivered to the Site in the quantities involved, plus sales tax, freight, and delivery.

The Owner reserves the right to approve materials and sources of supply or to supply materials to the Contractor if necessary for the progress of the Work. No markup shall be applied to any material provided by the Owner.

c) Tool and Equipment Rental. No payment will be made for the use of tools which have a replacement value of $100 or less.

Regardless of ownership, the rates to be used in determining equipment rental costs shall not exceed listed rates prevailing locally at equipment rental agencies or distributors at the time the work is performed.

The rental rates paid shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals.

Necessary loading and transportation costs for equipment used on the extra work shall be included. If equipment is used intermittently and, when not in use, could be returned to its rental source at less expense to the Owner than holding it at the work Site, it shall be returned unless the Contractor elects to keep it at the work Site at no expense to the Owner.

All equipment shall be acceptable to the Inspector of Record, in good working condition, and suitable for the purpose for which it is to be used. Manufacturer's ratings and modifications shall be used to classify equipment, and equipment shall be powered by a unit of at least the minimum rating recommended by the manufacturer.

d) Other Items. The Owner may authorize other items which may be required on the extra work. Such items include labor, services, material, and equipment which are different in their nature from those required by the Work, and which are of a type not ordinarily available from the Contractor or any of the Subcontractors. Invoices covering all such items in detail shall be submitted with the Application for Payment.

e) Invoices. Vendors' invoices for material, equipment rental, and other expenditures shall be submitted with the COR. If the Application for Payment is not substantiated by invoices or other documentation, the Owner may establish the cost of the item involved at the lowest price which was current at the time of the Daily Report.

f) Overhead, premiums and profit. For overhead, including direct and indirect costs, submit with the COR and include: home office overhead, off-Site supervision, CO preparation/negotiation/research for Owner initiated changes, time delays, project interference and disruption, additional guaranty and warranty durations, on-Site supervision, additional temporary protection, additional temporary utilities, additional material handling costs, and additional safety equipment costs.

7.7.3 FORMAT FOR PROPOSED COST CHANGE

The following format shall be used as applicable by the Owner and the Contractor to communicate proposed additions and deductions to the Contract.

	EXTRA	CREDIT
A. Material (attach itemized quantity and unit cost plus sales tax, invoices, receipts, truck tags, etc., for force account work)	_____	_____
B. Labor (attach itemized hours and rates, daily logs, certified payroll, etc.)	_____	_____
C. Equipment (attach any invoices)	_____	_____
D. Subtotal	_____	_____
E. If Subcontractor performed Work, add Subcontractor's overhead and profit to portions performed by Subcontractor, not to exceed fifteen percent (15%) of item D.	_____	_____
F. Liability and Property Damage Insurance, Worker's Compensation Insurance, Social Security, and Unemployment Taxes, not to exceed twenty percent (20%) of Item B.		
G. Subtotal	_____	_____
H. General Contractor's Overhead and Profit, not to exceed fifteen percent (15%) of Item G; and for work performed by subcontractors, not to exceed five percent (5%).	_____	_____
I. Subtotal	_____	_____
J. Bond not to exceed one percent (1%) of Item I.	_____	_____
K. TOTAL	_____	_____

It is expressly understood that the value of such extra work or changes, as determined by any of the aforementioned methods, expressly includes (1) any and all of the Contractor's costs and expenses, both direct and indirect, resulting from additional time required on the project or resulting from delay to the project, and (2) any costs of preparing a COR, including but not limited to delay analysis. Any costs or expenses not included are deemed waived.

It is further understood that the **total** percentage markup on any change order shall not exceed twenty five percent (25%).

7.7.4 **DISCOUNTS, REBATES, AND REFUNDS**

For purposes of determining the cost, if any, of any change, addition, or omission to the Work hereunder, all trade discounts, rebates, refunds, and all returns from the sale of surplus materials and equipment shall accrue and be credited to the Contractor, and the Contractor shall make provisions so that such discounts, rebates, refunds, and returns may be secured, and the amount thereof shall be allowed as a reduction of the Contractor's cost in determining the actual cost of construction for purposes of any change, addition, or omissions in the Work as provided herein.

7.7.5 ACCOUNTING RECORDS

With respect to portions of the Work performed by COs and CCDs on a time-and-materials, unit-cost, or similar basis, the Contractor shall keep and maintain cost-accounting records satisfactory to the Owner, which shall be available to the Owner on the same terms as any other books and records the Contractor is required to maintain under the Contract Documents.

7.7.6 NOTICE REQUIRED

Contractor shall submit a written Notice of Potential Change for additional money or time pursuant to section 4.5.1.

7.7.7 APPLICABILITY TO SUBCONTRACTORS

Any requirements under this Article 7 shall be equally applicable to COs or CCDs issued to Subcontractors by the Contractor to the same extent required of the Contractor.

7.8 WAIVER OF RIGHT TO CLAIM MONEY OR TIME

Failure to demand money based on costs, or time extensions, as part of a COR constitutes a complete waiver of Contractor's right to claim the omitted money or time. All money or time for an issue must be included in the COR at the time submitted.

ARTICLE 8

TIME

8.1 DEFINITIONS

8.1.1 CONTRACT TIME

Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Completion of the Work.

8.1.2 NOTICE TO PROCEED

Contractor shall not commence the Work until it receives a Notice to Proceed from Owner. The date of commencement of the Work is the date established in the Notice to Proceed. The date of commencement shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible.

8.1.3 DAYS

The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

8.2 HOURS OF WORK

8.2.1 SUFFICIENT FORCES

Contractors and Subcontractors shall furnish sufficient forces to ensure the prosecution of the Work in accordance with the Construction Schedule.

8.2.2 PERFORMANCE DURING WORKING HOURS

Work shall be performed during regular working hours except that in the event of an emergency or when required to complete the Work in accordance with job progress, work may be performed outside of regular working hours with the advance written consent of the Owner.

8.2.3 LABOR CODE APPLICATION

As provided in Article 3 (commencing at § 1810), Chapter 1, Part 7, Division 2 of the Labor Code, eight (8) hours of labor shall constitute a legal day's work. The time of service of any worker employed at any time by the Contractor or by any Subcontractor on any subcontract under this Contract, upon the work or upon any part of the work contemplated by this Contract, is limited and restricted to eight (8) hours during any one calendar day and forty (40) hours during any one calendar week, except as hereinafter provided. Notwithstanding the provision hereinabove set forth, work performed by employees of Contractors in excess of eight (8) hours per day and forty (40) hours during any one week shall be permitted upon this public work with compensation provided for all hours worked in excess of eight (8) hours per day at not less than one and one-half (1-1/2) times the basic rate of pay.

Contractor or subcontractor shall pay to the Owner a penalty of Twenty-five Dollars ($25.00) for each worker employed in the execution of this Contract by the Contractor, or by any Subcontractor, for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any calendar day and forty (40) hours in any one (1) calendar week, in violation of the provisions of Article 3 (commencing at § 1810), Chapter 1, Part 7, Division 2 of the Labor Code, unless compensation for the workers so employed by Contractor is not less than one and one-half (1-1/2) times the basic rate of pay for all hours worked in excess of eight (8) hours per day.

8.2.4 COSTS FOR AFTER HOURS INSPECTIONS

If the work done after hours is required by the Contract Documents to be done outside the Contractor's or the Inspector of Record's regular working hours, the costs of any inspections, if required to be done outside normal working hours, shall be borne by the Owner.

If the Owner allows the Contractor to do work outside regular working hours for the Contractor's own convenience, the costs of any inspections required outside regular working hours, among other remedies, shall be invoiced to the Contractor by the Owner and withheld from progress payments and/or retention. Contractor shall give Owner at least 48 hours notice prior to working outside regular working hours.

If the Contractor elects to perform work outside the Inspector of Record's regular working hours, costs of any inspections required outside regular working hours, among other remedies, may be invoiced to the Contractor by the Owner and withheld from progress payments and/or retention.

8.2.5 TIME FOR COMMENCEMENT BY SUBCONTRACTORS

Unless otherwise provided in the Contract Documents, all Subcontractors shall commence their Work within two (2) consecutive business days after notice to them by the Contractor and shall prosecute their Work in accordance with the progress of the Work.

8.3 PROGRESS AND COMPLETION

8.3.1 TIME OF THE ESSENCE

Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

8.3.2 NO COMMENCEMENT WITHOUT INSURANCE

The Contractor shall not knowingly, except by agreement or instruction of the Owner, in writing, commence operations on the Site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance.

8.3.3 EXPEDITIOUS COMPLETION

The Contractor shall proceed expeditiously to perform the Work, with adequate forces, labor, materials, equipment, services and management, and shall achieve Completion within the Contract Time.

8.4 EXTENSIONS OF TIME - LIQUIDATED DAMAGES

8.4.1 CONDITIONS ALLOWING FOR EXTENSIONS OF TIME TO COMPLETE THE WORK, ONLY (EXCUSABLE DELAY)

If Contractor exercises due diligence, but the critical path schedule of the Work is unavoidably delayed due to acts of God, acts of public enemy, acts of the Government, acts of the Owner or anyone employed by it, acts of another contractor in performance of a contract (other than this Contract) with the Owner, fires, floods, epidemics, quarantine restrictions, labor disputes, unusually severe weather, or delays of subcontractors due to such causes, the Owner shall extend the time to complete the Work if Contractor complies with Section 4.5 and Article 7. Owner shall take into consideration other relevant factors such as concurrent delays. Contractor has the burden of proving that any delay was excusable.

8.4.2 COMPENSABLE DELAY (TIME AND MONEY)

Compensable delays are those excusable delays for which Contractor is also entitled to money. To be compensable, an excusable delay must be one for which the Owner is responsible, where the delay was unreasonable under the circumstances involved, and where the delay was not within the contemplation of the parties; ***however***, Contractor shall not be entitled to monetary compensation when (a) Contractor could have reasonably anticipated the delay and avoided or minimized the cost impacts of it, (b) there was a concurrent delay which does not qualify for monetary compensation under this paragraph, (c) the cause of the delay was reasonably unforeseen by the City or the delay was caused by factors beyond the control of the Owner, including but not limited to a delay under Section 2.2.8 above or a delay caused by a utility company's failure to perform despite Owner's reasonable arrangements for such performance; or (d) any other defense available to Owner under law or equity applies. Contractor has the burden of proving that any delay was excusable and compensable, including an analysis that establishes non-concurrency.

8.4.3 NOTICE BY CONTRACTOR REQUIRED; PROCEDURES FOR DEMANDING ADDITIONAL TIME OR MONEY

For notice and other required procedures related to requests by Contractor for additional time or money related to delay, Contractor shall comply with the Contract Documents, including but not limited to Sections 3.18 and 4.5, and Article 7, above.

8.4.4 EARLY COMPLETION

Regardless of the cause therefore, the Contractor may not maintain any Claim or cause of action against the Owner for damages incurred as a result of its failure or inability to complete its work on the Project in a shorter period than established in the Contract Documents, the parties

stipulating that the period set forth in the Contract Documents is a reasonable time within which to perform the Work on the Project.

8.4.5 LIQUIDATED DAMAGES

Failure to Complete the Project within the time and in the manner provided for by the Contract Documents (i.e., by the Completion deadline) shall subject the Contractor to liquidated damages. For purposes of liquidated damages, the concept of "substantial completion" shall not constitute Completion and is not part of this agreement. The actual occurrence of damages and the actual amount of the damages which the Owner would suffer if the Project were not completed by the Completion deadline are dependent upon many circumstances and conditions which could prevail in various combinations and, from the nature of the case, it is impracticable and extremely difficult to fix the actual damages. Damages which the Owner would suffer in the event of delay include, but are not limited to, loss of the use of the Project, disruption of activities, costs of administration, supervision and the incalculable inconvenience and loss suffered by the public.

Accordingly, the parties agree that the amount set forth in the Agreement shall be presumed to be the amount of damages which the Owner shall directly incur upon failure of the Contractor to Complete the Project by the Completion deadline, during or as a result of each calendar day by which Completion of the Project is delayed beyond the Completion deadline as adjusted by Change Orders.

If the Contractor fails to Complete the Project by the Completion deadline as adjusted by Change Orders, and liquidated damages therefore accrue, the Owner, in addition to all other remedies provided by law, shall have the right to assess liquidated damages at any time, and to withhold liquidated damages (and any interest thereon) at any time from any and all retention or progress payments, which would otherwise be or become due the Contractor. In addition, if it is reasonably apparent to the Owner before the Completion deadline (as adjusted by Change Orders) that the Contractor cannot or will not complete the Work before that Completion deadline, Owner may assess and withhold, from retention or progress payments, the estimated amount of liquidated damages that will accrue in the future. If the retained percentage or withheld progress payments are not sufficient to discharge all liabilities of the Contractor incurred under this Article, the Contractor and its sureties shall continue to remain liable to the Owner until all such liabilities are satisfied in full.

If the Owner accepts any work or makes any payment under this Agreement after a default by reason of delays, the payment or payments shall in no respect constitute a waiver or modification of any Agreement provisions regarding time of Completion and liquidated damages.

8.5 GOVERNMENT APPROVALS

Owner shall not be liable for any delays or damages related to the time required to obtain government approvals.

ARTICLE 9

PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement, later adjusted by Change Orders and Construction Change Directives, and is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

9.2 COST BREAKDOWN

9.2.1 REQUIRED INFORMATION

On forms approved by the Owner, the Contractor shall furnish the following:

A. Within ten (10) days of the mailing, faxing or delivering of the Notice of Award of the Contract, a detailed breakdown of the Contract Sum (Schedule of Values) for each Project or Site. Each item in the schedule of values shall include its proper share of the overhead and profit.

B. Within ten (10) days of the mailing, faxing or delivering of the Notice of Award of the Contract, a schedule of estimated monthly payment requests (cash flow) due the Contractor showing the values and construction time of the various portions of the Work to be performed by it and by its Subcontractors or material and equipment suppliers containing such supporting evidence as to its correctness as the Owner may require;

C. Five (5) days prior to the submission of a pay request, an itemized breakdown of work done for the purpose of requesting partial payments;

D. Within ten (10) days of the mailing, faxing or delivering of the Notice of Award of the Contract, the name, address, telephone number, fax number, license number, and classification of all of its Subcontractors and of all other parties furnishing labor, material, or equipment for its Contract, along with the amount of each such subcontract or the price of such labor, material, and equipment needed for its entire portion of the Work.

9.2.2 OWNER ACCEPTANCE REQUIRED

The Owner shall review all submissions received pursuant to paragraph 9.2.1 in a timely manner. All submissions must be accepted by the Owner before becoming the basis of any payment.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 **PROCEDURE**

On or before the fifth (5th) day of each calendar month during the progress of the portion of the Work for which payment is being requested, the Contractor shall submit to the Architect, unless there is a construction manager for the Project or the Owner directs otherwise, an itemized Application for Payment for operations completed in accordance with the Schedule of Values through the end of the previous calendar month. Such application shall be notarized, if required, and supported by the following or such portion thereof as the applicable entity requires:

A. The amount paid to the date of the Application to the Contractor, to all its Subcontractors, and all others furnishing labor, material, or equipment for its Contract;

B. The amount being requested with the Application for Payment by the Contractor on its own behalf and separately stating the amount requested on behalf of each of the Subcontractors and all others furnishing labor, material, and equipment under the Contract;

C. The balance that will be due to each of such entities after said payment is made;

D. A certification that the Record Drawings and Annotated Specifications are current;

E. The Owner approved additions to and subtractions from the Contract Sum and Time;

F. A summary of the retentions (each Application shall provide for retention, as set out in Article 9.6);

G. Material invoices, evidence of equipment purchases, rentals, and other support and details of cost as the Owner may require from time to time;

H. The percentage of completion of the Contractor's Work by line item;

I. A statement showing all payments made by the Contractor for labor and materials on account of the Work covered in the preceding Application for Payment. Such applications shall not include requests for payment of amounts the Contractor does not intend to pay to subcontractors or others because of a dispute or other reason; and

J. Contractor's monthly reports, daily reports, and monthly schedule updates for all months of Work prior to the Application for Payment that Contractor has not previously submitted.

9.3.2 **PURCHASE OF MATERIALS AND EQUIPMENT**

As the Contractor is required to order, obtain, and store materials and equipment sufficiently in advance of its Work at no additional cost or advance payment from Owner, to assure that there

will be no delays, payment by the Owner for stored material shall be made only in unusual circumstances where the Architect specifically recommends, and Owner specifically approves the payment in writing. If payments are to be made on account of materials and equipment not incorporated in the Work, but delivered and suitably stored at the Site or at some other location agreed upon in writing by the Owner, the payments shall be conditioned upon submission by the Contractor, Subcontractor, or vendor of bills of sale and such other documents satisfactory to the Owner to establish the Owner's title to such materials or equipment free of all liens and encumbrances, and otherwise protect the Owner's interest, including, without limitation, provision of applicable insurance and transportation to the Site. All stored items shall be inventoried, specified by identification numbers (if applicable), released to the Owner by sureties of the Contractor and the Subcontractor and, if stored off-Site, stored only in a bonded warehouse.

9.3.3 WARRANTY OF TITLE

The Contractor warrants that title to all work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances in favor of the Contractor, Subcontractors, material and equipment suppliers, or other persons or entities making a claim by reason of having provided labor, materials, and equipment relating to the work. Transfer of title to work does not constitute a waiver by Owner of any defects in the work.

9.4 REVIEW OF PROGRESS PAYMENT

9.4.1 OWNER ACCEPTANCE

The Owner will, within seven (7) days after receipt of the Contractor's Application for Payment, either accept such payment or notify the Contractor in writing of the Owner's reasons for withholding acceptance in whole or in part as provided in paragraph 9.5.1.

9.4.2 OWNER'S REVIEW

The review of the Contractor's Application for Payment by the Owner will be based, at least in part, on the Owner's observations at the Site and the data comprising the Application for Payment that the Work has progressed to the point indicated. The review is also subject to an evaluation of the Work for conformance with the Contract Documents, to results of subsequent tests and inspections, to minor deviations from the Contract Documents correctable prior to completion, and to specific qualifications expressed by the Owner. The Owner may reject the Application for Payment if it is not complete under section 9.3. The issuance of a Certificate for Payment will constitute a representation that the Contractor is entitled to payment in the amount certified, subject to any specific qualifications Owner expresses in the Certificate for Payment. However, Contractor's entitlement to payment may be affected by subsequent evaluations of the Work for conformance with the Contract Documents, test and inspections and discovery of

minor deviations from the Contract Documents correctable prior to completion. The issuance of a Certificate for Payment will not be a waiver by the Owner of any defects in the work covered by the Application for Payment, nor will it be a representation that the Owner has:

A. Made exhaustive or continuous on-Site inspections to check the quality or quantity of the Work;

B. Reviewed construction means, methods, techniques, sequences, or procedures;

C. Reviewed copies of requisitions received from Subcontractors, material and equipment suppliers, and other data requested by the Owner to substantiate the Contractor's right to payment; or

D. Made an examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

9.5 DECISIONS TO WITHHOLD PAYMENT

9.5.1 REASONS TO WITHHOLD PAYMENT

The Owner may withhold from a progress payment, in whole or in part, to such extent as may be necessary to protect the Owner due to any of the following:

A. Defective or incomplete Work not remedied;

B. Stop Payment Notices. For any stop payment notice, the Owner shall withhold the amount stated in the stop payment notice, the stop notice claimant's anticipated interest and court costs and an amount to provide for the public entity's reasonable cost of any litigation pursuant to the stop payment notice. For any stop payment notice action the parties resolve before judgment is entered, Owner has the right to permanently withhold for any reasonable cost of litigation for that stop payment notice, even if it exceeds the amount originally withheld by Owner for the estimated reasonable cost of litigation. However, if (1) the Contractor at its sole expense provides a bond or other security satisfactory to the Owner in the amount of at least one hundred twenty-five percent (125%) of the claim, in a form satisfactory to the Owner, which protects the Owner against such claim, and (2) the Owner chooses to accept the bond, then Owner would release the stop payment notice funds withheld to the Contractor, except that Owner may permanently withhold for any reasonable cost of litigation. Any stop payment notice release bond shall be executed by a California admitted, fiscally solvent surety, completely unaffiliated with and separate from the surety on the payment and performance bonds, that does not have any assets pooled with the payment and performance bond sureties.

C. Liquidated damages against the Contractor, whether already accrued or estimated to accrue in the future;

D. Reasonable doubt that the Work can be completed for the unpaid balance of any Contract Sum or by the completion date;

E. Damage to the property or work of the Owner, another contractor, or subcontractor;

F. Unsatisfactory prosecution of the Work by the Contractor;

G. Failure to store and properly secure materials;

H. Failure of the Contractor to submit on a timely basis, proper and sufficient documentation required by the Contract Documents, including, without limitation, monthly progress schedules, shop drawings, submittal schedules, schedule of values, product data and samples, proposed product lists, executed change orders, and verified reports;

I. Failure of the Contractor to maintain record drawings;

J. Erroneous estimates by the Contractor of the value of the Work performed, or other false statements in an Application for Payment;

K. Unauthorized deviations from the Contract Documents;

L. Failure of the Contractor to prosecute the Work in a timely manner in compliance with established progress schedules and completion dates;

M. Subsequently discovered evidence or observations nullifying the whole or part of a previously issued Certificate for Payment;

N. Failure by Contractor to pay Subcontractors or material suppliers as required by Contract or law, which includes but is not limited to Contractor's failure to pay prevailing wage and any assessment of statutory penalties;

O. Overpayment to Contractor on a previous payment;

P. Credits owed to Owner for reduced scope of work or work that Contractor will not perform;

Q. The estimated cost of performing work pursuant to Section 2.4;

R. Actual damages related to false claims by Contractor;

S. Breach of any provision of the Contract Documents;

T. Owner's potential or actual loss, liability or damages caused by the Contractor; and

U. As permitted by other provisions in the Contract or as otherwise allowed by law, including statutory penalties Owner or other entities assessed against Contractor. (See e.g., Labor Code section 1813 (working hours) or Public Contract Code section 4110 (subcontractor listings and substitutions))

Owner may, but is not required to, provide to Contractor with the progress payment written notice of the items for which Owner is withholding amounts from the payment. To claim wrongful withholding by the Owner, or if Contractor otherwise disputes any amount being withheld, Contractor must submit an inquiry in writing to Owner within thirty (30) days of receipt of the notice, and Owner shall respond within fifteen (15) days of receipt of the inquiry. If any disputed issues remain unresolved after Owner's response, Contractor shall timely submit a Claim pursuant to Section 4.5.

For any withhold amount based on an estimate where the actual amount later becomes known and certain, no later than the final accounting for the Project the Owner will release any amount withheld over that certain and known amount. If the certain and known amount exceeds the amount previously withheld, Owner may withhold additional amounts from Contractor to cover the excess amount. If available funds are not sufficient, Contractor shall pay Owner the difference.

9.5.2 PAYMENT AFTER CURE

When Contractor removes or cures the grounds for withholding amounts, payment shall be made for amounts withheld because of them. No interest shall be paid on any retainage or amounts withheld due to the failure of the Contractor to perform in accordance with the terms and conditions of the Contract Documents.

9.5.3 OVERPAYMENT AND/OR FAILURE TO WITHHOLD

Neither Owner's overpayment to Contractor, nor Owner's failure to withhold an amount from payment that Owner had the right to withhold, shall constitute a waiver by Owner of its rights to withhold those amounts from future payments to Contractor or to otherwise pursue recovery of those amounts from Contractor.

9.6 PROGRESS PAYMENTS

9.6.1 PAYMENTS TO CONTRACTOR

Unless otherwise stated in the Contract Documents, within thirty (30) days after receipt of an undisputed and properly submitted Application for Payment, Contractor shall be paid a sum equal to ninety-five percent (95%) of the undisputed value of the Work performed up to the last day of the previous month, less the aggregate of previous payments; and Owner shall retain the other five percent (5%) of the undisputed value of the Work. The value of the Work completed shall be an estimate only, no inaccuracy or error in said estimate shall operate to release the Contractor, or any bondsman, from damages arising from such Work or from enforcing each and every provision of this Contract, and the Owner shall have the right subsequently to correct any

error made in any estimate for payment. Contractor shall base an Application for Payment only on the original Contract Sum plus any fully executed and Board-approved Change Orders. Contractor shall not include Notices of Potential Claims, CORs, Claims or disputed amounts.

The Contractor shall not be entitled to have any payment requests processed, or be entitled to have any payment made for work performed, so long as any lawful or proper direction given by the Owner concerning the Work, or any portion thereof, remains uncomplied with. Payment shall not be a waiver of any such direction.

9.6.2 PAYMENTS TO SUBCONTRACTORS

No later than ten (10) days after receipt of payment from Owner, pursuant to Business and Professions Code section 7108.5, the Contractor shall pay to each Subcontractor, out of the amount paid to the Contractor on account of such Subcontractor's portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

9.6.3 PERCENTAGE OF COMPLETION OR PAYMENT INFORMATION

The Owner will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor, and action taken thereon by the Owner, on account of portions of the Work done by such Subcontractor.

9.6.4 NO OBLIGATION OF OWNER FOR SUBCONTRACTOR PAYMENT

The Owner shall have no obligation to pay, or to see to the payment of, money to a Subcontractor except as may otherwise be required by law.

9.6.5 PAYMENT TO SUPPLIERS

Payment to material or equipment suppliers shall be treated in a manner similar to that provided in paragraphs 9.6.2, 9.6.3 and 9.6.4.

9.6.6 PAYMENT NOT CONSTITUTING APPROVAL OR ACCEPTANCE

An accepted Application for Payment, issuance of a Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance or approval of any portion of the Work, especially any Work not in accordance with the Contract Documents.

9.6.7 JOINT CHECKS

Owner shall have the right, if necessary for the protection of the Owner, to issue joint checks made payable to the Contractor and Subcontractors and/or material or equipment suppliers. The

joint check payees shall be responsible for the allocation and disbursement of funds included as part of any such joint payment. However, Owner has no duty to issue joint checks. In no event shall any joint check payment be construed to create any contract between the Owner and a Subcontractor of any tier, any obligation from the Owner to such Subcontractor, or rights in such Subcontractor against the Owner.

9.7 COMPLETION OF THE WORK

9.7.1 CLOSE-OUT PROCEDURES

When the Contractor considers that the Work is complete and submits a written notice to Owner requesting an inspection of the Work, the Owner shall review the Work and prepare and submit to the Contractor a comprehensive list of items to be completed or corrected (the "Punch List"). The Contractor and/or its Subcontractors shall proceed promptly to complete and correct items on the Punch List. Failure to include an item on the Punch List does not alter the responsibility of the Contractor to complete all Work (including the omitted item) in accordance with the Contract Documents, and to complete or correct the work so long as the statute of limitations (or repose) has not run.

When the Contractor believes the Punch List work is complete and in accordance with the Contract Documents, it shall then submit a request for an additional inspection by the Owner to determine completion. Owner shall again inspect the Work and inform the Contractor of any items that are incomplete or incorrect. Contractor shall promptly complete or correct items until no items remain.
After the Work, including all Punch List work, is inspected and informally deemed by the Owner to be complete, the Owner's governing body may formally accept the Work as complete at a meeting of the governing body. Warranties required by the Contract Documents shall commence on the date of Contractor's completion of the Work.

9.7.2 COSTS OF MULTIPLE INSPECTIONS

More than two (2) requests by Contractor to make inspections to confirm completion as required under paragraph 9.7.1 shall be considered an additional service of Owner, and all subsequent costs will be invoiced to Contractor and withheld from remaining payments.

9.8 PARTIAL OCCUPANCY OR USE

The Owner may occupy or use any completed, or partially completed, portion of the Work at any stage prior to acceptance, or prior to completion if there is no formal acceptance. Occupancy or use of any portion of the Work, or the whole Work, shall not constitute approval or acceptance of it, nor shall such occupancy or use relieve Contractor of any of its obligations under the Contract Documents regarding that portion of, or the whole, Work.

The Owner and the Contractor shall agree in writing to the responsibilities assigned to each of them for payments, security, maintenance, heat, utilities, damage to the Work, insurance, the period for correction of the Work, and the commencement of warranties required by the Contract

Documents. When the Contractor considers a portion complete, the Contractor may request an inspection of that portion and preparation of a Punch List by the Owner for that portion, as set forth for the entire Work under paragraph 9.7.1; however, such inspection and Punch List shall not act as any form of approval or acceptance of that portion of the Work, or of any Work not complying with the requirements of the Contract, and that portion shall be subject to subsequent inspections and Punch Lists.

Immediately prior to such partial occupancy or use, the Owner, the Architect and the Contractor shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

9.9 FINAL PROGRESS PAYMENT AND RELEASE OF RETENTION

9.9.1 FINAL APPLICATION FOR PROGRESS PAYMENT

When, pursuant to Section 9.7.1, the Owner finds all of the Work is completed in accordance with the Contract Documents, it shall so notify Contractor, who shall then submit to the Owner its final Application for Payment.
Upon receipt and approval of such final Application for Payment, the Owner shall issue a final Certificate of Payment, based on its knowledge, information, and belief, and on the basis of its observations, inspections, and all other data accumulated or received by the Owner in connection with the Work, that such Work has been completed in accordance with the Contract Documents.

9.9.2 PROCEDURES FOR APPLICATION FOR FINAL PROGRESS PAYMENT

The Application for Final Progress Payment pursuant to Section 9.9.1 shall be accompanied by the same details as set forth in paragraph 9.3, and in addition, the following conditions must be fulfilled:

A. The Work shall be complete, and the Contractor shall have made, or caused to have been made, all corrections to the Work which are required to remedy any defects therein, to obtain compliance with the Contract Documents or any requirements of applicable codes and ordinances, or to fulfill any of the orders or directions of Owner required under the Contract.

B. Each Subcontractor shall have delivered to the Contractor all written guarantees, warranties, applications, and bonds required by the Contract Documents for its portion of the Work, and Contractor delivered them to the Owner.

C. The Contractor shall deliver to the Owner (i) reproducible final Record Drawings and Annotated Specifications showing the Contractor's Work "as built," with the Contractor's certification of the accuracy of the Record Drawings and Annotated Specifications, (ii) all warranties and guarantees, (iii) operation and maintenance instructions, manuals and materials for equipment and apparatus, and (iv) all other documents required by the Contract Documents.

D. Contractor shall provide extensive assistance in the utilization of any equipment or system such as initial start-up or testing, adjusting and balancing, preparation of operation and maintenance manuals and training personnel for operation and maintenance.

Acceptance of Final Progress Payment shall constitute a complete waiver of Claims except for those previously identified in writing and identified by that payee as unsettled at the time of Final Progress Payment.

9.9.3 RELEASE OF RETAINAGE

Owner may withhold from release or payment of retainage (or "retention") up to 150% of disputed amounts listed in Section 9.5. If retainage is held in an escrow account pursuant to an escrow agreement under Public Contract Code section 22300 (see Section 9.10) and Owner withholds from release of retainage based on a breach of the Contract, or other default, by Contractor, Owner may withdraw the withheld retainage from the escrow account. Owner shall release the undisputed retainage within sixty (60) days after completion of the Work. For this purpose, "completion" is defined in Public Contract Code section 7107(c). No interest shall be paid on any retainage, or on any amounts withheld, except as provided to the contrary in any Escrow Agreement and General Conditions between the Owner and the Contractor under Public Contract Code section 22300.

9.10 SUBSTITUTION OF SECURITIES

In accordance with section 22300 of the Public Contract Code, the Owner will permit the substitution of securities for any retention monies withheld by the Owner to ensure performance under the Contract. At the request and expense of the Contractor, securities equivalent to the amount withheld shall be deposited with the Owner, or with a state or federally chartered bank as the escrow agent, who shall then pay such retention monies to the Contractor. Upon completion of the Contract, the securities shall be returned to the Contractor if Owner has no basis to withhold under the Contract Documents.

Securities eligible for investment under this section shall include those listed in Government Code section 16430, bank or savings and loan certificates of deposit, interest-bearing, demand-deposit accounts, standby letters of credit, or any other security mutually agreed to by the Contractor and the Owner.

The Contractor shall be the beneficial owner of any securities substituted for monies withheld and shall receive any interest thereon.

Any escrow agreement entered by Owner and Contractor pursuant to Public Contract Code section 22300, shall be substantially similar to the form set forth in Public Contract Code section 22300.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 CONTRACTOR RESPONSIBILITY

The Contractor shall have responsibility for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. Each Contractor shall designate a responsible member of its organization whose duties shall include loss and accident prevention, and who shall have the responsibility and full authority to enforce the program. This person shall attend meetings with the representatives of the various Subcontractors employed to ensure that all employees understand and comply with the programs. Contractor will ensure that his employees and Subcontractors cooperate and coordinate safety matters with any other contractors to form a joint safety effort.

10.1.2 SUBCONTRACTOR RESPONSIBILITY

Subcontractors have the responsibility for participating in, and enforcing, the safety and loss prevention programs established by the Contractor for the Project, which will cover all Work performed by the Contractor and its Subcontractors. Each Subcontractor shall designate a responsible member of its organization whose duties shall include loss and accident prevention, and who shall have the responsibility and full authority to enforce the program. This person shall attend meetings with the representatives of the various Subcontractors employed to ensure that all employees understand and comply with the programs.

10.1.3 COOPERATION

All Subcontractors and material or equipment suppliers, shall cooperate fully with Contractor, the Owner, and all insurance carriers and loss prevention engineers.

10.1.4 ACCIDENT REPORTS

Subcontractors shall promptly report in writing to the Contractor all accidents whatsoever arising out of, or in connection with, the performance of the Work, whether on or off the Site, which caused death, personal injury, or property damage, giving full details and statements of witnesses. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger. Contractor shall thereafter promptly report the facts in writing to the Owner giving full details of the accident.

10.1.5 FIRST-AID SUPPLIES AT SITE

The Contractor will provide and maintain at the Site first-aid supplies for minor injuries.

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 THE CONTRACTOR

The Contractor shall take reasonable precautions for the safety of, and shall provide reasonable protection to prevent damage, injury, or loss to:

A. Employees on the Work and other persons who may be affected thereby;

B. The Work, material, and equipment to be incorporated therein, whether in storage on or off the Site, under the care, custody, or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and

C. Other property at the Site or adjacent thereto such as trees, shrubs, lawns, walks, pavement, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

10.2.2 CONTRACTOR NOTICES

The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on the safety of persons or property or their protection from damage, injury, or loss.

10.2.3 SAFETY BARRIERS AND SAFEGUARDS

The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.

10.2.4 USE OR STORAGE OF HAZARDOUS MATERIAL

When use or storage of explosives, other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel. The Contractor shall notify the Owner any time that explosives or hazardous materials are expected to be stored on Site. Location of storage shall be coordinated with the Owner and local fire authorities.

10.2.5 FINGERPRINTING

At its own expense, Contractor shall comply with all fingerprinting requirements under law and Contract, including but not limited to the requirements of Education Code section 45125.2 and the Independent Contractor Student Contact Form which is a part of the Contract. Contractor shall hold harmless, defend and indemnify the Owner under section 3.16, for any costs, including attorneys' fees, Owner incurs from Contractor's failure to comply.

10.3 PROTECTION OF WORK AND PROPERTY

10.3.1 PROTECTION OF WORK

The Contractor and Subcontractors shall continuously protect the Work, the Owner's property, and the property of others, from damage, injury, or loss until formal acceptance of the Work or completion of the Work if there is no formal acceptance of the Work. The Contractor and Subcontractors shall make good any such damage, injury, or loss, except such as may be solely due to, or caused by, agents or employees of the Owner.

10.3.2 PROTECTION FOR ELEMENTS

The Contractor will remove all mud, water, or other elements as may be required for the proper protection and prosecution of its Work. The Contractor shall at all times provide heat, coverings, and enclosures necessary to maintain adequate protection against weather so as to preserve the Work, materials, equipment, apparatus, and fixtures free from injury or damage.

10.3.3 SHORING AND STRUCTURAL LOADING

The Contractor shall not impose structural loading upon any part of the Work under construction or upon existing construction on or adjacent to the Site in excess of safe limits, or loading such as to result in damage to the structural, architectural, mechanical, electrical, or other components of the Work. The design of all temporary construction equipment and appliances used in construction of the Work and not a permanent part thereof, including, without limitation, hoisting equipment, cribbing, shoring, and temporary bracing of structural steel, is the sole responsibility of the Contractor. All such items shall conform to the requirements of governing codes and all laws, ordinances, rules, regulations, and orders of all authorities having jurisdiction. The Contractor shall take special precautions, such as shoring of masonry walls and temporary tie bracing of structural steel work, to prevent possible wind damage during construction of the Work. The installation of such bracing or shoring shall not damage or cause damage to the Work in place or the Work installed by others. Any damage which does occur shall be promptly repaired by the Contractor at no cost to the Owner.

10.3.4 CONFORMANCE WITHIN ESTABLISHED LIMITS

The Contractor and Subcontractors shall confine their construction equipment, the storage of materials, and the operations of workers to the limits indicated by laws, ordinances, permits, and the limits established by the Owner, and shall not unreasonably encumber the premises with construction equipment or materials.

10.3.5 SUBCONTRACTOR ENFORCEMENT OF RULES

Subcontractors shall enforce the Owner's and the Contractor's instructions, laws, and regulations regarding signs, advertisements, fires, smoking, the presence of liquor, and the presence of firearms by any person at the Site.

10.3.6 SITE ACCESS

The Contractor and the Subcontractors shall use only those ingress and egress routes designated by the Owner, observe the boundaries of the Site designated by the Owner, park only in those

areas designated by the Owner, which areas may be on or off the Site, and comply with any parking control program established by the Owner such as furnishing license plate information and placing identifying stickers on vehicles.

10.3.7 PROTECTION OF MATERIALS

The Contractor and the Subcontractors shall receive, count, inspect for damage, record, store, and protect construction materials for the Work and Subcontractors shall promptly send to the Contractor evidence of receipt of such materials, indicating thereon any shortage, change, or damage (failure to so note shall constitute acceptance by the Subcontractor of financial responsibility for any shortage).

10.4 EMERGENCIES

10.4.1 EMERGENCY ACTION

In an emergency affecting the safety of persons or property, the Contractor shall take any action necessary, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional money or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Section 4.5 and Article 7.

10.4.2 ACCIDENT REPORTS

The Contractor shall promptly report in writing to the Owner all accidents arising out of or in connection with the Work, which caused death, personal injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported immediately by telephone or messenger to the Owner.

10.5 HAZARDOUS MATERIALS

10.5.1 DISCOVERY OF HAZARDOUS MATERIALS

In the event the Contractor encounters or suspects the presence on the Site material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), or any other material defined as being hazardous by section 25249.5 of the California Health and Safety Code, which (a) has not been rendered harmless, and (b) the handling or removal of which is not within the scope of the Work, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and the Architect in writing, whether or not such material was generated by the Contractor or the Owner. The Work in the affected area shall not thereafter be resumed, except by written agreement of the Owner and the Contractor, if in fact the material is asbestos, polychlorinated biphenyl (PCB), or other hazardous material, and has not been rendered harmless. The Work in the affected area shall be resumed only in the absence of asbestos, polychlorinated biphenyl (PCB), or other hazardous material, or when it has been rendered harmless by written agreement of the Owner and the Contractor.

10.5.2 HAZARDOUS MATERIAL WORK LIMITATIONS

In the event that the presence of hazardous materials is suspected or discovered on the Site, the Owner shall retain an independent testing laboratory to determine the nature of the material encountered and whether corrective measures or remedial action is required. The Contractor shall not be required pursuant to Article 7 to perform without consent any Work in the affected area of the Site relating to asbestos, polychlorinated biphenyl (PCB), or other hazardous material, until any known or suspected hazardous material has been removed, or rendered harmless, or determined to be harmless by Owner, as certified by an independent testing laboratory and/or approved by the appropriate government agency.

10.5.3 INDEMNIFICATION BY OWNER FOR HAZARDOUS MATERIAL NOT CAUSED BY CONTRACTOR

In the event the presence of hazardous materials on the Site is not caused by the Contractor, Owner shall pay for all costs of testing and remediation, if any, and shall compensate Contractor for any additional costs incurred or Project delay in accordance with the applicable provisions of Article 7 herein. Owner shall defend, indemnify and hold harmless the Contractor and its agents, officers, directors and employees from and against any and all claims, damages, losses, costs and expenses incurred in connection with or arising out of, or relating to, the performance of the Work in the area affected by the hazardous material, except to the extent the claims, damages, losses, costs, or expenses were caused by Contractor's active negligence, sole negligence or willful misconduct. By providing this indemnification, District does not waive any immunities.

10.5.4 INDEMNIFICATION BY CONTRACTOR FOR HAZARDOUS MATERIAL CAUSED BY CONTRACTOR

In the event the presence of hazardous materials on the Site is caused by Contractor, Subcontractors, materialmen or suppliers, the Contractor shall pay for all costs of testing and remediation, if any, and shall compensate the Owner for any additional costs incurred as a result of the generation of hazardous material on the Project Site. In addition, the Contractor shall defend, indemnify and hold harmless Owner and its agents, officers, and employees from and against any and all claims, damages, losses, costs and expenses incurred in connection with, arising out of, or relating to, the presence of hazardous material on the Site, except to the extent the claims, damages, losses, costs, or expenses were caused by Owner's active negligence, sole negligence or willful misconduct.

10.5.5 TERMS OF HAZARDOUS MATERIAL PROVISION

The terms of this Hazardous Material provision shall survive the completion of the Work and/or any termination of this Contract.

10.5.6 ARCHEOLOGICAL MATERIALS

In the event the Contractor encounters or reasonably suspects the presence on the Site of archeological materials, the Contractor shall immediately stop Work in the area affected and

report the condition to the Owner and the Architect in writing. The Work in the affected area shall not thereafter be resumed, except after Contractor's receipt of written notice form the Owner.

ARTICLE 11

INSURANCE AND BONDS

11.1. CONTRACTOR'S LIABILITY INSURANCE

11.1.1 LIABILITY INSURANCE REQUIREMENTS

11.1.1 By the earlier of the deadline set forth in the Instructions to Bidders or the commencement of the Work and within limits acceptable to the Owner, the Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in California as admitted carriers with a financial rating of at least A+, Class XII status as rated in the most recent edition of Best's Insurance Reports such commercial general liability insurance per occurrence for bodily injury, personal injury and property damage as set forth in the Agreement and automobile liability insurance per accident for bodily injury and property damage combined single limit as set forth in the Agreement as will protect the Contractor from claims set forth below, which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations are by the Contractor, by a Subcontractor, by Sub-subcontractor, by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

11.1.1.1 claims for damages because of bodily injury (including emotional distress), sickness, disease, or death of any person other than the Contractor's employees. This coverage shall be provided in a form at least as broad as Insurance Services Office (ISO) Form CG 0001 11188;

11.1.1.2 claims for damages arising from personal or advertising injury in a form at least as broad as ISO Form CG 0001 11188;

11.1.1.3 claims for damages because of injury or destruction of tangible property, including loss of use resulting therefrom, arising from operations under the Contract Documents; and

11.1.1.4 claims for damages because of bodily injury, death of a person, or property damage arising out of the ownership, maintenance, or use of a motor vehicle, all mobile equipment, and vehicles moving under their own power and engaged in the Work; and

11.1.1.5 claims involving blanket contractual liability applicable to the Contractor's obligations under the Contract Documents, including liability assumed by and

the indemnity and defense obligations of the Contractor and the Subcontractors; and

11.1.1.6 claims involving Completed Operations, Independent Contractors' coverage, and Broad Form property damage, without any exclusions for collapse, explosion, demolition, underground coverage, and excavating. (XCU)

If commercial general liability insurance or another insurance form with a general aggregate limit is used, either the general aggregate limit shall apply separately to the project location (with the ISO CG 2501 or insurer's equivalent endorsement provided to the Owner) or the general aggregate limit shall be twice the required occurrence limit.

Any deductible or self-insured retention must be declared to and approved by the Owner. At the option of the Owner, either the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the Owner, its Board of Trustees, members of its Board of Trustees, officers, employees, agents and volunteers; or the Contractor shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses.

11.1.2 SUBCONTRACTOR INSURANCE REQUIREMENTS

The Contractor shall require its Subcontractors and any Sub-subcontractors to take out and maintain similar public liability insurance and property damage insurance, in a company or companies lawfully authorized to do business in California as admitted carriers with a financial rating of at least A+, Class XII status as rated in the most recent edition of Best's Insurance Reports, in like amounts and scope of coverage.

11.1.3 OWNER'S INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance. Optionally, the Owner may purchase and maintain other insurance for self protection against claims which may arise from operations under the Contract. The Contractor shall not be responsible for purchasing and maintaining this optional Owner's liability insurance unless specifically required by the Contract Documents.

11.1.4 ADDITIONAL INSURED ENDORSEMENT REQUIREMENTS

The Contractor shall name, on any policy of insurance, the Owner and the Architect as additional insureds. Subcontractors shall name the Contractor, the Owner and the Architect as additional insureds. The Additional Insured Endorsement included on all such insurance policies shall state that coverage is afforded the additional insured with respect to claims arising out of operations performed by or on behalf of the insured. If the additional insureds have other insurance which is applicable to the loss, such other insurance shall be excess to any policy of insurance required herein. The amount of the insurer's liability shall not be reduced by the existence of such other insurance.

11.1.5 WORKERS' COMPENSATION INSURANCE

During the term of this Contract, the Contractor shall provide workers' compensation insurance for all of the Contractor's employees engaged in Work under this Contract on or at the site of the Project and, in case any of the Contractor's work is sublet, the Contractor shall require the Subcontractor to provide workers' compensation insurance for all the Subcontractor's employees engaged in Work under the subcontract. Any class of employee or employees not covered by a Subcontractor's insurance shall be covered by the Contractor's insurance. In case any class of employees engaged in Work under this Contract on or at the site of the Project is not protected under the Workers' Compensation laws, the Contractor shall provide or cause a Subcontractor to provide adequate insurance coverage for the protection of those employees not otherwise protected. The Contractor shall file with the Owner certificates of insurance as required under this Article and in compliance with Labor Code section 3700.

If the contractor fails to maintain such insurance, the Owner may take out compensation insurance which the Owner might be liable to pay under the provisions of the Act by reason of an employee of the Contractor being injured or killed, and withhold from progress payments and/or retention the amount of the premium for such insurance.

11.1.6 BUILDER'S RISK/"ALL RISK" INSURANCE

11.1.6.1 ***COURSE-OF-CONSTRUCTION INSURANCE REQUIREMENTS.*** Unless provided by Owner at Owner's sole discretion, Contractor, during the progress of the Work and until final acceptance of the Work by Owner upon completion of the entire Contract, shall maintain Builder's Risk/Course-of-Construction insurance satisfactory to the Owner, issued on a completed value basis on all insurable Work included under the Contract Documents. This insurance shall insure against all risks, including but not limited to the following perils: vandalism, theft, malicious mischief, fire, sprinkler leakage, civil authority, sonic boom, explosion, collapse, flood, earthquake (for projects not solely funded through revenue bonds, limited to earthquakes equivalent to or under 3.5 on the Richter Scale in magnitude), wind, hail, lightning, smoke, riot or civil commotion, debris removal (including demolition) and reasonable compensation for the Architect's services and expenses required as a result of such insured loss. This insurance shall provide coverage in an amount not less than the full cost to repair, replace or reconstruct the Work. Such insurance shall include the Owner, the Architect, and any other person or entity with an insurable interest in the Work as an additional named insured.

The Contractor shall submit to the Owner for its approval all items deemed to be uninsurable under the Builder's Risk/Course-of Construction insurance. The risk of the damage to the Work due to the perils covered by the Builder's Risk/Course-of-Construction insurance, as well as any other hazard which might result in damage to the Work, is that of the Contractor and the surety, and no claims for such loss or damage shall be recognized by the Owner, nor will such loss or damage excuse the complete and satisfactory performance of the Contract by the Contractor.

11.1.7 CONSENT OF INSURER FOR PARTIAL OCCUPANCY OR USE

Partial occupancy or use in accordance with the Contract Documents shall not commence until the insurance company providing property insurance has consented to such partial occupancy or

use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company and shall, without mutual consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of the insurance.

11.1.8 FIRE INSURANCE

Before the commencement of the Work, the Contractor shall procure, maintain, and cause to be maintained at the Contractor's expense, fire insurance on all Work included under the Contract Documents, insuring the full replacement value of such Work as well as the cost of any removal and demolition necessary to replace or repair all Work damaged by fire. The amount of fire insurance shall be subject to approval by the Owner and shall be sufficient to protect the Project against loss or damage in full until the Work is accepted by the Owner. Should the Work being constructed be damaged by fire or other causes during construction, it shall be replaced in accordance with the requirements of the drawings and specifications without additional expense to the Owner.

11.1.9 OTHER INSURANCE

The Contractor shall provide all other insurance required to be maintained under applicable laws, ordinances, rules, and regulations.

11.1.10 PROOF OF CARRIAGE OF INSURANCE

The Contractor shall not commence Work nor shall it allow any Subcontractor to commence Work under this Contract until all required insurance, certificates, and an Additional Insured Endorsement and Declarations Page have been obtained and delivered in duplicate to the Owner for approval subject to the following requirements:

(a) Certificates and insurance policies shall include the following clause:

This policy shall not be non-renewed, canceled, or reduced in required limits of liability or amounts of insurance until notice has been mailed to the Owner. Date of cancellation or reduction may not be less than thirty (30) days after the date of mailing notice.

(b) Certificates of insurance shall state in particular those insured, the extent of insurance, location and operation to which the insurance applies, the expiration date, and cancellation and reduction notices.

(c) Certificates of insurance shall clearly state that the Owner, the Architect and the Construction Manager are named as additional insureds under the policy described and that such insurance policy shall be primary to any insurance or self-insurance maintained by Owner and any other insurance carried by the Owner with respect to the matters covered by such policy shall be excess and non-contributing.

(d) The Contractor and its Subcontractors shall produce a certified copy of any insurance policy required under this Section upon written request of the Owner.

11.1.11 COMPLIANCE

In the event of the failure of any contractor to furnish and maintain any insurance required by this Article, the Contractor shall be in default under the Contract. Compliance by Contractor with the requirement to carry insurance and furnish certificates, policies, Additional Insured Endorsement and Declarations Page evidencing the same shall not relieve the Contractor from liability assumed under any provision of the Contract Documents, including, without limitation, the obligation to defend and indemnify the Owner and the Architect.

11.2 PERFORMANCE AND PAYMENT BONDS

11.2.1 BOND REQUIREMENTS

Unless otherwise specified in the Contract Documents, prior to commencing any portion of the Work, the Contractor shall apply for and furnish Owner separate payment and performance bonds for its portion of the Work which shall cover 100% faithful performance of and payment of all obligations arising under the Contract Documents and/or guaranteeing the payment in full of all claims for labor performed and materials supplied for the Work. All bonds shall be provided by a corporate surety authorized and admitted to transact business in California. All bonds shall be submitted on the Owner's approved form.

To the extent, if any, that the Contract Sum is increased in accordance with the Contract Documents, the Contractor shall cause the amount of the bonds to be increased accordingly and shall promptly deliver satisfactory evidence of such increase to the Owner. To the extent available, the bonds shall further provide that no change or alteration of the Contract Documents (including, without limitation, an increase in the Contract Sum, as referred to above), extensions of time, or modifications of the time, terms, or conditions of payment to the Contractor will release the surety. If the Contractor fails to furnish the required bond, the Owner may terminate the Contract for cause.

11.2.2 SURETY QUALIFICATION

Only bonds executed by admitted Surety insurers as defined in Code of Civil Procedure section 995.120 shall be accepted. The surety insurers must, unless otherwise agreed to by Owner in writing, at the time of issuance of the bonds, have a rating not lower than "A-" as rated by A.M. Best Company, Inc. or other independent rating companies. Owner reserves the right to approve or reject the surety insurers selected by Contractor and to require Contractor to obtain bonds from surety insurers satisfactory to the Owner.

ARTICLE 12

UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

12.1.1 UNCOVERING WORK FOR REQUIRED INSPECTIONS

If a portion of the Work is covered contrary to the Owner's request or to requirements specifically expressed in the Contract Documents, Contractor must, if required in writing by the Owner, uncover it for the Owner's observation and replace the removed work at the Contractor's expense without change in the Contract Sum or Time.

12.1.2 COSTS FOR INSPECTIONS NOT REQUIRED

If a portion of the Work has been covered which the Owner has not specifically requested to observe prior to its being covered, the Owner may request to see such work, and it shall be uncovered by the Contractor. If such work is in accordance with the Contract Documents, costs of uncover and replacement shall, by appropriate Change Order, be paid by the Owner. If such work is not in accordance with Contract Documents, the Contractor shall pay such costs, unless the condition was caused by the Owner or a separate contractor, in which event the Owner shall be responsible for payment of such costs to the Contractor.

12.2 CORRECTION OF WORK; WARRANTY

12.2.1 CORRECTION OF REJECTED WORK

The Contractor shall promptly correct the work rejected by the Owner for failing to conform to the requirements of the Contract Documents, until the statutes of limitation (or repose) and all warranties have run, as applicable, and whether or not fabricated, installed or completed. The Contractor shall bear costs of correcting the rejected work, including additional testing, inspections, and compensation for the Owner's expenses and costs incurred.

12.2.2 REMOVAL OF NONCONFORMING WORK

The Contractor shall remove from the Site portions of the Work which are not in accordance with the requirements of the Contract Documents and are not corrected by the Contractor or accepted or approved by the Owner.

12.2.3 OWNER'S RIGHTS IF CONTRACTOR FAILS TO CORRECT

If the Contractor fails to correct nonconforming work within a reasonable time, the Owner may correct it in accordance with Section 2.4. As part of Owner's correction of the work, the Owner may remove any portion of the nonconforming Work and store any salvageable materials or equipment at the Contractor's expense. If the Contractor does not pay costs of such removal and storage within ten (10) days after written notice, the Owner may upon ten (10) additional days written notice sell such material or equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Architect's and other professionals and representatives' services and expenses, made necessary thereby. If such proceeds of sale do not

cover costs which the Contractor should have borne, the Contractor shall be invoiced for the deficiency or Owner may withhold such costs from payment pursuant to Section 9.5. If progress payments or retention then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

12.2.4 COST OF CORRECTING THE WORK

The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or separate contractors, whether completed or partially completed, caused by the Contractor's correction or removal of the nonconforming work.

12.2.5 WARRANTY CORRECTIONS (INCLUDES REPLACEMENT)

Pursuant to the warranty in Section 3.5, if within one (1) year after the completion of the Work or within a longer time period for an applicable special warranty or guarantee required by the Contract Documents, any of the Work does not comply with the Contract Documents, the Contractor shall correct it after receipt of Owner's written notice to do so, unless the Owner has previously waived in writing such right to demand correction. Contractor shall correct the Work promptly, and passage of the applicable warranty period shall not release Contractor from its obligation to correct the Work if Owner provided the written notice within the applicable warranty period. Contractor's obligation to correct the warranty item continues until the correction is made. After the correction is made to Owner's satisfaction, a new warranty period of the same length as the original warranty period shall run on the corrected work. The obligations under this paragraph 12.2.5 shall survive acceptance of the Work under the Contract and termination of the Contract.

12.2.6 NO TIME LIMITATION

Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the time period of one (1) year as described in Section 12.2.5 relates only to the specific warranty obligation of the Contractor to correct the Work after the date of commencement of warranties under Sections 3.5 and 9.7.1, and has, for example, no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, or to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

12.3 NONCONFORMING WORK AND WITHHOLDING THE VALUE OF IT

If it is found at any time before completion of the Work that the Contractor has varied from the Contract Documents in materials, quality, form, finish, or in the amount or value of the materials or labor used, the Owner may, in addition to other remedies in the Contract Documents or under law and as allowed by law, accept the improper work. The Owner may withhold from any amount due or to become due Contractor that sum of money equivalent to the difference in value between the Work performed and that called for by the Drawings and Specifications. The Owner

shall determine such difference in value. No structural related work shall be accepted that is not in conformance with the Contract Documents.

ARTICLE 13

MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located.

13.2 SUCCESSORS AND ASSIGNS

The Owner and the Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns, and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole or in part without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

13.3 WRITTEN NOTICE

In the absence of specific notice requirements in the Contract Documents, written notice shall be deemed to have been duly served if delivered in person to the individual, member of the firm or entity, or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified or overnight mail to the last business address known to the party giving notice. Owner shall, at Contractor's cost, timely notify Contractor of Owner's receipt of any third party claims relating to the Contract pursuant to Public Contract Code section 9201.

13.4 RIGHTS AND REMEDIES

13.4.1 DUTIES AND OBLIGATIONS CUMULATIVE

Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

13.4.2 NO WAIVER

No action or failure to act by the Owner, Inspector of Record, Architect or any construction manager shall constitute a waiver of a right or duty afforded them under the Contract Documents, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed to in a written amendment to the Contract.

13.5 TESTS AND INSPECTIONS

13.5.1 COMPLIANCE

Tests, inspections, and approvals of portions of the Work required by the Contract Documents will comply with Title 24, and with all other laws, ordinances, rules, regulations, or orders of public authorities having jurisdiction.

13.5.2 INDEPENDENT TESTING LABORATORY

The Owner will select and pay an independent testing laboratory to conduct all tests and inspections, including shipping or transportation costs or expenses (mileage and hours). Selection of the materials required to be tested shall be made by the laboratory or the Owner's representative and not by the Contractor. However, if Contractor requests that the Owner use a different testing laboratory and Owner chooses to approve such request, Contractor shall obtain prior approval. Owner will pay all costs for testing, contractor may not apy any testing expenses. Owner may invoice such costs or expenses to the Contractor or withhold such costs or expenses from progress payments and/or retention.

13.5.3 ADVANCE NOTICE TO INSPECTOR OF RECORD

The Contractor shall notify the Inspector of Record a sufficient time in advance of its readiness for required observation or inspection so that the Inspector of Record may arrange for same. The Contractor shall notify the Inspector of Record a sufficient time in advance of the manufacture of material to be supplied under the Contract Documents which must, by terms of the Contract Documents, be tested in order that the Inspector of Record may arrange for the testing of the material at the source of supply.

13.5.4 TESTING OFF-SITE

Any material shipped by the Contractor from the source of supply, prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said Inspector of Record that such testing and inspection will not be required, shall not be incorporated in the Work.

13.5.5 ADDITIONAL TESTING OR INSPECTION

If the Inspector of Record, the Architect, the Owner, or public authority having jurisdiction determines that portions of the Work require additional testing, inspection, or approval not included under section 13.5.1, the Inspector of Record will, upon written authorization from the Owner, make arrangements for such additional testing, inspection, or approval. The Owner shall bear such costs except as provided in section 13.5.6.

13.5.6 COSTS FOR RETESTING

If such procedures for testing, inspection, or approval under sections 13.5.1, 13.5.2 and 13.5.5 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, the Contractor shall bear all costs arising from such failure, including those of re-testing, re-inspection, or re-approval, including, but not limited to, compensation for the Architect's services and expenses. Any such costs shall be paid by the Owner, invoiced to the Contractor, and, among other remedies, can be withheld from progress payments and/or retention.

13.5.7 COSTS FOR PREMATURE TEST

In the event the Contractor requests any test or inspection for the Project and is not completely ready for the inspection, the Contractor shall be invoiced by the Owner for all costs and expenses resulting from that testing or inspection, including, but not limited to, the Architect's fees and expenses, and the amount of the invoice can among other remedies, be withheld from progress payments and/or retention.

13.5.8 TESTS OR INSPECTIONS NOT TO DELAY WORK

Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

13.6 [INTENTIONALLY LEFT BLANK]

13.7 TRENCH EXCAVATION

13.7.1 TRENCHES GREATER THAN FIVE FEET

Pursuant to Labor Code section 6705, if the Contract Sum exceeds $25,000 and involves the excavation of any trench or trenches five (5) feet or more in depth, the Contractor shall, in advance of excavation, submit to the Owner or a registered civil or structural engineer employed by the Owner a detailed plan showing the design of shoring for protection from the hazard of caving ground during the excavation of such trench or trenches.

13.7.2 EXCAVATION SAFETY

If such plan varies from the Shoring System Standards established by the Construction Safety Orders, the plan shall be prepared by a registered civil or structural engineer, but in no case shall such plan be less effective than that required by the Construction Safety Orders. No excavation of such trench or trenches shall be commenced until said plan has been accepted by the Owner or by the person to whom authority to accept has been delegated by the Owner.

13.7.3 NO TORT LIABILITY OF OWNER

Pursuant to Labor Code section 6705, nothing in this Article shall impose tort liability upon the Owner or any of its employees.

13.7.4 NO EXCAVATION WITHOUT PERMITS

The Contractor shall not commence any excavation work until it has secured all necessary permits including the required CAL OSHA excavation/shoring permit. Any permits shall be prominently displayed on the Site prior to the commencement of any excavation.

13.8 WAGE RATES

13.8.1 WAGE RATES

Pursuant to the provisions of Article 2 (commencing at § 1770), Chapter 1, Part 7, Division 2, of the Labor Code, the governing board of the Owner has obtained the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work in the locality in which this public work is to be performed for each craft, classification, or type of worker needed for this Project from the Director of Industrial Relations ("Director"). These rates are on file with the Clerk of the Owner's Governing Board, and copies will be made available to any interested party on request. The Contractor shall post a copy of such wage rates at the Site.

13.8.2 HOLIDAY AND OVERTIME PAY

Holiday and overtime work, when permitted by law, shall be paid for at a rate of at least one and one-half (1½) times the above specified rate of per diem wages, unless otherwise specified. Holidays shall be defined in the Collective Bargaining Agreement applicable to each particular craft, classification, or type of worker employed.

13.8.3 WAGE RATES NOT AFFECTED BY SUBCONTRACTS

The Contractor shall pay and shall cause to be paid each worker engaged in work on the Project not less than the general prevailing rate of per diem wages determined by the Director, regardless of any contractual relationship which may be alleged to exist between the Contractor or any Subcontractor and such workers.

13.8.4 CHANGE IN PREVAILING WAGE DURING BID OR CONSTRUCTION

If during the period this bid is required to remain open, the Director of Industrial Relations determines that there has been a change in any prevailing rate of per diem wages in the locality in which this public work is to be performed, such change shall not alter the wage rates discussed in the Notice to Bidders or the Contract subsequently awarded.

13.8.5 FORFEITURE AND PAYMENTS

Pursuant to Labor Code section 1775, the Contractor and any subcontractor under the Contractor shall as a penalty to the Owner, forfeit not more than two hundred dollars ($200.00) for each calendar day, or portion thereof, for each worker paid less than the prevailing rate of per diem wages, determined by the Director, for such craft or classification in which such worker is employed for any public work done under the Agreement by the Contractor or by any Subcontractor under it. Minimum penalties shall apply, as also provided in Labor Code section 1775. The amount of the penalty shall be determined by the Labor Commissioner and shall be based on both of the following: (1) whether the failure of the contractor or subcontractor to pay the correct rate of per diem wages was a good faith mistake and, if so, the error was promptly and voluntarily corrected upon being brought to the attention of the contractor or subcontractor; and (2) whether the contractor or subcontractor has a prior record of failing to meet its prevailing wage obligations. The difference between such prevailing rate of per diem wage and the amount paid to each worker for each calendar day or portion thereof for which each worker was paid less than the prevailing rate of per diem wage shall be paid to each worker by the Contractor or subcontractor.

13.8.6 MINIMUM WAGE RATES

Any worker employed to perform work on the Project, which work is not covered by any craft or classification listed in the general prevailing rate of per diem wages determined by the Director, shall be paid not less than the minimum rate of wages specified therein for the craft or classification which most nearly corresponds to the Work to be performed by them, and such minimum wage rate shall be retroactive to time of initial employment of such person in such craft or classification.

13.8.7 PER DIEM WAGES

Pursuant to Labor Code section 1773.1, per diem wages include fringe benefits such as employer payments for health and welfare, pension, and vacation pay.

13.8.8 POSTING OF WAGE RATES AND OTHER REQUIRED JOB SITE NOTICES

The Contractor shall post at appropriate conspicuous points on the Site, a schedule showing all determined wage rates and all other required job site notices as prescribed by regulation.

13.9 RECORD OF WAGES PAID: INSPECTION

13.9.1 APPLICATION OF LABOR CODE

Pursuant to section 1776 of the Labor Code:

(a) Each Contractor and subcontractor shall keep accurate payroll records, showing the name, address, social security number, work classification, and straight time and overtime hours worked each day and week, and the actual per diem wages paid to each journeyman, apprentice, worker, or other employee employed by him or her in connection with the public work. Each payroll record shall contain or be verified by a

written declaration that is made under penalty of perjury, stating both of the following:

(1) The information contained in the payroll record is true and correct.

(2) The employer has complied with the requirements of sections 1771, 1811 and 1815 for any work performed by his or her employees on the public works project.

(b) The payroll records enumerated under subdivision (a) shall be certified and shall be available for inspection at all reasonable hours at the principal office of the Contractor on the following basis:

(1) A certified copy of an employee's payroll record shall be made available for inspection or furnished to the employee or his or her authorized representative on request.

(2) A certified copy of all payroll records enumerated in subdivision (a) shall be made available for inspection or furnished upon request to a representative of the body awarding the contract and the Division of Labor Standards Enforcement of the Department of Industrial Relations ("DIR"). The Contractor and each subcontractor shall furnish a certified copy of all payroll records directly to the Labor Commissioner monthly or more frequently, if so specified in the Agreement and in a format the Labor Commissioner prescribes.

(3) A certified copy of all payroll records enumerated in subdivision (a) shall be made available upon request by the public for inspection or for copies thereof. However, a request by the public shall be made through either the body awarding the contract or the Division of Labor Standards Enforcement of the DIR. If the requested payroll records have not been provided pursuant to paragraph (2), the requesting party shall, prior to being provided the records, reimburse the costs of the preparation by the contractor, subcontractors, and the entity through which the request was made. The public may not be given access to such records at the principal office of the Contractor.

(c) Unless required as of January 1, 2016, to be furnished directly to the Labor Commissioner under Labor Code section 1771.4(a)(3), the certified payroll records shall be on forms provided by the Division of Labor Standards Enforcement of the DIR or shall contain the same information as the forms provided by the division. The payroll records may consist of printouts of payroll data that are maintained as computer records, if the printouts contain the same information as the forms provided by the division and the printouts are verified in the manner specified in (a) above.

(d) A Contractor or subcontractor shall file a certified copy of the records enumerated in subdivision (a) with the entity that requested such records within 10 days after receipt of a written request.

(e) Except as provided in subdivision (f), any copy of records made available for inspection as copies and furnished upon request to the public or any public agency by the awarding body or the Division of Labor Standards Enforcement of the DIR shall be marked or obliterated to prevent disclosure of an individual's name, address and social security number. The name and address of the Contractor awarded the Contract or the subcontractor performing the Contract shall not be marked or obliterated. Any copy of records made available for inspection by, or furnished to, a multiemployer Taft-Hartley trust fund (29 U.S.C. Sec. 186(c)(5) that requests the records for the purposes of allocating contributions to participants shall be marked or obliterated only to prevent disclosure of an individual's full social security number, but shall provide the last four digits of the social security number. Any copy of records made available for inspection by, or furnished to, a joint labor-management committee established pursuant to the federal Labor Management Cooperation Act of 1978 (29 U.S.C. Sec. 175a) shall be marked or obliterated only to prevent disclosure of an individual's social security number.

(f) Notwithstanding any other provision of law, agencies that are included in the Joint Enforcement Strike Force on the Underground Economy established pursuant to Section 329 of the Unemployment Insurance Code and other law enforcement agencies investigating violations of law shall, upon request, be provided nonredacted copies of certified payroll records. Any copies of records or certified payroll made available for inspection and furnished upon request to the public by an agency included in the Joint Enforcement Strike Force on the Underground Economy or to a law enforcement agency investigating a violation of law shall be marked or redacted to prevent disclosure of an individual's name, address, and social security number. An employer shall not be liable for damages in a civil action for any reasonable act or omission taken in good faith in compliance with this subsection.

(g) The contractor shall inform the body awarding the contract of the location of the records enumerated under subdivision (a), including the street address, city and county, and shall, within five working days, provide a notice of a change of location and address.

(h) The contractor or subcontractor has 10 days in which to comply subsequent to receipt of written notice requesting the records enumerated in subdivision (a). In the event that the Contractor or subcontractor fails to comply within the 10-day period, he or she shall, as a penalty to the state or political subdivision on whose behalf the contract is made or awarded, forfeit one hundred dollars ($100.00) for each calendar day, or portion thereof, for each worker, until strict compliance is effectuated. Upon the request of the Division of Labor Standards Enforcement of the DIR, these penalties shall be withheld from progress payments then due. A contractor is not subject to a penalty assessment pursuant to this section due to the failure of the subcontractor to comply with this section.

13.10 APPRENTICES

13.10.1 APPRENTICE WAGES AND DEFINITIONS

All apprentices employed by the Contractor to perform services under the Contract shall be paid the standard wage paid to apprentices under the regulations of the craft or trade at which he or she is employed, and shall be employed only at the work of the craft or trade to which he or she is registered. Only apprentices, as defined in section 3077 of the Labor Code, who are in training under apprenticeship standards and written apprenticeship agreements under Chapter 4 (commencing with § 3070) of Division 3, are eligible to be employed under this Contract. The employment and training of each apprentice shall be in accordance with the apprenticeship standards and apprentice agreements under which he or she is training.

13.10.2 APPRENTICE LABOR POOL

When the Contractor to whom the Contract is awarded by the Owner, or any Subcontractor under him or her, in performing any of the Work under the Contract or subcontract, employs workers in any apprenticeable craft or trade, the Contractor and Subcontractor may apply to the joint apprenticeship committee administering the apprenticeship standards of the craft or trade in the area of the Site of the Project, for a certificate approving the Contractor or Subcontractor under the apprenticeship standards for the employment and training of apprentices in the area or industry affected. However, approval as established by the joint apprenticeship committee or committees shall be subject to review by the Administrator of Apprenticeship. The joint apprenticeship committee or committees, subsequent to approving the subject Contractor or Subcontractor, shall arrange for the dispatch of apprentices to the Contractor or Subcontractor in order to comply with this section. Every Contractor and Subcontractor shall submit the contract award information to the applicable joint apprenticeship committee which shall include an estimate of journeyman hours to be performed under the Contract, the number of apprentices to be employed, and the approximate dates the apprentices will be employed. There shall be an affirmative duty upon the joint apprenticeship committee or committees administering the apprenticeship standards of the crafts or trade in the area of the Site of the public work, to ensure equal employment and affirmative action and apprenticeship for women and minorities. Contractors or Subcontractors shall not be required to submit individual applications for approval to local joint apprenticeship committees provided they are already covered by the local apprenticeship standards. The ratio of work performed by apprentices to journeymen, who shall be employed in the craft or trade on the Project, may be the ratio stipulated in the apprenticeship standards under which the joint apprenticeship committee operates, but, except as otherwise provided in this section, in no case shall the ratio be less than one (1) hour of apprentice work for every five (5) hours of labor performed by a journeyman. However, the minimum ratio for the Operating Engineer and Labor classification shall not be less than one (1) apprentice for each four (4) journeymen.

13.10.3 JOURNEYMAN/APPRENTICE RATIO; COMPUTATION OF HOURS

Any ratio shall apply during any day or portion of a day when any journeyman or the higher standard stipulated by the joint apprenticeship committee, is employed at the job Site and shall be computed on the basis of the hours worked during the day by journeymen so. Any work performed by a journeyman in excess of eight (8) hours per day or forty (40) hours per week,

shall not be used to calculate the hourly ratio required by the section. The Contractor shall employ apprentices for the number of hours computed as above before the end of the Contract. However, the Contractor shall endeavor, to the greatest extent possible, to employ apprentices during the same time period that the journeymen in the same craft or trade are employed at the job Site. Where an hourly apprenticeship ratio is not feasible for a particular craft or trade, the Division of Apprenticeship Standards, upon application of a joint apprenticeship committee, may order a minimum ratio of not less than one (1) apprentice for each five (5) journeymen in a craft or trade classification.

13.10.4 JOURNEYMAN/APPRENTICE RATIO

The Contractor or Subcontractor, if he or she is covered by this section upon the issuance of the approval certificate, or if he or she has been previously approved in the craft or trade, shall employ the number of apprentices or the ratio of apprentices to journeymen stipulated in the apprenticeship standards. Upon proper showing by the Contractor that he or she employs apprentices in the craft or trade in the state on all of his or her contracts on an annual average of not less than one (1) hour of apprentice work for every five (5) hours of labor performed by a journeyman, or in the land surveyor classification, one (1) apprentice for each five (5) journeymen, the Division of Apprenticeship Standards may grant a certificate exempting the Contractor from the 1-to-5 hourly ratio as set forth in this section. This section shall not apply to contracts of general contractors or to contracts of specialty contractors not bidding for work through a general or prime contractor, when the contracts of general contractors or those specialty contractors involve less than Thirty Thousand Dollars ($30,000).

13.10.4.1 ***Apprenticeable Craft or Trade.*** "Apprenticeable craft or trade" as used in this Article means a craft or trade determined as an apprenticeable occupation in accordance with the rules and regulations prescribed by the California Apprenticeship Council. The joint apprenticeship committee shall have the discretion to grant a certificate, which shall be subject to the approval of the Administrator of Apprenticeship, exempting a Contractor from the 1-to-5 ratio set forth in this Article when it finds that any one of the following conditions is met:

A. Unemployment for the previous three-month period in the area exceeds an average of fifteen percent (15%).

B. The number of apprentices in training in such area exceeds a ratio of 1-to-5.

C. There is a showing that the apprenticeable craft or trade is replacing at least one-thirtieth (1/30) of its journeymen annually through the apprenticeship training, either on a statewide basis or on a local basis.

D. Assignment of an apprentice to any work performed under this contract would create a condition which would jeopardize his or her life or the life, safety, or property of fellow employees or the public at large or if the specific task to which the apprentice is to be assigned is of such a nature that training cannot be provided by a journeyman.

13.10.5 RATIO EXEMPTION

When exemptions are granted to an organization which represents Contractors in a specific trade from the 1-to-5 ratio on a local or statewide basis, the member Contractors will not be required to submit individual applications for approval to local joint apprenticeship committees, if they are already covered by the local apprenticeship standards.

13.10.6 APPRENTICE FUND

A contractor to whom a contract is awarded, who, in performing any of the work under the contract, employs journeymen or apprentices in any apprenticeable craft or trade shall contribute to the California Apprenticeship Council the same amount that the director determines is the prevailing amount of apprenticeship training contributions in the area of the public works site. A contractor may take as a credit for payments to the council any amounts paid by the contractor to an approved apprenticeship program that can supply apprentices to the site of the public works project. The contractor may add the amount of the contricbutions in computing his or her bid for the contract. The Division of Labor Standards Enforcement is authorized to enforce the payment of the contributions to the fund or funds as set forth in the Labor Code section 227.

13.10.7 PRIME CONTRACTOR COMPLIANCE

The responsibility of compliance with section 13.10 and section 1777.5 of the Labor Code for all apprenticeable occupations is with the Prime Contractor. However, if a subcontractor is found to have violated Section 1777.5, the prime contractor of the project is not liable for any penalties under subdivision (2) unless the prime contractor had knowledge of the subcontractor's failure to comply with the provisions of Section 1777.5 or unless the contract executed between the contractor and the subcontractor for the performance of work on the public works project failed to include a copy of the provisions of Section 1771, 1775, 1776, 1777.5, 1831 and 1851. Additionaly, the contractor shall continually monitor a subcontractor's use of apprentices required to be employed on the public works project pursuant to subdivision (d) of Section 1777.5, including, but not limited to, periodic review of the certified payroll of the subcontractor, and upon becoming aware of a failure of the subcontractor to employ the required number of apprentices, the contractor shall take corrective action, including, but not limited to, retaining funds due to the subcontractor for work performed on the public works project until the failure is corrected.

13.10.8 DECISIONS OF JOINT APPRENTICESHIP COMMITTEE

All decisions of the joint apprenticeship committee under this section13.10 and Labor Code section 1777.5 are subject to Labor Code section 3081.

13.10.9 NO BIAS

It shall be unlawful for an employer or a labor union to refuse to accept otherwise qualified employees as registered apprentices on any public works on the grounds of race, religious creed, color, national origin, ancestry, sex, or age, except as provided in the Labor Code section 3077.

13.10.10 VIOLATION OF LABOR CODE

Pursuant to Labor Code section 1777.1, in the event a Contractor or Subcontractor willfully fails to comply with the provisions of this section 13.10 and Labor Code section 1777.5, among other things:

(a) The Labor Commissioner may deny to the contractor or subcontractor, and to its responsible officers, the right to bid on, or be awarded or perform work as a subcontractor on, any public works project for a period of up to one year for the first violation and for a period of up to three years for the second and subsequent violation. Each period of debarment shall run from the date the determination of noncompliance by the Labor Commissioner becomes a final order.

(b) A contractor or subcontractor who violates section 1777.5 shall forfeit as a civil penalty an amount not exceeding the sum of one hundred dollars ($100) for each full calendar day of noncompliance for a first violation and not more than three hundred dollars ($300) for a second or subsequent violation within a three-year period. Upon receipt of a determination that a civil penalty has been imposed, the awarding body shall enforce the penalty, which includes withholding the amount of the civil penalty from the contract progress payments or retention then due or to become due.

(c) In lieu of the penalty provided, the Labor Commissioner may for a first time violation and with the concurrence of an applicable apprenticeship program, order the contractor or subcontractor to provide apprentice employment equivalent to the work hours that would have been provided for apprentices during the period of noncompliance.

(d) Any funds withheld by the awarding body pursuant to this section shall be deposited in the General Fund.

(e) The interpretation and enforcement of section 1777.5 and this section shall be in accordance with the regulations of the California Apprenticeship Council.

Pursuant to Public Contract Code section 6109, no contractor or subcontractor may bid on, be awarded, or perform work as a subcontractor on a public works project if ineligible to bid or work on, or be awarded, a public works project pursuant to section 1777.1 of the Labor Code.

13.11 ASSIGNMENT OF ANTITRUST CLAIMS

13.11.1 APPLICATION

Pursuant to Public Contract Code section 7103.5 and Government Code section 4552, in entering into a public works contract or a subcontract to supply goods, services, or materials pursuant to a public works contract, the Contractor or Subcontractor offers and agrees to assign to the Owner all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act, (15 U.S.C. § 15) or under the Cartwright Act (Chapter 2 [commencing with § 16700] of Part 2 of Division 7 of the Bus. & Prof. Code), arising from the purchase of goods, services, or materials pursuant to the public works contract or the subcontract. This assignment shall be made and become effective at the time the awarding body tenders Final Progress Payment to the Contractor, without further acknowledgment by the parties. If the Owner receives, either through judgment or settlement, a monetary recovery for a cause of action assigned under Chapter 11 (commencing with § 4550) of Division 5 of Title 1 of the Government Code, the assignor may, upon demand, recover from the Owner any portion of the recovery, including treble damages, attributable to overcharges that were paid by the assignor but were not paid by the Owner as part of the bid price, less the expenses incurred in obtaining that portion of the recovery.

13.11.2 ASSIGNMENT OF CLAIM

Upon demand in writing by the assignor, the Owner shall, within one (1) year from such demand, reassign the cause of action assigned pursuant to this Article if the assignor has been or may have been injured by the violation of law for which the cause of action arose and the Owner has not been injured thereby or the Owner declines to file a court action for the cause of action.

13.12 AUDIT

Pursuant to and in accordance with the provisions of Government Code section 8546.7, or any amendments thereto, all books, records, and files of the Owner, the Contractor, or any Subcontractor connected with the performance of this Contract involving the expenditure of state funds in excess of Ten Thousand Dollars ($10,000.00), including, but not limited to, the administration thereof, shall be subject to the examination and audit of the Office of the Auditor General of the State of California for a period of three (3) years after release of all retention under this Contract. Contractor shall preserve and cause to be preserved such books, records, and files for the audit period. During the progress of the Work and for three (3) years after release of all retention under the Contract, Owner shall also have the right to an audit, and Contractor must cooperate by producing all information requested within seven (7) days.

13.13 STORM WATER DISCHARGE PERMIT

If applicable, the Contractor shall file a Notice of Intent to comply with the terms of the general permit to discharge storm water associated with construction activity Order 2009-0009-DWQ (as amended by 2010-0014-DWQ and 2017-006-DWQ). The Notice of Intent must be sent to the following address along with the appropriate payment (warrant to be furnished by the Owner upon request by the Contractor, allow warrant processing time.): California State Water Resources Control Board, Division of Water Quality, Storm Water Permit Unit, P.O. Box 1977, Sacramento, CA 95812-1977. The Contractor may also call the State Water Board's

Construction Activity Storm Water Hotline at (916) 657-1146. The Notice of Intent shall be filed prior to the start of any construction activity.

ARTICLE 14

TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR FOR CAUSE

Contractor may not terminate for convenience. Contractor may only terminate for cause if the Work is stopped by others for a period of one hundred eighty (180) consecutive days through no act or fault of the Contractor, a Subcontractor of any tier, their agents or employees, or any other persons performing portions of the Work for whom the Contractor is contractually responsible, **and** the Work was stopped by others for one of the following reasons: (A) Issuance of an order of a court or other public authority having jurisdiction which requires Owner to stop all Work; or (B) an act of government, such as a declaration of national emergency, making material unavailable which requires Owner to stop all Work. If such grounds exist, the Contractor may serve written notice of such grounds on Owner and demand a meet-and-confer conference to negotiate a resolution in good faith within twenty (20) days of Owner's receipt of such notice. If such conference does not lead to resolution and the grounds for termination still exist, Contractor may terminate the Contract and recover from the Owner payment for Work executed and for reasonable verified costs with respect to materials, equipment, tools, construction equipment, and machinery, including reasonable overhead, profit, and damages for the Work executed, but excluding overhead (field and home office) and profit for (i) Work not performed and (ii) the period of time that the Work was stopped.

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 GROUNDS FOR TERMINATION

The Owner may terminate the Contract if the Contractor:

A. Refuses or fails to supply enough properly skilled workers or proper materials, or refuses or fails to take steps to adequately prosecute the work toward completion within the Contract Time;

B. Fails to make payment to Subcontractors for materials or labor in accordance with Public Contract Code section 10262 or Business and Professions Code section 7108.5, as applicable;

C. Violates Labor Code section 1771.1(a), subject to the provisions of Labor Code section 1771.1(f);

D. Disregards laws, ordinances, rules, regulations, or orders of a public authority having jurisdiction; or

E. Otherwise is in breach of the Contract Documents.

14.2.2 NOTIFICATION OF TERMINATION

When any of the above reasons exist, the Owner may, without prejudice to any other rights or remedies of the Owner, give notice to Contractor of the grounds for termination and demand cure of the grounds within seven (7) days (a "Notice of Intent to Terminate"). If Contractor fails to **either** (a) completely cure the grounds for termination within seven (7) days **or** (b) reasonably commence cure of the grounds for termination within seven (7) days and reasonably continue to cure the grounds for termination until such cure is complete, then Owner may terminate the Contract effective immediately upon service of written Notice of Termination and may, subject to any prior rights of Contractor's surety on the performance bond ("Surety"):

A. Take possession of the Site and of all material, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

B. Accept assignment of subcontracts pursuant to section 5.4; and

C. Complete the Work by whatever reasonable method the Owner may deem expedient.

14.2.3 PAYMENTS WITHHELD

If the Owner terminates the Contract for one of the reasons stated in section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is complete.

14.2.4 PAYMENTS UPON COMPLETION

If the unpaid balance of the Contract Sum exceeds costs of completing the Work, including compensation for professional services and expenses made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. This payment obligation shall survive completion of the Contract.

14.2.5 INCLUSION OF TERMINATION FOR CONVENIENCE

Any purported termination by Owner for cause under this section 14.2, which is revoked or determined to not have been for cause, shall be deemed to have been a termination for convenience effective as of the same date as the purported termination for cause.

14.3 SUSPENSION OR TERMINATION BY THE OWNER FOR CONVENIENCE

14.3.1 SUSPENSION BY OWNER

The Owner may, without cause, order the Contractor in writing to suspend, delay, or interrupt the Work in whole or in part for such period of time as the Owner may determine.

14.3.1.1 ***Adjustments.*** An adjustment shall be made for increases in the cost of performance of the Contract, including profit on the increased cost of performance caused by suspension, delay, or interruption. No adjustment shall be made to the extent:

A. That performance is, was or would have been so suspended, delayed, or interrupted by another cause for which the Contractor is responsible; or

B. That an equitable adjustment is made or denied under another provision of this Contract.

14.3.1.2 ***Adjustments for Fixed Cost.*** Adjustments made in the cost of performance may have a mutually agreed fixed or percentage fee.

14.3.2 **TERMINATION BY THE OWNER FOR CONVENIENCE**

14.3.2.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

14.3.2.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall:

1. Cease operations as directed by the Owner in the notice;

2. Take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

3. Except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

14.3.2.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination.

14.4 NOT A WAIVER

Any suspension or termination by Owner for convenience or cause under this Article 14 shall not act as a waiver of any claims by Owner against Contractor or others for damages based on breach of contract, negligence or other grounds.

14.5 MUTUAL TERMINATION FOR CONVENIENCE

The Contractor and the Owner may mutually agree in writing to terminate this Contract for convenience. The Contractor shall receive payment for all Work performed to the date of termination in accordance with the provisions of Article 9.

14.6 EARLY TERMINATION

Notwithstanding any provision herein to the contrary, if for any fiscal year of this Contract the governing body of the Owner fails to appropriate or allocate funds for future periodic payments under the Contract after exercising reasonable efforts to do so, the Owner may upon thirty (30) days' notice, order work on the Project to cease. The Owner will remain obligated to pay for the work already performed but shall not be obligated to pay the balance remaining unpaid beyond the fiscal period for which funds have been appropriated or allocated and for which the work has not been done.

END OF DOCUMENT

DOCUMENT 00 73 00

SPECIAL CONDITIONS

1. **Mitigation Measures**

Contractor shall comply will all applicable mitigation measures, if any, adopted by any public agency with respect to this Project pursuant to the California Environmental Quality Act. (Public Resources Code section 21000 et. seq.).

2. **Modernization / Post Occupancy Projects**

a. **Access**. Access to the school buildings and entry to buildings, classrooms, restrooms, mechanical rooms, electrical rooms, or other rooms, for construction purposes, must be coordinated with District and onsite District personnel before Work is to start. Unless agreed to otherwise in writing, only a school custodian will be allowed to unlock and lock doors in existing building(s). The custodian will be available only while school is in session. If a custodian is required to arrive before 7:00 a.m. or leave after 3:30 p.m. to accommodate Contractor's Work, the overtime wages for the custodian will be paid by the Contractor, unless, at the discretion of the District, other arrangements are made in advance.

b. **Master Key**. Upon request, the District may, at is own discretion, provide a master key to the school site for the convenience of the Contractor. The Contractor agrees to pay all expenses to re-key the entire school site and all other affected District buildings if the master key is lost or stolen or if any unauthorized party obtains a copy of the key or access to the school.

c. **Maintaining Services**. The Contractor is advised that Work is to be performed in spaces regularly scheduled for instruction. Interruption and/or periods of shutdown of public access, electrical service, water service, lighting, or other utilities shall be only as arranged in advance with the District. Contractor shall provide temporary services to all facilities interrupted by Contractor's Work.

d. **Maintaining Utilities**. The Contractor shall maintain in operation during duration of Contract, drainage lines, storm drains, sewers, water, gas, electrical, steam, and other utility service lines within working area. No new services or connections shall be anticipated for operation of existing facilities during construction.

e. **Confidentiality**. Contractor shall maintain the confidentiality of all information, documents, programs, procedures and all other items that Contractor encounters while performing the Work. This requirement shall be ongoing and shall survive the expiration or termination of this Contract and specifically includes, without limitation, all student, parent, and employee disciplinary information and health information.

f. **No Work During Student Testing**. Contractor shall, at no additional cost to the District and at the District's request, coordinate its Work to not disturb District students including, without limitation, not performing any Work when students at the Site are taking State-required tests.

3. **Substitution for Specified Items**

a. Requests for substitutions prior to award of the Contract shall be done within the time period indicated in the Instructions to Bidders.

b. Whenever in the Specifications any materials, process, or article is indicated or specified by grade, patent, or proprietary name, or by name of manufacturer, that Specification shall be deemed to be followed by the words "or equal." Contractor may, unless otherwise stated, offer any material, process, or article that shall be substantially equal or better in every respect to that so indicated or specified.

(1) If the material, process, or article offered by Contractor is not, in the opinion of the District, substantially equal or better in every respect to that specified, then Contractor shall furnish the material, process, or article specified in the Specifications without any additional compensation or change order.

(2) This provision shall not be applicable with respect to any material, product, thing or service for which District made findings and gave notice in accordance with Public Contract Code section 3400(b); therefore, Contractor shall not be entitled to request a substitution with respect to those materials, products or services.

c. A request for a substitution shall be in writing and shall include:

(1) All variations of the proposed substitute from the material specified including, but not limited to, principles of operation, materials, or construction finish, thickness or gauge of materials, dimensions, weight, and tolerances;

(2) Available maintenance, repair or replacement services;

(3) Increases or decreases in operating, maintenance, repair, replacement, and spare parts costs;

(4) Whether or not acceptance of the substitute will require other changes in the Work (or in work performed by the District or others under Contract with the District); and

(5) The time impact on any part of the Work resulting directly or indirectly from acceptance of the proposed substitute.

d. No substitutions shall be made until approved, in writing, by the District. The burden of proof as to equality of any material, process, or article shall rest with Contractor. The Contractor warrants that if substitutes are approved:

(1) The proposed substitute is equal or superior in all respects to that specified, and that such proposed substitute is suitable and fit for the intended purpose and will perform adequately the function and achieve the results called for by the general design and the Contract Documents;

(2) The Contractor provides the same warranties and guarantees for the substitute that would be provided for that specified;

(3) The Contractor shall be fully responsible for the installation of the substitute and any changes in the Work required, either directly or indirectly, because of the acceptance of such substitute, with no increase in Contract Price or Contract Time. Incidental changes or extra component parts required to accommodate the substitute will be made by the Contractor without a change in the Contract Price or Contract Time;

(4) The Contractor shall be responsible for any re-design costs occasioned by District's acceptance and/or approval of any substitute; and

(5) The Contractor shall, in the event that a substitute is less costly than that specified, credit the District with one hundred percent (100%) of the net difference between the substitute and the originally specified material. In this event, the Contractor agrees to execute a deductive Change Order to reflect that credit.

e. In the event Contractor furnishes a material, process, or article more expensive than that specified, the difference in the cost of that material, process, or article so furnished shall be borne by Contractor.

f. In no event shall the District be liable for any increase in Contract Price or Contract Time due to any claimed delay in the evaluation of any proposed substitute or in the acceptance or rejection of any proposed substitute.

4. **Fingerprinting**

Contractor shall comply with the provisions of Education Code section 45125.2 regarding the submission of employee fingerprints to the California Department of Justice and the completion of criminal background investigations of its employees, its subcontractor(s), and its subcontractors' employees. Contractor shall not permit any employee to have any contact with District pupils until such time as Contractor has verified in writing to the governing board of the District, that such employee has not

been convicted of a felony, as defined in Education Code section 45122.1. Contractor shall fully complete and perform all tasks required pursuant to the Criminal Background Investigation/ Fingerprinting Certification.

5. **Weather Days**

Extensions of the Performance Period shall be determined by reference to the Terms and Conditions to Field Contract. Rain in excess of one-tenth of an inch (1/10") in one (1) day, or tempature which does not exceed 32° F shall be considered adverse weather. The following chart shows the normal number of adverse weather days:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
10	8	8	5	2	1	0	0	1	3	7	8

6. **Insurance Policy Limits**. All of Contractor's insurance shall be with insurance companies with an A.M. Best rating of no less than A: XI. All limits of insurance shall not be less than what is specified in Agreement Between Owner and Contractor Document 00 52 26, Article XI, Indemnifications and Insurance in the.

7. **Permits, Certificates, Licenses, Fees, Approval**

a. **Payment for Permits, Certificates, Licenses, and Fees**. As required in the Terms and Conditions to Field Contract, the Contractor shall secure and pay for all permits, licenses and certificates necessary for the prosecution of the Work with the exception of the following:

(1) Water connection fees
(2) Sewer connection fees
(3) Electrical connection fees
(4) Gas connections fees
(5) Cable TV connection fees
(6) Phone connection fee

With respect to the above listed items, Contractor shall be responsible for securing such items, however, District will be responsible for payment of these charges or fees. Contractor shall notify the District of the amount due with respect to such items and to whom the amount is payable. Contractor shall provide the District with an invoice and receipt with respect to such charges or fees. The contractor shall receive written approval from the District prior to any payment.

b. The Contractor shall obtain a Grading Permit from the City of Menlo Park Engineering Department prior to any grading activities on the site. An approved Engineer's Estimate of costs shall be submitted to the Engineering Department, for the determination of the grading fees, which shall be paid at the time of Engineering Permit issuance and in the amounts specified in the City code and regulations that are in effect at that time. Currently, the grading plan check fees

are 2.5% and inspection fees are 3.00% of the cost of grading. The cost of the Grading Permit shall be included in the base bid.

c. **Storm Water Pollution Prevention Plan**

- NPDES PERMITTING

1. General. The intent of these requirements is to enforce federal, state and local laws, ordinances, codes and regulations that pertain to storm water pollution attributable to construction projects. Storm drains discharge directly to creeks without treatment. Therefore, discharge of pollutants (i.e. any substance, material or waste other than uncontaminated storm water) into the storm drain system is strictly prohibited.

   For the purpose of eliminating storm water pollution, the Contractor shall implement effective
   control measures over the entire project. There are several publications which provide guidance on selecting and implementing effective control measures known as Best Management Practices (BMPs). BMPs include, but are not limited to, schedules of activities, prohibition of practices, general good housekeeping practices, operational practices, pollution prevention practices, maintenance procedures and other management procedures designed to prevent the discharge of pollutants directly or indirectly to the storm drain system. BMPs also include the construction of some facilities which may be required to prevent, control and abate storm water pollution. The reference publications are as follows:

   * California Storm Water Best Management Practices Handbook-Industrial/Commercial
   * California Storm Water Best Management Practices Handbook-Construction Activity

   These handbooks may be purchased from Blue Print Services (BPS), 1700 Jefferson Street, Oakland, California 94612, (510) 287-5485.

   The Contractor shall be responsible for preparing and submitting to the Owner a Storm Water Pollution Prevention Plan (SWPPP) in conformance with the California NPDES (National Pollution Discharge Elimination System) General Permit for Storm Water Discharges associated with construction activity. The SWPPP shall address intended methods to reduce the amount of pollutants contained in storm water runoff during construction of the work.

   The SWPPP is considered a report available to the public under Section 308 (b) of the Clean Water Act. The SWPPP shall be kept at the site during construction and made available upon request of a representative of the Regional Water Board or other local agency. The Contractor shall amend the SWPPP for any change in construction or operations which may affect the discharge of pollutants to surface water, ground waters, or storm drain system.

The Contractor shall submit the SWPPP to the Owner and governing agencies within fifteen (15) days of the Notice to Proceed. Upon approval of the SWPPP, the Contractor shall be responsible for implementing, maintaining, and repairing all storm water pollution controls as described in his approved SWPPP for the duration of the work. The Contractor shall make any repairs to the storm water pollution controls and amend the SWPPP if, in the opinion of the Owner, the Contractor is not in compliance with the SWPPP. Failure to make the necessary repairs or other maintenance when directed by the Owner shall result in the necessary repair work being done by District forces, and the Contractor will be billed at double the rate of all District expenses. In addition, the Contractor shall be responsible for any fines imposed by the Regional Water Quality Control Board or other agency as a result of noncompliance, negligence, or violation of permit conditions.
Records of all inspections and compliance certifications reporting must be retained as part of the Storm Water Pollution Prevention Plan for a period of three years. Upon completion of the project construction and termination of coverage under the General Permit, the records shall be retained by the contractor with a copy of the final SWPPP.

2. Material Storage. Storage and exposure of raw materials, by-products, finished products, and containers shall be controlled as described below:

   All construction materials shall be stored at least ten (10) feet away from inlets, catch basins, and curb returns. The Contractor shall not allow any material to enter the storm drain system. At the end of each working day, the Contractor shall collect and dispose of all scrap, debris, and waste material.

   During wet weather or when rain is forecast, the Contractor shall store materials that can contaminate rainwater or be transported by storm water or other runoff to the storm drain system inside a building or cover them with a tarp or other waterproof material secured with weighted tires or sandbags to prevent contact with rain.

   The Contractor is reminded that storage and disposal of all hazardous materials such as paints, thinners, solvents, and fuels; and all hazardous wastes such as waste oil must meet all federal, state and local standards and requirements.

3. De-watering Operations. All groundwater removed from the trench or excavations must be de-silted prior to discharging it into the storm drain system through filtering materials and methods meeting the Association of Bay Area Governments (ABAG) Standards for Erosion & Sediment Control Measures and/or through methods and procedures described in the California Storm Water Best Management Practice Handbook - Construction Activity (latest edition).

4. Pavement Saw-Cutting Operations. The Contractor shall prevent any saw-cutting debris from entering the storm drain system. The Contractor, preferably, shall use dry cutting techniques and sweep up residue. If wet methods are used, the Contractor shall vacuum slurry as cutting proceeds or collect all wastewater by

constructing a sand bag sediment barrier. The bermed area shall be of adequate size to collect all wastewater and solids. The Contractor shall allow collected water to evaporate if the wastewater volume is minimal and if maintaining the ponding area does not interfere with public use of the street area or create a safety hazard. If approved by the Owner, the Contractor may direct or pump saw-cutting wastewater to a dirt area and allow to infiltrate. The dirt area shall be adequate to contain all the wastewater. After wastewater has infiltrated, all remaining saw-cutting residue must be removed and disposed of properly. Remaining silt and debris from the ponding or bermed area shall be removed or vacuumed and disposed of properly.

If a suitable dirt area is not available or discharge to the sanitary sewer is not feasible, with the approval of the Owner and Contra Costa County Flood Control (CCCFC) & Water Conservation District (WCD), the Contractor shall filter the saw-cutting wastewater through filtering materials and methods meeting ABAG Standards for Erosion and Sedimentation Control Measures (latest edition) before discharging to the storm drain.

5. Pavement Operations. The Contractor shall prevent the discharge of pollutants from paving operations by using measures to prevent run-on and run-off pollution, disposing of wastes properly, and by implementing the procedures in the Best Management Practices Handbook. In addition, the Contractor shall observe the following guidelines:
   - Paving during wet weather:
     a) No paving while it is raining.
     b) No paving of the top lift of asphalt concrete (AC) on any day that experiences ¼" of rain in a twenty-four (24) hour period.
     c) No paving of bottom lift if previous seventy-two (72) hour period experienced more than ½" rain, unless directed by the Owner.
   - Store materials as required under section 2.
   - Cover inlets and manholes when applying asphalt, seal coat, tack coat, slurry seal, fog seal, etc.
   - Place drip pans or absorbent materials under paving equipment when not in use. During wet weather, store contaminated paving equipment indoors, or cover with tarp or other waterproof covering.
   - Sweep site daily using mechanical methods to prevent sand, gravel or excess asphalt from entering or being transported by rain into the storm drain system.
   - Keep ample supplies of drip pans or absorbent materials on-site.
   - If paving involves Portland cement concrete, refer to section G6 below.
   - All of the above at the discretion of the Owner.

6. Concrete Operations. **Do not wash out concrete trucks into storm drains, open ditches, streets, streams, etc.** The Contractor shall prevent the discharge of pollutants from concrete operations by using measures to prevent run-on and run-off pollution, properly disposing of wastes, and by implementing the following BMPs:

- Store all materials in waterproof containers or under cover away from drain inlets or drainage areas.
- Avoid mixing excess amounts of Portland cement materials. Dispose of any excess materials properly.
- Whenever possible, perform washout of concrete trucks off-site where discharge is controlled and not permitted to discharge to the storm drain system. For on-site washout:
- Locate washout area at least fifty (50) feet from storm drains, open ditches or other water bodies, preferably in a dirt area. Confine run-off from this area by constructing a temporary pit or bermed area large enough for the liquid and solid waste.
- Wash out concrete wastes into the temporary pit where the concrete can set, be broken up and then disposed of properly. If the volume of water is greater than what will allow concrete to set, allow the wash water to infiltrate and/or evaporate, if possible. Remove or vacuum the remaining silt and debris from the ponding or bermed area and dispose of it properly.
- Dispose of wastewater from washing of exposed aggregate to dirt area. The dirt area shall be adequate to contain all the wastewater and once the wastewater has infiltrated, any remaining residue must be removed.
- Collect and return sweepings from exposed aggregate concrete to a stockpile or dispose of the waste in trash container.

7. Grading and Excavation Operations. The Contractor shall prepare a 40 scale erosion control plan and submit it to the Owner and governing agencies for approval, within fifteen (15) days of the Notice To Proceed.

   The erosion and sedimentation control materials and methods shall be in accordance with ABAG Standards For Erosion And Sediment Control Measures and/or the procedures and methods described in the California Storm Water Best Management Practice Handbook - Construction Activity (latest edition) and the City of Menlo Park grading ordinance.

   Sedimentation and erosion control/filter materials shall be placed in a manner that will retain any debris or sediment from flowing into the storm drain system. The Contractor shall have labor, tools, equipment and materials needed, at the job site, to provide the erosion control measures necessary as a result of earthwork or trenching before beginning or continuing these construction activities. Sand bags and straw wattle shall be stockpiled adjacent to the locations of activity and ready to be installed when the rainfall forecast for 48 hours is 40% or greater or when directed by the Owner.

The Contractor shall install siltation control devices around catch basins at the end of each working day. These devices shall be maintained at all times during the construction period, and shall be removed when construction is complete.

The Contractor shall not be allowed to block existing drainage flowing onto the work area. The Contractor shall install temporary drainage facilities, if necessary. There shall be no extra compensation to the Contractor for keeping existing

drainage open. The Contractor is responsible for any damage to property or existing improvements resulting from blocking existing drainage.

The Contractor shall inspect the sites of work at the beginning and once every 24-hour period through the duration of each storm to assure that inlets and pipes are not blocked with silt or debris and shall be prepared to make repairs to the erosion control devices and take any other remedial measures as directed by the Owner. At the end of a storm event all depressions with ponded water, the water in catch basins, and the check dam ponds shall be pumped dry and all silt and debris removed. This work shall be completed within twenty-four (24) hours after the end of each storm.

8. Spill Prevention and Control. The Contractor shall take any and all precautions to prevent accidental spills during the work under this contract. However, in the event of a spill:
   - The Contractor shall immediately contain and prevent leaks and spills from entering the storm drain system, and properly clean-up and dispose of the waste and clean-up materials. If waste is hazardous, the Contractor shall comply with all federal, state and local hazardous waste requirements.
   - The Contractor shall not wash any spilled material into the streets, gutters, storm drains, or creeks.
   - The Contractor shall report any hazardous material spills immediately to the Owner and the City of Menlo Park Police Department, as per hazardous material response protocol.

9. Vehicle/Equipment Cleaning. The Contractor shall not perform vehicle or equipment cleaning or maintenance on-site or in the street using soaps, solvents, de-greasers, steam cleaning equipment or equivalent methods. The Contractor shall perform vehicle or equipment cleaning with water only in a designated, bermed area that will not allow rinse water to run off-site or into the storm drain system. The rinse-water shall be permitted to infiltrate in dirt area or shall be discharged to the sanitary sewer with the approval of the Owner.

   The Contractor shall dispose of wash water from the cleaning of water base paint equipment and tools to the sanitary sewer.

   If using oil based paint, to the maximum extent practicable, the Contractor shall filter the paint thinner and solvents for reuse and dispose of the waste thinner and solvent, and sludge from cleaning of equipment and tools as hazardous waste. No disposal of oil base materials is allowed into the City sewer system.

10. Contractor Training and Awareness. The Contractor shall train all employees on the water pollution prevention requirements contained in these specifications. The Contractor shall inform all subcontractors of the water pollution prevention contract requirements and include appropriate subcontract provisions to ensure that these requirements are met.

The Contractor shall utilize thermoplastic to stencil new catch basins, constructed as part of the project, with "No Dumping, Drains to Bay".

11. Good Housekeeping Practices. In addition to the practices and procedures discussed above, the Contractor shall implement the following applicable good housekeeping practices.
    - Store materials that have the potential to be transported to the storm drain system by storm run-off or by a spill under cover in a contained area or in sealed waterproof containers.
    - Use tarps on the ground to collect fallen debris or splatters that could contribute to storm water pollution.
    - Secure opened bags of cement, and of other light or powdered materials which can be transported by wind.
    - Pick up litter, construction debris and other wastes daily from outside areas including the sidewalk area, gutter, street pavement and storm drains impacted by the project. All wastes shall be stored in covered containers or disposed of or recycled immediately.
    - Dispose of wash water to the sanitary sewer with the approval of Owner or recycle wash water (refer to section 6).
    - Inspect vehicles and equipment arriving on-site for leaking fluids and promptly repair leaking vehicles and equipment. Vehicles leaking fluids will not be allowed on the construction site and if not repaired, must be removed.
    - Avoid spills by handling materials carefully. Keep a stockpile of spill control materials, such as rags or absorbents, readily accessible on-site. Clean up all spills immediately to prevent any material from being discharged to the storm drain (refer to section 8).
    - Train employees regularly on good housekeeping practices and BMPs. Assign responsibility to specific employees on BMPs, good housekeeping practices, and what to do in the event of a spill (refer to section 10).
    - Maintain and replace all sediment and water pollution control devices as necessary to ensure that said controls are working effectively (e.g. inspect all sediment ponds or sandbag sedimentation/filtering systems after each rain. Remove accumulated sediment and debris and replace or repair damaged sandbags immediately).

END OF DOCUMENT

DOCUMENT 00 73 73

COMPLIANCE MONITORING AND ENFORCEMENT NOTICE

The _____ is a public works project that is subject to compliance monitoring and enforcement by the Department of Industrial Relations. The prevailing wage laws require that all workers be paid at least the minimum hourly prevailing wage rate as determined by the Director of Industrial Relations for the specific classification (or type of work) performed by workers on the project. The awarding body shall post prevailing wage rates and all other job site postings prescribed by regulation or require the prime contractor to do so.

The Contractor, and each subcontractor, shall submit weekly certified payrolls directly to the Labor Commissioner at least monthly or more frequently if specified in the contract with the District. CPRs shall be in a format prescribed by the Labor Commissioner and the department shall undertake those activities it deems necessary to monitor and enforce compliance with prevailing wage requirements. Complaints concerning nonpayment of the required prevailing wage rates to workers on this project may be filed with the Division of Labor Standards Enforcement (DLSE).

END OF DOCUMENT

DOCUMENT 00 81 00

HAZARDOUS MATERIALS PROCEDURES AND REQUIREMENTS

1. Summary

This document includes information applicable to hazardous materials and hazard waste abatement.

2. Notice of Hazardous Waste or Materials Conditions

a. Contractor shall give notice in writing to the District, the Construction Manager, and the Architect promptly, before any of the following conditions are disturbed, and in no event later than twenty-four (24) hours after first observance, of any:

(1) Material that Contractor believes may be material that is hazardous waste or hazardous material, as defined in section 25117 of the Health and Safety Code, that is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law;

(2) Other material that may present a substantial danger to persons or property exposed thereto in connection with Work at the site.

b. Contractor's written notice shall indicate whether the hazardous waste or material was shown or indicated in the Contract Documents to be within the scope of Work, and whether the materials were brought to the site by Contractor, its Subcontractors, suppliers, or anyone else for whom Contractor is responsible. As used in this document the term "hazardous materials" shall include, without limitation, asbestos, lead, Polycholrinated biphenyl (PCB), petroleum and related hydrocarbons, and radioactive material.

c. In response to Contractor's written notice, the District shall investigate the identified conditions.

d. If the District determines that conditions do not involve hazardous materials or that no change in terms of Contract is justified, the District shall so notify Contractor in writing, stating reasons. If the District and Contractor cannot agree on whether conditions justify an adjustment in Contract Price or Contract Times, or on the extent of any adjustment, Contractor shall proceed with the Work as directed by the District.

e. If after receipt of notice from the District, Contractor does not agree to resume Work based on a reasonable belief it is unsafe, or does not agree to resume Work under special conditions, then District may order such portion of Work that is in connection with such hazardous condition or such affected area to be deleted from the Work, or performed by others, or District may invoke its

rights to terminate the Contract in whole or in part. District will determine entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of deleting such portion of Work, or performing the Work by others.

f. If Contractor stops Work in connection with any hazardous condition and in any area affected thereby, Contractor shall immediately redeploy its workers, equipment, and materials, as necessary, to other portions of the Work to minimize delay and disruption.

3. Additional Warranties and Representations

a. Contractor represents and warrants that it, its employees, and its subcontractors and their employees, shall at all times have the required levels of familiarity with the Site and the Work, training, and ability to comply fully with all applicable law and contract requirements for safe and expeditious performance of the Work, including whatever training is or may be required regarding the activities to be performed (including, but not limited to, all training required to address adequately the actual or potential dangers of Contract performance).

b. Contractor represents and warrants that it, its employees, and its subcontractors and their employees, shall at all times have and maintain in good standing any and all certifications and licenses required by applicable federal, state, and other governmental and quasi-governmental requirements applicable to the Work.

c. Contractor represents and warrants that it has studied carefully all requirements of the Specifications regarding procedures for demolition, hazardous waste abatement, or safety practices, specified in the Contract, and prior to submitting its bid, has either (a) verified to its satisfaction that the specified procedures are adequate and sufficient to achieve the results intended by the Contract Documents, or (b) by way of approved "or equal" request or request for clarification and written Addenda, secured changes to the specified procedures sufficient to achieve the results intended by the Contract Documents. Contractor accepts the risk that any specified procedure will result in a completed Project in full compliance with the Contract Documents.

4. Monitoring and Testing

a. District reserves the right, in its sole discretion, to conduct air monitoring, earth monitoring, Work monitoring, and any other tests (in addition to testing required under the agreement or applicable law), to monitor Contract requirements of safe and statutorily compliant work methods and (where applicable) safe re-entry level air standards under state and federal law upon

completion of the job, and compliance of the work with periodic and final inspection by public and quasi-public entities having jurisdiction.

b. Contractor acknowledges that District has the right to perform, or cause to be performed, various activities and tests including, but not limited to, pre-abatement, during abatement, and post-abatement air monitoring, that District shall have no obligation to perform said activities and tests, and that a portion of said activities and tests may take place prior to the completion of the Work by Contractor. In the event District elects to perform these activities and tests, Contractor shall afford District ample access to the Site and all areas of the Work as may be necessary for the performance of these activities and tests. Contractor will include the potential impact of these activities or tests by District in the Contract Price and the Scheduled Completion Date.

c. Notwithstanding District's rights granted by this paragraph, Contractor may retain its own industrial hygiene consultant at Contractor's own expense and may collect samples and may perform tests including, but not limited to, pre-abatement, during abatement, and post-abatement personal air monitoring, and District reserves the right to request documentation of all such activities and tests performed by Contractor relating to the Work and Contractor shall immediately provide that documentation upon request.

5. Compliance with Laws

a. Contractor shall perform safe, expeditious, and orderly work in accordance with the best practices and the highest standards in the hazardous waste abatement, removal, and disposal industry, the applicable law, and the Contract Documents, including, but not limited to, all responsibilities relating to the preparation and return of waste shipment records, all requirements of the law, delivering of all requisite notices, and obtaining all necessary governmental and quasi-governmental approvals.

b. Contractor represents that it is familiar with and shall comply with all laws applicable to the Work or completed Work including, but not limited to, all federal, state, and local laws, statutes, standards, rules, regulations, and ordinances applicable to the Work relating to:

(1) The protection of the public health, welfare and environment;

(2) Storage, handling, or use of asbestos, PCB, lead, petroleum based products or other hazardous materials;

(3) The generation, processing, treatment, storage, transport, disposal, destruction, or other management of asbestos, PCB, lead, petroleum, or hazardous waste materials or other waste materials of any kind; and

(4) The protection of environmentally sensitive areas such as wetlands and coastal areas.

6. Disposal

a. Contractor has the sole responsibility for determining current waste storage, handling, transportation, and disposal regulations for the job Site and for each waste disposal facility. Contractor must comply fully at its sole cost and expense with these regulations and any applicable law. District may, but is not obligated to, require submittals with this information for it to review consistent with the Contract Documents.

b. Contractor shall develop and implement a system acceptable to District to track hazardous waste from the Site to disposal, including appropriate "Hazardous Waste Manifests" on the EPA form, so that District may track the volume of waste it put in each landfill and receive from each landfill a certificate of receipt.

c. Contractor shall provide District with the name and address of each waste disposal facility prior to any disposal, and District shall have the express right to reject any proposed disposal facility. Contractor shall not use any disposal facility to which District has objected. Contractor shall document actual disposal or destruction of waste at a designated facility by completing a disposal certificate or certificate of destruction forwarding the original to the District.

7. Permits

a. Before performing any of the Work, and at such other times as may be required by applicable law, Contractor shall deliver all requisite notices and obtain the approval of all governmental and quasi-governmental authorities having jurisdiction over the Work. Contractor shall submit evidence satisfactory to District that it and any disposal facility

(1) have obtained all required permits, approvals, and the like in a timely manner both prior to commencement of the Work and thereafter as and when required by applicable law, and

(2) are in compliance with all such permits, approvals and the regulations.

For example, before commencing any work in connection with the Work involving asbestos-containing materials, or PCBs, or other hazardous materials subject to regulation, Contractor agrees to provide the required notice of intent to renovate or demolish to the appropriate state or federal agency having jurisdiction, by certified mail, return receipt requested, or by some other method of transmittal for which a return receipt is obtained, and to send a copy of that notice to District. Contractor shall not conduct any Work involving asbestos-containing materials or PCBs unless Contractor has first confirmed that the appropriate agency having jurisdiction is in receipt of the

required notification. All permits, licenses, and bonds that are required by governmental or quasi-governmental authorities, and all fees, deposits, tap fees, offsite easements, and asbestos and PCB disposal facilities expenses necessary for the prosecution of the Work, shall be procured and paid for by Contractor. Contractor shall give all notices and comply with the all applicable laws bearing on the conduct of the Work as drawn and specified. If Contractor observes or reasonably should have observed that Plans and Specifications and other Contract Documents are at variance therewith, it shall be responsible for promptly notifying District in writing of such fact. If Contractor performs any Work contrary to applicable laws, it shall bear all costs arising therefrom.

b. In the case of any permits or notices held in District's name or of necessity to be made in District's name, District shall cooperate with Contractor in securing the permit or giving the notice, but the Contractor shall prepare for District review and execution upon approval, all necessary applications, notices, and other materials.

8. Indemnification

a. To the extent permitted by law, the indemnities and limitations of liability expressed throughout the Contract Documents apply with equal force and effect to any claims or liabilities imposed or existing by virtue of the removal, abatement, and disposal of hazardous waste. This includes, but is not limited to, liabilities connected to the selection and use of a waste disposal facility, personal injury, property damage, loss of use of property, damage to the environment or natural resources, or "disposal" and "release" of materials associated with the Work (as defined in 42 U.S.C. § 9601 et seq.).

9. Termination

a. District shall have an absolute right to terminate for default immediately without notice and without an opportunity to cure should Contractor knowingly or recklessly commit a material breach of the terms of the Contract Documents, or any applicable law, on any matter involving the exposure of persons or property to hazardous waste. However, if the breach of contract exposing persons or property to hazardous waste is due solely to an ordinary, unintentional, and non-reckless failure to exercise reasonable care, then the procedures for termination for cause shall apply without modification.

END OF DOCUMENT

11/13/13

DOCUMENT 00 88 00

AGREEMENT AND RELEASE OF ANY AND ALL CLAIMS

THIS AGREEMENT AND RELEASE OF CLAIMS ("Agreement and Release") IS MADE AND ENTERED INTO THIS _____ DAY OF _____, 20____ by and between the Berryessa Union School District ("District") and _____ ("Contractor"), whose place of business is _____.

RECITALS:

1. District and Contractor entered into _____ NO.:_____ ("Contract" or "Project") in the County of Santa Clara, California.

2. The Work under the Contract has been completed.

NOW, THEREFORE, it is mutually agreed between District and Contractor as follows:

AGREEMENT

3. Contractor will only be assessed liquidated damages as detailed below:

Original Contract Sum	$_____
Modified Contract Sum	$_____
Payment to Date	$_____
Liquidated Damages	$_____
Payment Due Contractor	$_____

4. Subject to the provisions hereof, District shall forthwith pay to Contractor the undisputed sum of $_____ (_____ Dollars and __ _____ Cents) under the Contract, less any amounts represented by any notice to withhold funds on file with District as of the date of such payment.

5. Contractor acknowledges and hereby agrees that there are no unresolved or outstanding claims in dispute against District arising from the performance of work under the Contract, except for the claims described in Paragraph 6 and continuing obligations described in Paragraph 8. It is the intention of the parties in executing this Agreement and Release that this Agreement and Release shall be effective as a full, final and general release of all claims, demands, actions, causes of action, obligations, costs, expenses, damages, losses and liabilities of Contractor against District, all its respective agents, employees, inspectors, assignees and transferees except for the

Disputed Claim is set forth in Paragraph 6 and continuing obligations described in Paragraph 8 hereof.

6. The following claims are disputed (hereinafter, the "Disputed Claims") and are specifically excluded from the operation of this Agreement and Release:

Claim No.	Description of Claim	Amount of Claim	Date Claim Submitted

[Insert information, including attachment if necessary]

7. Consistent with California Public Contract Code section 7100, Contractor hereby agrees that, in consideration of the payment set forth in Paragraph 4 hereof, Contractor hereby releases and forever discharges District, all its agents, employees, inspectors, assignees, and transferees from any and all liability, claims, demands, actions, or causes of action of whatever kind or nature arising out of or in any way concerned with the Work under the Contract.

8. Guarantees and warranties for the Work, and any other continuing obligation of Contractor, shall remain in full force and effect as specified in the Contract Documents.

9. To the furthest extent permitted by California law, Contractor shall defend, indemnify, and hold harmless the District, its agents, representatives, officers, consultants, employees, trustees, and volunteers (the "indemnified parties") from any and all losses, liabilities, claims, suits, and actions of any kind, nature, and description, including, but not limited to, attorneys' fees and costs, directly or indirectly arising out of, connected with, or resulting from the performance of the Contract unless caused wholly by the sole negligence or willful misconduct of the indemnified parties.

10. Contractor hereby waives the provisions of California Civil Code section 1542 which provides as follows:

> A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM MUST HAVE MATERIALLY AFFECTED HIS SETTLEMENT WITH THE DEBTOR.

11. The provisions of this Agreement and Release are contractual in nature and not mere recitals and shall be considered independent and severable. If any such provision or any part thereof shall be at any time held invalid in whole or in part under any federal, state, county, municipal, or other law, ruling, or regulations, then such provision, or part thereof, shall remain in force and effect to the extent permitted by law, and the remaining provisions of this Agreement and Release shall also remain in full force and effect, and shall be enforceable.

12. All rights of District shall survive completion of the Work or termination of Contract, and execution of this Release.

* * * CAUTION: THIS IS A RELEASE - READ BEFORE EXECUTING * * *

Berryessa Union School District

TITLE: _____

NAME: _____

SIGNATURE: _____

CONTRACTOR

TITLE: _____

NAME: _____

SIGNATURE: _____

END OF DOCUMENT

11/13/13

DOCUMENT 00 89 00

GUARANTEE FORM

_____("Contractor") hereby agrees that the _____ ("Work" of Contractor) which Contractor has installed for the Berryessa Union School District ("District") for the following project:

PROJECT:

Cherrywood Elementary School Modernization and F.I.S.

has been performed in accordance with the requirements of the Contract Documents and that the Work as installed will fulfill the requirements of the Contract Documents.

The undersigned agrees to repair or replace any or all of such Work that may prove to be defective in workmanship or material together with any other adjacent Work that may be displaced in connection with such replacement within a period of _____ year(s) from the date of completion as defined in Public Contract Code section 7107, subdivision (c), ordinary wear and tear and unusual abuse or neglect excepted. The date of completion is _____, 20___.

In the event of the undersigned's failure to comply with the above-mentioned conditions within a reasonable period of time, as determined by the District, but not later than seven (7) days after being notified in writing by the District, the undersigned authorizes the District to proceed to have said defects repaired and made good at the expense of the undersigned. The undersigned shall pay the costs and charges therefore upon demand.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

Representatives to be contacted for service subject to terms of Contract:

NAME: _____

ADDRESS: _____

PHONE NO.: _____

END OF DOCUMENT

11/13/13

DOCUMENT 00 91 20

PRIME BIDDER CERTIFICATION OF DISABLED VETERAN BUSINESS ENTERPRISE PARTICIPATION

To be completed by the Prime Bidder

PART I – IDENTIFICATION INFORMATION		
BIDDER'S NAME	BUSINESS ADDRESS	TELEPHONE NUMBER
SCHOOL DISTRICT	COUNTY	APPLICATION NO.

PART II – METHOD OF COMPLIANCE WITH DVBE PARTICIPATION GOALS – Include this form and any other applicable documents listed in this table with your bid/proposal. Read the three columns in the table below as sentences from left to right. Check the appropriate box to indicate your method of committing the contract dollar amount.

NOTE: *Architectural, engineering, environmental, land surveying or construction management firms must indicate their method of compliance by marking the appropriate box A, B, C, or D after selection by the District and before the contract is signed.*

YOUR BUSINESS ENTERPRISE	**AND YOU**	**AND YOU**
A. ☐ *is Disabled Veteran owned and your forces, will perform at least 3 percent of this contract*	*will include a copy of your DVBE letter from the Office of Small Minority Business (OSBCR).*	
B. ☐ *is Disabled Veteran owned* ***but is unable*** *to perform the 3 percent of this contract with your forces*	*will use DVBE subcontractors/ suppliers to bring the contract participation to at least 3 percent*	*will include a copy of each DVBE's letter from OSBCR (including yours, if applicable).*
C. ☐ *is* ***not*** *Disabled Veteran owned*	*will use DVBE subcontractors/ suppliers for at least 3 percent of this contract*	
D. ☐ *is unable to meet the required participation goals*	*will complete a Good Faith Effort to obtain DVBE participation*	*will include the Prime Bidder's Good Faith Effort Worksheet.*

Note: An Office of Small Business, Certification and Resources (OSBCR) letter must be attached for each DVBE participating in the contract. The DVBE letter is obtained by application through the OSBCR and must be provided at the time of bid opening. If the letter is not provided, the bid may be deemed nonresponsive and may be ineligible for award of the contract.

Continued on reverse side

PART III – DVBE DOLLAR PARTICIPATION OF BID/PROPOSAL – *Architectural, engineering, environmental, land surveying or construction management firms complete this part **after** selection by the district and before the contract is signed.*

Show deductive alternate(s) in parenthesis. For more alternates/base bids, use a separate page to show items.

A. If your business enterprise is a DVBE, list in the appropriate column the total dollar amount of your bid to be performed by your own participation.

B. List all your DVBE subcontractors/suppliers. Enter in the appropriate column the dollar amount for each of your subcontractors/suppliers.

C. Enter the total of Lines A and B for each column.

D. Enter the dollar amount of the bid/proposal to be performed by **non**-DVBE firms. Note: This line is the sum of the prime and subcontractor(s) **non**-DVBE dollar participation.

E. Enter the sum of the column totals from Line C and Line D. Note: Please be aware that the final determination of DVBE compliance is made based on the contract amount resulting from the district's acceptance or rejection of alternates.

	BASE BID/PROPOSAL	**ALTERNATE #1**	**ALTERNATE #2**	**ALTERNATE #3 OR BASE BID B**	**ALTERNATE #4 OR BASE BID C**	**ALTERNATE #5** (Modernization or Reconstruction Only)
A. Prime Bidder, *if DVBE (own participation)*	$	$	$	$	$	$
B. DVBE Subcontractor or Supplier						
1.						
2.						
3.						
4.						
C. Subtotal (A & B)						
D. Non-DVBE						
E. Total Bid						

PRIME BIDDER GOOD FAITH EFFORT WORKSHEET

This worksheet is to be used to assist the Prime Bidder in meeting the 3% DVBE participation goal

BIDDER'S NAME	BUSINESS ADDRESS	CONTACT PERSON
TELEPHONE NUMBER	OWNER	COUNTY

GENERAL INSTRUCTIONS:

This worksheet is to be used to assist you in meeting the 3 percent DVBE participation goal. If specific information is not provided for Parts I through III, you do not meet the test of the "Good Faith Effort" and cannot so certify. If you are qualifying based on a "Good Faith Effort" you must include this form with your bid/proposal to the Owner.

PART I – CONTACTS

To identify DVBE subcontractors/suppliers for participation in your bid/proposal, contact must be made with each of the following categories. It is recommended that you contact several DVBE organizations.

CATEGORY	TELEPHONE NUMBER	DATE CONTACTED	PERSON CONTACTED
1. Owner			
2. Office of Small Business and DVBE Services (OSDS). OSDS publishes a searchable list of Disabled Veteran Business Enterprises Internet address – http://www.bidsync.com/DPXRisCASB	(916) 375-4940		
3. DVBE Organizations (*List*):			
4. Write "recorded message" in this column, if applicable.			

PART II – ADVERTISEMENTS *You must make at least two (2) advertisements, one (1) in a paper that focuses on DVBE and one (1) in a trade paper. Advertisements should be published at least 14 days prior to bid/proposal opening; if you cannot advertise 14 days prior, advertise as soon as possible and provide an explanation. (Advertisements must be published in time to allow for a reasonable response). Advertisements must include that your firm is seeking DVBE participation, the project name and location, your firm's name, your firm's contact person, and phone number.*

Attach copies of advertisements to this form.

FOCUS/TRADE PAPER NAME	CHECK ONE		DATE OF ADVERTISEMENT
	TRADE	FOCUS	

PART III – DVBE SOLICITATIONS *List DVBE subcontractors/suppliers that were invited to bid. Use the following instructions to complete the remainder of this section (read the three columns as a sentence from left to right). If you need additional space to list DVBE solicitations, please use a separate page and attach to this form.*

IF THE DVBE.....	THEN.....	AND.....
Was selected to participate	Check "yes" in the "SELECTED" column, include the applicable dollar amount in Part III of the Prime Bidder Certification	Include a copy of their DVBE letter from OSBCR.
Was **not** selected to participate	Check "no" in the "SELECTED" column	State why in the "REASON NOT SELECTED" column.
Did not respond to your solicitation	Check the "NO RESPONSE" column	

DISABLED VETERANS BUSINESS ENTERPRISES CONTACTED	SELECTED		REASON NOT SELECTED *This section must be completed*	NO RESPONSE
	YES	NO		

IMPORTANT NOTE:

Please be aware that certification of the "Good Faith Effort" may only be made if you fully complete Parts I, II, and III on both sides of this form. A copy of this form must be retained by you and may be subject to a future audit.

CERTIFICATION

I, _____ certify that I am the bidder's Chief Executive Officer and that I have made a diligent effort to ascertain the facts with regard to the representations made herein. In making this certification, I am aware of Section 12650 et seq. of the Government Code providing for the imposition of treble damages for making false claims.

SIGNATURE OF CHIEF EXECUTIVE OFFICER	DATE

DOCUMENT 00 92 00

SMOKE-FREE ENVIRONMENT CERTIFICATION

PROJECT/CONTRACT NO.: _____ between Berryessa Union School District (the "District" or the "Owner") and _____ (the "Contractor" or the "Bidder") (the "Contract" or the "Project").

This Smoke-Free Environment Certification form is required from the successful Bidder.

Per District Board Policy and consistent with Education Code section 48901 and Health and Safety Code section 39002 all District sites, including the Project site are Tobacco Free Environments. Smoking and the use of tobacco products by all persons is prohibited on or in District property. District property includes; school buildings, school grounds, school owned vehicles and vehicles owned by others while on District property.

I acknowledge that I am aware of the District's policy regarding smoke-free environments at District sites, including the Project site and hereby certify that I will adhere to the requirements of that policy and not permit any of my firm's employees, agents, subcontractors, or my firm's subcontractors' employees or agents to smoke on the Project site.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

DOCUMENT 00 92 50

ASBESTOS AND OTHER HAZARDOUS MATERIALS CERTIFICATION

Contractor hereby certifies that no Asbestos, or Asbestos-Containing Materials, polychlorinated biphenyl (PCB), or any material listed by the federal or state Environmental Protection Agency or federal or state health agencies as a hazardous material, or any other material defined as being hazardous under federal or state laws, rules, or regulations "New Material Hazardous", shall be furnished, installed, or incorporated in any way into the Project or in any tools, devices, clothing, or equipment used to affect any portion of Contractor's work on the Project for District.

Contractor further certifies that it has instructed its employees with respect to the above-mentioned standards, hazards, risks, and liabilities.

Asbestos and/or asbestos-containing material shall be defined as all items containing but not limited to chrysotile, crocidolite, amosite, anthophyllite, tremolite, and actinolite. Any or all material containing greater than one-tenth of one percent (.1%) asbestos shall be defined as asbestos-containing material.

Any disputes involving the question of whether or not material is New Hazardous Material shall be settled by electron microscopy or other appropriate and recognized testing procedure, at the District's determination. The costs of any such tests shall be paid by Contractor if the material is found to be New Hazardous Material.

All Work or materials found to be New Hazardous Material or Work or material installed with "New Hazardous Material" containing equipment will be immediately rejected and this Work will be removed at Contractor's expense at no additional cost to the District.

Contractor has read and understood the document Hazardous Materials Procedures & Requirements, and shall comply with all the provisions outlined therein.

Date: _____

Proper Name of Bidder: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

DOCUMENT 00 93 00

LEAD-BASED PAINT CERTIFICATION

California Occupational Safety and Health Administration (CalOSHA), Environmental Protection Agency (EPA), California Department of Health Services (DHS), California Department of Education (CDE), and the Consumer Product Safety Commission (CPSC) regulate lead-containing paint and lead products. Because the Contractor and its employees will be providing services for the District, and because the Contractor's work may disturb lead-containing building materials, **CONTRACTOR IS HEREBY NOTIFIED** of the potential presence of lead-containing materials located within certain buildings utilized by the District. All school buildings built prior to 1993 are presumed to contain some lead-based paint until sampling proves otherwise.

The CDE mandates that school districts utilize DHS lead-certified personnel when a lead-based hazard is identified. Examples of lead-certified personnel include: project designers, inspectors, and abatement workers. Furthermore, since it is assumed by the district that all painted surfaces (interior as well as exterior) within the District contain some level of lead, it is imperative that the Contractor, its workers and subcontractors fully and adequately comply with all applicable laws, rules and regulations governing lead-based materials **(Including Title 8, California Code of Regulations, Section 1532.1).** Any and all Work which may result in the disturbance of lead-containing building materials must be coordinated through the District.

The California Education Code also prohibits the use or import of lead-containing paint, lead plumbing and solders, or other potential sources of lead contamination in the construction of any new school facility or in the modernization or renovation of any existing school facility. The Contractor shall provide the District with any sample results prior to beginning Work, during the Work, and after the completion of the Work. The District may request to examine, prior to the commencement of the Work, the lead training records of each employee of the Contractor.

If failure to comply with these laws, rules, and regulations results in a site or worker contamination, the Contractor will be held solely responsible for all costs involved in any required corrective actions, and shall defend, indemnify and hold harmless the District, pursuant to the indemnification provisions of the Contract, for all damages and other claims arising therefrom. If lead disturbance is anticipated in the Work, only persons with appropriate accreditation, registrations, licenses and training shall conduct this Work.

It shall be the responsibility of the Contractor to properly dispose of any and all waste products, including but not limited to, paint chips, any collected residue, or any other visual material that may occur from the prepping of any painted surface. It will be the responsibility of the Contractor to provide the proper disposal of any hazardous waste by a certified hazardous waste hauler. This company shall be registered with the

Department of Transportation (DOT) and shall be able to issue a current manifest number upon transporting any hazardous material from any school site within the District.

THE UNDERSIGNED HEREBY ACKNOWLEDGES, UNDER PENALTY OF PERJURY, THAT HE OR SHE HAS RECEIVED NOTIFICATION OF POTENTIAL LEAD-BASED MATERIALS ON THE OWNER'S PROPERTY, AS WELL AS THE EXISTENCE OF APPLICABLE LAWS, RULES AND REGULATIONS GOVERNING WORK WITH, AND DISPOSAL OF, SUCH MATERIALS WITH WHICH IT MUST COMPLY. THE UNDERSIGNED ALSO WARRANTS THAT HE OR SHE HAS THE AUTHORITY TO SIGN ON BEHALF OF AND BIND THE CONTRACTOR.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

THE UNDERSIGNED HEREBY ACKNOWLEDGES, UNDER PENALTY OF PERJURY, THAT HE OR SHE HAS RECEIVED NOTIFICATION OF POTENTIAL LEAD-BASED MATERIALS ON THE OWNER'S PROPERTY, AS WELL AS THE EXISTENCE OF APPLICABLE LAWS, RULES AND REGULATIONS GOVERNING WORK WITH, AND DISPOSAL OF, SUCH MATERIALS WITH WHICH IT MUST COMPLY. THE UNDERSIGNED ALSO WARRANTS THAT HE OR SHE HAS THE AUTHORITY TO SIGN ON BEHALF OF AND BIND THE CONTRACTOR. THE OWNER MAY REQUIRE PROOF OF SUCH AUTHORITY.

Date: _____

Proper Name of Bidder: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

DOCUMENT 00 93 50

IMPORTED MATERIALS CERTIFICATION

PROJECT/CONTRACT NO.: _____ between Berryessa Union School District (the "District") and _____ (the "Contractor" or the "Bidder") (the "Contract" or the "Project").

This form shall be executed by the Contractor and by all entities that, in any way, provide or deliver and/or supply any soils, aggregate, or related materials ("Fill") to the Project Site. All Fill shall satisfy all requirements of any environmental review of the Project performed pursuant to the statutes and guidelines of the California Environmental Quality Act, section 21000 et seq. of the Public Resources Code ("CEQA"), and all requirements of section 17210 et seq. of the Education Code, including requirements for a Phase I environmental assessment acceptable to the State of California Department of Education and Department of Toxic Substances Control.

To the furthest extent permitted by California law, Contractor shall defend, indemnify, and hold harmless the District, its agents, representatives, officers, consultants, employees, trustees, and volunteers pursuant to the indemnification provisions in the Contract Documents for, without limitation, any claim(s) connected with providing, delivering, and/or supplying Fill.

Certification of:
- □ Delivery Firm/Transporter
- □ Wholesaler
- □ Distributor
- □ Supplier
- □ Broker
- □ Other _____
- □ Manufacturer
- □ Retailer

Type of Entity
- □ Corporation
- □ Limited Partnership
- □ Sole Proprietorship
- □ General Partnership
- □ Limited Liability Company
- □ Other _____

Name of firm ("Firm"): _____

Mailing address: _____

Addresses of branch office used for this Project: _____

If subsidiary, name and address of parent company: _____

_____

_____=

By my signature below, I hereby certify that I am aware of section 25260 of the Health and Safety Code and the sections referenced therein regarding the definition of hazardous material. I further certify on behalf of the Firm that all soils, aggregates, or related materials provided, delivered, and/or supplied or that will be provided, delivered, and/or supplied by this Firm to the Project Site are free of any and all hazardous material as defined in section 25260 of the Health and Safety Code. I further certify that I am authorized to make this certification on behalf of the Firm.

Date: _____

Proper Name of Contractor: _____

Signature: _____

Print Name: _____

Title: _____

END OF DOCUMENT

11/13/13

SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.1 PROJECT

A. Project Name:

B. Owner's Name: Berryessa Union School District.

C. Architect's Name:

D. The Project consists of

1.2 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 5200 - Agreement Form.

1.3 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is shown on drawings and specified in Section 02 4100.

B. Scope of alterations work is shown on drawings.

C. Owner will remove the following items before start of work.

1. All F, F & E from all spaces with work shown on the drawings.

D. Contractor shall remove and deliver the following to Owner prior to start of work.

E. Contractor shall remove and store the following prior to start of work, for later reinstallation by Contractor.

1. Irrigation sprinkler heads, elbows and related fittings and other items called out as such on the drawings.

1.4 OWNER OCCUPANCY

A. Owner intends to occupy the entire Project upon Substantial Completion.

B. Owner intends to occupy All buildings with the possible exception of the F.I.S. prior to the completion date to move teachers and staff back and to prepare for the upcoming school commencement.

C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

D. Schedule the Work to accommodate Owner occupancy.

1.5 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

B. Provide access to and from site as required by law and by Owner.

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.

2. Do not obstruct roadways, sidewalks, or other public ways without permit.

C. Utility Outages and Shutdown.

1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.

2. Limit shutdown of utility services to minimal hours, arranged at least 24 hours in advance with Owner.

3. Prevent accidental disruption of utility services to other facilities.

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.2 RELATED REQUIREMENTS

A. Document 00 50 00 - Contracting Forms and Supplements: Forms to be used.

B. Document 00 52 00 - Agreement Form: Contract Sum, retainages, payment period, monetary values of unit prices.

C. Document 00 72 00 - General Conditions and Document 00 73 00 - Supplementary Conditions: Additional requirements for progress payments, final payment, changes in the Work.

D. Document 00 73 00 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.

E. Section 01 2100 - Allowances: Payment procedures relating to allowances.

F. Section 01 2200 - Unit Prices: Monetary values of unit prices, payment and modification procedures relating to unit prices.

1.3 SCHEDULE OF VALUES

A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect and Construction Manager for approval.

B. Forms filled out by hand will not be accepted.

C. Submit Schedule of Values in duplicate within 10 days after date of the Notice of Award of the Contract. This date is per the District's General Conditions

Section 9.2.1.A by the District.

D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization.

E. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

F. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.

G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.4 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. For each item, provide a column for listing each of the following:

1. Item Number.

2. Description of work.

3. Scheduled Values.

4. Previous Applications.

5. Work in Place and Stored Materials under this Application.

6. Authorized Change Orders.

7. Total Completed and Stored to Date of Application.

8. Percentage of Completion.

9. Balance to Finish.

10. Retainage.

E. Execute certification by signature of authorized officer.

F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.

H. Submit Four copies of each Application for Payment.

I. Include the following with the application:

1. Transmittal letter as specified for Submittals in Section 01 3000.

2. Construction progress schedule, revised and current as specified in Section 01 3000.

3. Partial release of liens from major Subcontractors and vendors.

4. Affidavits attesting to off-site stored products.

5. Conditional and Unconditional Waiver Releases.

J. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.5 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ a n d / o r subcontractors of changes to the Contract Documents.

B. For required changes, Owner, Architect or Construction Manager will issue a CCD approved by DSA and signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.

1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.

2. Promptly execute the change.

C. Contractor may propose a change by submitting a request for change to O w n e r, Architect or Construction Manager describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 6000.

D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

1. For change requested by Owner, Architect or Construction Manager for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.

2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Owner, Architect or Construction Manager.

3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.

4. For change ordered by Owner, Architect or Construction Manager without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.

E. Substantiation of Costs: Provide full information required for evaluation.

1. On request, provide the following data:

   a. Quantities of products, labor, and equipment.

   b. Taxes, insurance, and bonds.

   c. Overhead and profit.

   d. Justification for any change in Contract Time.

   e. Credit for deletions from Contract, similarly documented.

2. Support each claim for additional costs with additional information:

   a. Origin and date of claim.

   b. Dates and times work was performed, and by whom.

   c. Time records and wage rates paid.

   d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

F. Execution of Change Orders: Owner, Architect or Construction Manager will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

G. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

I. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

J. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

K. Application for Final Payment will not be considered until the following have been accomplished:

1. All closeout procedures specified in Section 01 7000 have been accomplished and the project is Certified by DSA.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 21 00
ALLOWANCES

PART 1 GENERAL

1.1 SECTION INCLUDES

1.2 RELATED REQUIREMENTS

A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.3 CONTINGENCY ALLOWANCE

A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.

B. Funds will be drawn from the Contingency Allowance only by Change Order.

C. Labor quantities MUST be verified by the I.O.R. prior to payment.

D. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 22 00
UNIT PRICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.2 RELATED REQUIREMENTS

A. Document 00 21 13 - Instructions to Bidders: Instructions for preparation of pricing for Unit Prices.

B. Document 00 43 22 - Unit Prices Form: List of Unit Prices as supplement to Bid Form.

C. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.3 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.4 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.5 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect, Owner or Construction Manager.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.

E. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

F. Measurement by Area: Measured by square dimension using mean length and width or radius.

G. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

H. Stipulated Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

I. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.

J. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes, calculate and certify quantities for payment purposes.

1.6 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

B. Payment will not be made for any of the following:

1. Products wasted or disposed of in a manner that is not acceptable.

2. Products determined as unacceptable before or after placement.

3. Products not completely unloaded from the transporting vehicle.

4. Products placed beyond the lines and levels of the required Work.

5. Products remaining on hand after completion of the Work.

6. Loading, hauling, and disposing of rejected Products.

1.7 DEFECT ASSESSMENT

A. Replace Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of Architect, Owner or Construction Manager it is not practical to remove and replace the Work, Architect will direct one of the following remedies:

1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Architect, Owner or Construction Manager.

2. The defective Work will be partially repaired to the instructions of the Architect, and the unit price will be adjusted to a new unit price at the discretion of Architect.

C. The individual specification sections may modify these options or may identify a specific formula or percentage price reduction.

D. The authority of Architect to assess the defect and identify payment adjustment is final.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

DOCUMENT 01 23 00

ALTERNATES AND UNIT PRICING

PART I – ALTERNATES

1.01 RELATED DOCUMENTS AND PROVISIONS

A. All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

1. General Conditions;
2. Special Conditions;
3. Bid Form and Proposal;
4. Instruction to Bidders.

1.02 DESCRIPTION

A. The following items of work include proposed modifications to, substitutions for, to and/or deletions from the various parts of the Work specified in other Documents of the Specifications. The acceptance or rejection of any of the alternates is strictly at the option of the District subject to District's acceptance of Contractor's stated prices contained in this Proposal.

1.03 GENERAL

A. Where an item is omitted, or scope of Work is decreased, all Work pertaining to the item whether specifically stated or not, shall be omitted and where an items is added or modified or where scope of Work is increased, all Work pertaining to that required to render same ready for use on the Project in accordance with intention of Drawings and Specifications shall be included in an agreed upon price amount.

1.04 BASE BID

A. The Base Bid includes all work required to construct the Project completely and in accordance with the Contract Documents.

1.05 ALTERNATES

A. The below Alternate descriptions are general in nature and for reference purposes only. The Contract Documents, including, without limitation, the Drawings and Specifications, must be referred to for the complete scope of Work.

PART 2 - UNIT PRICING

2.01 GENERAL

A. Contractor shall completely state all required figures based on Unit Prices listed below. Where scope of Work is decreased, all Work pertaining to the item, whether specifically stated or not, shall be omitted and where scope of Work is increased, all work pertaining to that item required to render same ready for use on the Project in

accordance with intention of Drawings and Specifications shall be included in an agreed upon price amount.

2.02 UNIT PRICES

A. Furnish unit prices for each of the named items included on the bid form on a square foot, lineal foot, or per each basis, as applies. Unit prices shall include all labor, materials, services, profit, overhead, insurance (excluding costs of insurance covered by OCIP), bonds, taxes, and all other incidental costs of Contractor, subcontractors, and supplier(s).

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

11/13/13

DOCUMENT 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Substitutions For Specified Items;

B. Special Conditions.

1.02 SUBSTITUTIONS OF MATERIALS AND EQUIPMENT

A. Catalog numbers and specific brands or trade names followed by the designation "or equal" are used in conjunction with material and equipment required by the Specifications to establish the standards of quality, utility, and appearance required. Substitutions which are equal in quality, utility, and appearance to those specified may be reviewed subject to the provisions of the General Conditions.

B. Wherever more than one manufacturer's product is specified, the first-named product is the basis for the design used in the work and the use of alternative-named manufacturers' products or substitutes may require modifications in that design. If such alternatives are proposed by Contractor and are approved by the District and-or the Architect, Contractor shall assume all costs required to make necessary revisions and modifications of the design resulting from the substitutions requested by the Contractor.

C. When materials and equipment are specified by first manufacturer's name and product number, second manufacturer's name and "or approved equal," supporting data for the second product, if proposed by Contractor, shall be submitted in accordance with the requirements for substitutions.

D. If the District and-or Architect, in reviewing proposed substitute materials and equipment, requires revisions or corrections to be made to previously accepted Shop Drawings and supplemental supporting data to be resubmitted, Contractor shall promptly do so. If any proposed substitution is judged by the District and-or Architect to be unacceptable, the specified material or equipment shall be provided.

E. Samples may be required. Tests required by the District and-or Architect for the determination of quality and utility shall be made at the expense of Contractor, with acceptance of the test procedure first given by the District.

F. In reviewing the supporting data submitted for substitutions, the District and-or Architect will use for purposes of comparison all the characteristics of the specified material or equipment as they appear in the manufacturer's published data even though all the characteristics may not have been particularly mentioned in the Contract Documents. If more than two (2) submissions of supporting data are required, the cost of reviewing the additional supporting data shall be borne by Contractor, and the District will deduct the costs from the Contract Price.

1.03 SUBMITTALS

A. Substitution Request Submittal: Requests for substitution will be considered if received as noted in the contract documents. Requests not received within the timeline established may be considered or rejected at the discretion of the Architect.

1. Submit 3 copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.

2. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Document and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

a. Product Date, including Drawings and descriptions, or products, fabrication and installation procedures.

b. Samples, where applicable or requested.

c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.

d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors that will become necessary to accommodate the proposed substitution.

e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.

f. Cost information, including a proposal of the net change, if any in the Contract Sum.

g. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

B. Architect's Action: Within one week of receipt of the request for substitution, the Architect will request additional information or documentation necessary for evaluation of the request. Within 2 weeks of receipt of the request, or one week of receipt of the additional information or documentation, whichever is later, the Architect will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name.

PART 2 – PRODUCTS

2.01 SUBSTITUTIONS

A. Conditions: The Contractor's substitution request will be received and considered by the Architect when one or more of the following conditions are satisfied, as determined by the Architect; otherwise, requests will be returned without action except to record noncompliance with these requirements.

1. Extensive revisions to Contract Documents are not required.

2. Proposed changes are in keeping with the general intent of Contract Documents.

3. The request is timely, fully documented and properly submitted.

4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.

5. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.

6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.

7. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities for the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.

8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.

9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.

10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.

B. The Contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval

C. By making requests for substitutions based on Sub-paragraph above, the Contractor:

1. Represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to the specified.

2. Represents that the Contractor will provide the same warranty for the substitution that the Contractor would for the specified.

3. Certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently becomes apparent.

4. Will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be completed in all respects.

D. If a proposed substitution requires investigation, testing or approval to determine its suitability for incorporation into the work, the testing of the proposed substitution shall be as determined by the Architect. The Contractor shall bear all cost of such investigations or test.

E. All Substitutions that affect Structural Safety, Fire and Life Safety, Access Compliance or Energy (as applicable) shall be submitted to the Division of the State Architect for review and approval.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

11/13/13

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electronic document submittal service.

B. Preconstruction meeting.

C. Site mobilization meeting.

D. Progress meetings.

E. Construction progress schedule.

F. Submittals for review, information, and project closeout.

G. Submittal procedures.

1.2 RELATED REQUIREMENTS

A. Division 00 - Procurement and Contracting Requirements

B. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.

C. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

D. Section 01 7800 - Closeout Submittals: Project record documents.

1.3 PROJECT COORDINATION

A. Project Coordinator: Construction Manager.

B. Cooperate with the Construction Manager in allocation of mobilization areas of site; staging, Contractor access, traffic, and parking facilities.

C. Coordinate field engineering and layout work under instructions of the District, CM and Architect.

D. Make the following types of submittals to Architect through the Construction Manager and I.O.R.:

1. Requests for information.
2. Requests for substitution.
3. Shop drawings, product data, and samples.
4. Test and inspection reports.
5. Applications for payment and change order requests.

6. Progress schedules.

7. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via email or an Internet-based submittal service as determined by the CM that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.

1. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.

2. [ ]ll parties are required to use this service.

3. It is Contractor's responsibility to submit documents in PDF format.

4. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no extra charge.

5. Users of the service need an email address, Internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.

6. Paper document transmittals will be reviewed if submitted with samples or other similar items only; emailed PDF documents will not be reviewed if an internet service is agreed to.

7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Submittal Service: The selected service is:
1. To be approved by the Owner.

C. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.

1. Representatives of Owner and Construction Manager will be included in this training as necessary.

D. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.2 CONTRACTOR MEETINGS

A. Conduct trade preconstruction meeting with each trade to review scope and schedule prior to start of work.

B. Conduct coordination meetings with multiple trades prior to start of work in cases where more than two trades are working simultaneously in the same work area, or where two or more trades' work intersects, or impacts the other.

3.3 PRECONSTRUCTION MEETING

A. Owner will schedule a meeting after Notice of Award.

B. Project Coordinator will schedule a meeting after Notice of Award.

C. Attendance Required:

1. Owner.
2. Architect.
3. Contractor.
4. Construction Manager.
5. [ ].

D. Agenda:

1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to the Contract, Owner, Construction Manager and Architect.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.
8. Review site logistics plans, site safety plans and construction sequencing.

E. The Construction Manager will record minutes and distribute copies within 48 hours after meeting to participants.[ ]

3.4 SITE MOBILIZATION MEETING

A. Construction Manager will schedule meeting at the Project site prior to [ ] occupancy.

B. Attendance Required:

1. Contractor.
2. Owner.
3. I.O.R..

C. Agenda:

1. Use of premises by Owner and Contractor.
2. Owner's requirements and occupancy prior to completion.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Survey and building layout.
6. Security and housekeeping procedures.
7. Schedules.
8. Application for payment procedures.
9. Procedures for testing.
10. Procedures for maintaining record documents.
11. Requirements for start-up of equipment.
12. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.5 PROGRESS MEETINGS

A. Construction Manager will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

B. Attendance Required: Job superintendent, Owner, CM, Architect, I.O.R., subcontractors as appropriate to agenda topics for each meeting.

C. Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress and three week look-ahead against the original schedule submitted by the contractor prior to initiation of work.
3. Field observations, issues, and decisions.
4. Identification of issues that impede, or will impede, planned progress including

open RFIs.

5. Review of submittals schedule and status of submittals.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Maintenance of quality and work standards.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business relating to Work.

D. Record minutes and distribute copies within 48 hours after meeting to participants.

3.6 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:

1. Product data.
2. Shop drawings.
3. Samples for selection.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below.

3.7 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:

1. Design data.
2. Certificates upon completion of installation.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator and to Owner.

3.8 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:

1. Project record documents with field marked as-built drawings.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Training Manuals.
6. Other types as indicated.

B. Submit for Owner's benefit during and after project completion.

3.9 NUMBER OF COPIES OF SUBMITTALS

A. Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Upon review and acceptance of submittals, provide two hard copies, one to the Architect and one to the Owner.

C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.

1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.10 SUBMITTAL PROCEDURES

A. Shop Drawing Procedures:

1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
2. Use of the Construction drawings for shop drawing production will only be allowed if the contractor and specific sub-contractor submit a signed release of liability statement provided by the Architect. [ ].
3. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.

B. Transmit each submittal with a copy of approved submittal form.

C. Submit complete list of anticipated submittals no later than 10 days after notice to proceed[ ].

D. Submittals must be submitted and review completed and accepted prior to the start of work.

E. Submittals are to be complete for all items in each specification section. Partial submittals may not be reviewed.

F. Transmit each submittal with a transmittal.

G. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

H. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

I. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the Work and Contract Documents and date of review.

J. Deliver submittals to Architect via email or Contractor's website. Provide email notification when submittals are loaded to website.

K. Schedule submittals to expedite the Project, and coordinate submission of related items.

L. For each submittal for review, allow 10 business days excluding delivery time to and from the Contractor.

M. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work. Describe proposed substitutions or equals on the submittal cover. Accepting a submittal that does not identify deviations from the contract does not constitute acceptance of the deviations.

N. Provide space for Contractor and Architect review stamps.

O. When revised for resubmission, identify all changes made since previous submission.

P. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

Q. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.2 RELATED SECTIONS

A. Section 01 3000 - Administrative Requirements

1.3 REFERENCES

A. AGC (CPSM) - Construction Planning and Scheduling Manual; Associated General Contractors of America; 2004.

1.4 SUBMITTALS

A. Within 10 days after notice to proceed, submit complete, detailed construction schedule.

1. This project will be built in conjunction and concurrently with other projects. Integrate schedule for this project with other projects being performed.

2. Schedules to be maintained in Primavera, P6 Project Planner platform.

3. Submit three copies of the schedule in 11 by 17 format, landscape.

B. Submit updated schedule with each Application for Payment.

1.5 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

PART 2 PRODUCTS

2.1 Software: Primavera P6 Project Planner

PART 3 EXECUTION

3.1 NETWORK ANALYSIS

A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.

B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.

C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:

1. Preceding and following event numbers.
2. Activity description.
3. Estimated duration of activity, in maximum 15 day intervals.
4. Earliest start date.
5. Earliest finish date.
6. Actual start date.
7. Actual finish date.
8. Latest start date.
9. Latest finish date.
10. Total and free; float time shall accrue to Owner and to Owner's benefit.

3.2 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within two business days.

3.3 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

3.4 UPDATE INTERVALS

A. Provide monthly updates from notice to proceed to start of construction.

B. Provide updates every other week during construction.

3.5 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, Architect, and Owner.

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. References and standards.

B. Quality assurance submittals.

C. Control of installation.

D. Tolerances.

E. Testing and inspection services.

1.2 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

1.3 REFERENCE STANDARDS

A. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2013a.

1.4 SUBMITTALS

A. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.

1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

B. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.5 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

PART 2 PRODUCTS - NOT

USED PART 3 EXECUTION

3.1 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.2 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.3 TESTING AND INSPECTION

Project Inspector to be approved by DSA and employed by the District.

Testing laboratory is to be employed by owner.

A. Limits on Testing/Inspection Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

B. Contractor Responsibilities:

1. Make available to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to Work to be tested/inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
   c. To facilitate tests/inspections.
   d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

C. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

D. Re-testing, re-inspection, stand-by time, and other cost or time impacts required because of non-conformance to specified requirements shall be paid for by the Contractor.

3.4 DIVISION OF THE STATE ARCHITECT TESTING AND INSPECTION FORM

A. Architect shall provide to Contactor DSA Testing and Inspection Form approved for the project and Contractor to cooperate with the testing agency in performing the tests indicated.

B. POST INSTALLED ANCHORS

1. Test post installed Anchors in concrete per CBC 1913A.7

3.5 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Temporary Controls: Barriers, enclosures, and fencing.

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Field offices.

1.2 TEMPORARY UTILITIES

A. Contractor may use Owner's existing utilities on the site at no charge.

B. Contractor to provide equipment and devices to properly tap into existing utilities or to increase capacity of utilities if Owner's capacity is not adequate.

1. Electrical power and metering, consisting of connection to existing facilities.

2. Water supply, consisting of connection to existing facilities.

C. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.3 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to the Project Manager and Project Superintendent.

B. Telecommunications services shall include:
1. Cell phone lines: One line, minimum; per person.

2. Internet Connections: Minimum of one; DSL modem or faster.

3. Email: Account/address reserved for project use for each person.

1.4 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.5 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.6 FENCING

A. Construction: Commercial grade chain link fence.

B. Areas of work including storage and lay down areas are to be separated from staff and students by fencing.

C. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.7 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.8 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.

B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces.

1.9 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft. Do not disable Owner's security system without notification.

1.10 VEHICULAR ACCESS AND PARKING

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Limited parking is available on site. Make provisions for contractor parking with the school's staff and the Construction Manager.

D. Manage trade workers parking areas ensuring workers only parked in approved areas.

1.11 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site weekly.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

1.12 FIELD OFFICES

A. Field office is not required.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

DOCUMENT 01 60 00

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Purchase of Materials and Equipment;

B. Special Conditions;

C. Imported Materials Certification.

1.02 MATERIAL AND EQUIPMENT

A. Only items approved by the District and-or Architect shall be used.

B. Contractor shall submit lists of products and other product information in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

1.03 MATERIAL AND EQUIPMENT COLORS

A. The District and-or Architect will provide a schedule of colors.

B. No individual color selections will be made until after approval of all pertinent materials and equipment and after receipt of appropriate samples in accordance with the Contract Documents, including, without limitation, the provisions regarding the submittals.

C. Contractor shall request priority in writing for any item requiring advance ordering to maintain the approved Construction Schedule.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall deliver manufactured materials in original packages, containers, or bundles (with seals unbroken), bearing name or identification mark of manufacturer.

B. Contractor shall deliver fabrications in as large assemblies as practicable; where specified as shop-primed or shop-finished, package or crate as required to preserve such priming or finish intact and free from abrasion.

C. Contractor shall store materials in such a manner as necessary to properly protect them from damage. Materials or equipment damaged by handling, weather, dirt, or from any other cause will not be accepted.

D. Materials are not acceptable that have been warehoused for long periods of time, stored or transported in improper environment, improperly packaged, inadequately labeled, poorly protected, excessively shipped, deviated from normal distribution pattern, or reassembled.

E. Contractor shall store material so as to cause no obstructions of sidewalks, roadways, and underground services. Contractor shall protect material and equipment furnished under Contract.

F. Contractor may store materials on Site with prior written approval by the District, all material shall remain under Contractor's control and Contractor shall remain liable for any damage to the materials. Should the Project Site not have storage area available, the Contractor shall provide for off-site storage at no cost to District.

G. When any room in Project is used as a shop or storeroom, the Contractor shall be responsible for any repairs, patching, or cleaning necessary due to that use. Location of storage space shall be subject to prior written approval by District.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers listed in various sections of Contract Documents are names of those manufacturers that are believed to be capable of supplying one or more of items specified therein.

B. The listing of a manufacturer does not imply that every product of that manufacturer is acceptable as meeting the requirements of the Contract Documents.

2.02 FACILITIES AND EQUIPMENT

A. Contractor shall provide, install, maintain, and operate a complete and adequate facility for handling, the execution, disposal, and distribution of material and equipment as required for proper and timely performance of Work connected with Contract.

2.03 MATERIAL REFERENCE STANDARDS

A. Where material is specified solely by reference to "standard specifications" and if requested by District, Contractor shall submit for review data on actual material proposed to be incorporated into Work of Contract listing name and address of vendor, manufacturer, or producer, and trade or brand names of those materials, and data substantiating compliance with standard specifications.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Where not more specifically described in any other Contract Documents, workmanship shall conform to methods and operations of best standards and accepted practices of trade or trades involved and shall include items of fabrication, construction, or installation regularly furnished or required for completion (including finish and for successful operation, as intended).

B. Work shall be executed by tradepersons skilled in their respective lines of Work. When completed, parts shall have been durably and substantially built and present a neat appearance.

3.02 COORDINATION

A. Contractor shall coordinate installation of Work so as to not interfere with installation of others. Adjustment or rework because of Contractor's failure to coordinate will be at no additional cost to District.

B. Contractor shall examine in-place work for readiness, completeness, fitness to be concealed or to receive other work, and in compliance with Contract Documents. Concealing or covering Work constitutes acceptance of additional cost which will result should in-place Work be found unsuitable for receiving other Work or otherwise deviating from the requirements of the Contract Documents.

3.03 COMPLETENESS

A. Contractor shall provide all portions of the Work, unless clearly stated otherwise, installed complete and operational with all elements, accessories, anchorages, utility connections, etc., in manner to assure well-balanced performance, in accordance with manufacturer's recommendations and by Contract Documents. For example, electric water coolers require water, electricity, and drain services; roof drains require drain system; sinks fit within countertop, etc. Terms such as "installed complete," "operable condition," "for use intended," "connected to all utilities," "terminate with proper cap," "adequately anchored," "patch and refinish," "to match similar,"

should be assumed to apply in all cases, except where completeness of functional or operable condition is specifically stated as not required.

3.04 APPROVED INSTALLER OR APPLICATOR

A. Installation by a manufacturer's approved installer or applicator is an understood part of Specifications and only approved installer or applicator is to provide on-site Work where specified manufacturer has on-going program of approving (i.e. certifying, bonding, re-warranting) installers or applicators. Newly established relationships between a manufacturer and an installer or applicator who does not have other approved applicator work in progress or completed is not approved for this Project.

3.05 MANUFACTURER'S RECOMMENDATIONS

A. All installations shall be in accordance with manufacturer's published recommendations and specific written directions of manufacturer's representative. Should Contract Documents differ from recommendations of manufacturer or directions of his representative, Contractor shall analyze differences, make recommendations to the District and the Architect in writing, and shall not proceed until interpretation or clarification has been issued by the District and-or the Architect.

END OF DOCUMENT

11/13/13

SECTION 01 60 05
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations and procedures.

E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements: Product quality monitoring.

1.3 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data and installation instructions. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1. Detail structural assemblies and structural connections to the building components.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.1 NEW PRODUCTS

A. Provide new products only unless noted otherwise on the Drawings.

B. Where all other criteria are met, Contractor shall give preference to products that:

1. If used on interior, have lower emissions.

2. If wet-applied, have lower VOC content.

3. Have a published GreenScreen Chemical Hazard Analysis.

2.2 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers with a Provision for equal: Equal products are acceptable with Architect's or Owner's review.

C. If specified product does not come with required options, select alternate manufacturer or customize product to suit.

2.3 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to a site selected by the Owner within the District's boundaries; obtain receipt prior to final payment. Prior to delivery, coordinate delivery with Owner.

PART 3 EXECUTION

3.1 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions.

B. Architect will consider requests for substitutions only within 15 days after date established in Notice to Proceed.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Organize in side-by-side tabular format with specified product attributes in the left column and proposed substitution in the right column.

D. A request for substitution constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.

2. Will provide the same warranty for the substitution as for the specified product.

3. The installer is qualified or certified to install the proposed substitution.

4. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.

5. Waives claims for additional costs or time extension that may subsequently become apparent.

6. Credit cost savings for substitutions to Owner.

E. Substitution Submittal Procedure:

1. Submit one copy of request for substitution for consideration. Limit each request to one proposed substitution.

2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.

3. The Architect will notify Contractor in writing of decision to accept or reject request.

4. If the product is accepted as equal, but additional information indicates that the product is not equal in a significant quality or property, the product will be removed and replaced at no cost to the Owner or a credit will be passed on to the Owner for diminished quality.

3.2 TRANSPORTATION AND HANDLING

A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

B. Transport and handle products in accordance with manufacturer's instructions.

C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

D. Promptly inspect shipments prior to off-loading and stockpiling to ensure that products comply with requirements, quantities are correct, and products are undamaged.

E. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

F. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

G. Provide traffic control and flagmen for deliveries.

3.3 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive and absorbent products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground and wrap in plastic.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

DOCUMENT 01 61 00

DELIVERY, STORAGE AND HANDLING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. General Conditions, including, without limitation, Site Access, Conditions and Requirements;

B. Special Conditions.

1.02 PRODUCTS

A. Products are as defined in the General Conditions.

B. Contractor shall not use and-or reuse materials and-or equipment removed from existing Premises, except as specifically permitted by the Contract Documents.

C. Contractor shall provide interchangeable components of the same manufacturer, for similar components.

1.03 TRANSPORTATION AND HANDLING

A. Contractor shall transport and handle Products in accordance with manufacturer's instructions.

B. Contractor shall promptly inspect shipments to confirm that Products comply with requirements, quantities are correct, and products are undamaged.

C. Contractor shall provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.04 STORAGE AND PROTECTION

A. Contractor shall store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Contractor shall store sensitive products in weather-tight, climate controlled enclosures.

B. For exterior storage of fabricated Products, Contractor shall place on sloped supports, above ground.

C. Contractor shall provide off-site storage and protection when Site does not permit on-site storage or protection.

D. Contractor shall cover products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.

E. Contractor shall store loose granular materials on solid flat surfaces in a well-drained area and prevent mixing with foreign matter.

F. Contractor shall provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

G. Contractor shall arrange storage of Products to permit access for inspection and periodically inspect to assure Products are undamaged and are maintained under specified conditions.

PART 2 – PRODUCTS Not Used.

PART 3 - EXECUTION Not Used.

END OF DOCUMENT

11/13/13

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Surveying for laying out the work.

D. Cleaning and protection.

E. Closeout procedures, except payment procedures.

1.2 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 3000 - Administrative Requirements: Submittals procedures.

C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

D. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

E. Section 01 7329 - Cutting and Patching

1.3 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.4 QUALIFICATIONS

A. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.5 PROJECT CONDITIONS

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

C. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

1. Indoors: Limit conduct of especially noisy interior work to times when the building is not occupied by the owner.

2. Provide sound attenuation systems to prevent disruption of staff and students (if occupied by them), neighboring residents and to meet City noise ordinance requirements.

1.6 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements. Exposed piping or ducts will not be allowed unless specifically noted as such on the Drawings.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.1 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. See 02 4050 Cutting and Patching for additional information.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

G. Verify Drawings are coordinated and match existing conditions prior to start of work.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

G. Utilize recognized engineering survey practices.

H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations; and control or expansion joints.

2. Grid or axis for structures.

3. Building foundation, column locations, ground floor elevations, and Eave heights.

I. Periodically verify layouts by same means.

J. Maintain a complete and accurate log of control and survey work as it progresses.

3.4 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.5 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.

1. Verify that construction and utility arrangements are as shown.

2. Report discrepancies to Architect before disturbing existing installation.

3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Remove existing work as indicated and as required to accomplish new work.

1. Remove items indicated on drawings.

2. Relocate items indicated on drawings.

3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.

4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and Fire Alarm): Remove, relocate, and extend existing systems to accommodate new construction.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.

2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.

3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.

   a. Disable existing systems only to make switchovers and connections; minimize duration of outages.

   b. Provide temporary connections as required to maintain existing systems in service.

4. Verify that services serve only abandoned facilities.

5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

D. Protect existing work to remain.

   1. Prevent movement of structure; provide shoring and bracing if necessary.

   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.

   3. Repair adjacent construction and finishes damaged during removal work.

E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

G. Refinish existing surfaces as indicated:

   1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.

   2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

H. Clean existing systems and equipment.

I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

J. Do not begin new construction in alterations areas before demolition is complete.

K. Comply with all other applicable requirements of this section.

3.6 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:

1. Complete the work.
2. Replace curb cuts of insufficient size to provide
3. Fit products together to integrate with other work.
4. Provide openings for penetration of mechanical, electrical, and other services.
5. Match work that has been cut to adjacent work.
6. Repair areas adjacent to cuts to required condition.
7. Repair new work damaged by subsequent work.
8. Remove samples of installed work for testing when requested.
9. Remove and replace defective and non-conforming work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. Patching:

1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.7 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition. Broom sweep work areas at the end of each day.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Clean parking areas daily, including street parking used by workers.

E. Sweep parking areas, driveways and streets used for the work. Removal of oil and other stains left by equipment or worker vehicles.

F. Collect and remove waste materials, debris, and trash/rubbish from work area daily and dispose off-site weekly; do not burn or bury.

3.8 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.9 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Test and balance HVAC systems affected by the work.

3.10 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.11 CLOSEOUT PROCEDURES

A. Make submittals that are required by Division of the State Architect or other authorities.

1. Complete DSA Form 155 at each phase of the work indicated on the DSA Inspection Card, Form 152.

B. Notify Architect when work is considered ready for Substantial Completion.

C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.

D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.

E. Notify Architect when work is considered finally complete.

F. Complete items of work determined by Architect's final inspection.

END OF SECTION

DOCUMENT 01 72 00

FIELD ENGINEERING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Documents, apply to work of this document.

1.02 SUMMARY

A. General: This Document specifies administrative and procedural requirements for field engineering services, including, but not necessarily limited to, the following:

1. Layout of the Project
2. Land Survey Work
3. Shoring and Bracing Engineering
4. Construction Equipment
5. Support from Structure
6. Stormwater Runoff Protection Plan
7. Other Field Engineering

B. Except for engineering work to be provided by the owner relative to existing conditions, all grade lines, levels and bench marks shall be established and maintained by the Contractor.

1.03 SUBMITTALS

A. Certificates: Submit a certificate signed by the Land Surveyor or Professional Engineer certifying that the location and elevation of improvements comply with the Contract Documents.

B. Final Property Survey: Submit 10 copies of the final property survey.

C. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of Documents "Submittals" and "Project Closeout."

1.04 QUALITY ASSURANCE

A. Surveyor: Engage a Registered Land Surveyor registered with the State of California and approved by the Architect to perform land surveying and layout services required.

PART 2 -PRODUCTS Not Used

PART 3 -EXECUTION

3.01 EXAMINATION

A. The Owner will identify existing control points and property line corner stakes.

B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks before proceeding to layout the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

C. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations.

D. Promptly replace lost or destroyed project control points. Base replacements on the original survey control points.

E. Establish and maintain a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.

F. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

G. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction. Contact utility companies, including USA, for on-site location services.

H. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, water service piping and gas. Verify locations of underground electrical line. It is the responsibility of the Contractor to use all means possible to locate underground utilities.

3.02 PERFORMANCE

A. Working from lines and levels established by the property survey, establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

B. Advise entities engaged in construction activities, of marked lines and levels provided for their use.

C. As construction proceeds, check every major element for line, level and plumb.

D. Surveyor's Log: Maintain a surveyor's log of control and other survey Work. Make this log available for reference.

1. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.

2. On completion of major site improvements, and other Work requiring field engineering services, prepare a certified survey showing dimensions, locations, angles and elevations of construction and sitework.

E. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

F. Existing Utilities: Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities having jurisdiction.

G. Final Property Survey: Before Substantial Completion, prepare a final property survey showing significant features (real property) for the Project. Include on the survey a certification, signed by the Surveyor, to the effect that principal metes, bounds, lines and levels of the Project are accurately positioned as shown on the survey.

1. Provide survey both on reproducible Mylar and an electronic copy compatible with AutoCAD V-14.

H. Shoring and Bracing:

1. Design of Shoring and Bracing for support of formwork, scaffolding, or other temporary construction supports, shall be the responsibility of

the Contractor. If requested, supply engineering calculations and data regarding proposed shoring and bracing.

I. Construction Equipment: Engineering for cranes, temporary hoists, or other hoisting equipment requiring structural loading during construction shall be the responsibility of the Contractor. If requested, supply engineering calculations and data regarding proposed construction equipment. The structural system of the building is not intended to support hoisting systems unless specifically noted, and all such equipment shall be designed to be structurally independent of the building.

J. Storm water Runoff Protection Plan (SWRPP)

1. It shall be the responsibility of the Contractor to obtain all permits required by the EPA or their designated authority regarding control of Storm water at construction sites. It shall also be the responsibility of the Contractor to bring the construction activities for this project into compliance with the requirements of the State Water Resources Control Board General Construction Activity Storm Water Permit of April 17, 1997, to discharge storm water associated with construction activities, to be in full compliance with the LOCAL JURISDICTION Standards, and the National Pollutant Discharge Elimination (NPDES) Permit.

2. The Contractor shall engage a Civil Engineer as necessary to prepare an Erosion Control and SWRPP, and shall fully implement the recommendations of the Plan on the Project Site, including a Post-Construction Storm Water Management Plan.

3. The Contractor shall file a Notice of Intent to comply with the terms of the General Permit to discharge storm water associated with construction activity (WQ Order No. 92-08-DWQ). The Notice of Intent must be sent to the following address along with the appropriate payment (warrant to be furnished by the Owner upon request by the Contractor, allow normal warrant processing time) California State Water Resources Control Board, Division of Water Quality Storm Water Permit Unit, P.O. Box 1977, 901 "P" Street, Sacramento, California 95812-1977; (916) 657-0919. The Notice of Intent shall be filed prior to the start of any construction activity.

K. Other Field Engineering: Other field engineering affecting means and methods of construction, or engineering of specific building components as required by Specification, or demolition shall be the responsibility of the Contractor.

END OF DOCUMENT

11/13/13

DOCUMENT 01 77 00

CLOSE OUT PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Document Includes:

1. Description of Contract closeout procedures including:

a. Removal of Temporary Construction Facilities
b. Substantial Completion
c. Final Completion
d. Project Record Documents
e. Project Guarantee
f. Warranties
g. Turn-In
h. Release of Claims
i. Fire Inspection Coordination
j. Building Inspection Coordination

1.2 REMOVAL OF TEMPORARY CONSTRUCTION FACILITIES

A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion inspection.

B. Clean and repair damage caused by installation or use of temporary facilities.

C. Restore permanent facilities used during construction to specified condition.

D. Comply with Document 01 50 00 (Temporary Facilities and Controls).

1.3 SUBSTANTIAL COMPLETION

A. When Contractor considers Work or designated portion of the Work as Substantially Complete, submit written notice to District, with list of items remaining to be completed or corrected.

B. Within reasonable time, District will inspect to determine status of completion.

C. Should District determine that Work is not Substantially Complete, District will promptly notify Contractor in writing, listing all defects and omissions.

D. Remedy deficiencies and send a second written notice of Substantial Completion. District will re-inspect the Work. If deficiencies previously noted are not corrected on re-inspection, then pay the cost of the re-inspection.

E. When District concurs that Work is Substantially Complete, District will issue a Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified by District.

F. Manufactured units, equipment and systems that require startup must have been started up and run for periods prescribed by District before a Certificate of Substantial Completion will be issued.

G. A punch list examination will be performed upon Substantial Completion. One follow-up review of punch list items for each discipline will be provided. If further Site visits are required to review punch list items due to incompleteness of the Work by Contractor, Contractor will reimburse District for costs associated with these visits.

1.4 FINAL COMPLETION

A. Final Completion occurs when Work meets requirements for District's Final Acceptance. When Contractor considers Work is Finally Complete, submit written certification that:

1. Contractor has inspected Work for compliance with Contract Documents, and all requirements for Final Acceptance have been met.

2. Except for Contractor maintenance after Final Acceptance, Work has been completed in accordance with Contract Documents and deficiencies listed with Certificate of Substantial Completion have been corrected. Equipment and systems have been tested in the presence of District, and are operative.

3. Work is complete and ready for final inspection.

B. In addition to submittals required by Contract Documents, provide submittals required by governing authorities and submit final statement of accounting giving total adjusted Contract Sum, previous payments, and sum remaining due.

C. When District finds Work is acceptable and final closeout submittals are complete, District will issue final Change Order reflecting approved adjustments to Contract Sum not previously made by Change Order. Should District determine that Work is incomplete or Defective:

1. District promptly will so notify Contractor, in writing, listing the incomplete or Defective items.

2. Promptly remedy the deficiencies and notify the District when it is ready for re-inspection.

3. When District determines that the Work is acceptable under the Contract Documents, District will request Contractor to make closeout submittals.

D. Final adjustments of accounts:
   1. Submit a final statement of accounting to District, showing all adjustments to the Contract Sum and complete and execute Document 00 88 00 (Agreement and Release of Any and All Claims).

   2. If so required, District shall prepare a final Change Order for submittal to Contractor, showing adjustments to the Contract Sum that were not previously made into a Contract Modification.

1.5 PROJECT RECORD DOCUMENTS

A. Contract Documents will not be closed out and final payment will not be made until completion and submittal of Project Record Documents described in Document 01 78 00 (Project Record Documents).

1.6 PROJECT GUARANTEE

A. Requirements for Contractor's guarantee of completed Work are included in Document 00 72 00 (General Conditions). Guarantee Work done under Contract against failures, leaks, or breaks or other unsatisfactory conditions due to defective equipment, materials, or workmanship, and perform repair work or replacement required, at Contractor's sole expense, for period of one year from date of Final Acceptance.

B. Neither recordation of Final Acceptance nor final certificate for payment nor provision of the Contract nor partial or entire use or occupancy of premises by District shall constitute acceptance of Work not done in accordance with Contract Documents nor relieve Contractor of liability in respect to express warranties or responsibility for faulty materials or workmanship.

C. District may make repairs to Defective Work as set forth in Document 00 72 00 (General Conditions).

D. If, after installation, operation, or use of materials or equipment to be provided under Contract proves to be unsatisfactory to District, District shall have right to operate and use materials or equipment until said materials and equipment can, without damage to District, be taken out of service for correction or replacement. Period of use of Defective materials or equipment pending correction or replacement shall in no way decrease guarantee period required for acceptable corrected or replaced items of materials or equipment.

E. Nothing in this Document 01 77 00 shall be construed to limit, relieve, or release Contractor's, Subcontractors', and equipment suppliers' liability to District for damages sustained as result of latent defects in equipment caused by negligence of suppliers' agents, employees, or Subcontractors. Stated in another manner, warranty contained in the Contract Documents shall not amount to, nor shall it be deemed to be, waiver by District of any rights or remedies (or time limits in which to enforce such rights or remedies) it may have for Defective workmanship or Defective materials under laws of this State pertaining to acts of negligence.

1.7 WARRANTIES

A. Execute Contractor's Submittals and assemble warranty documents, and Installation, Operation, and Maintenance Manuals described in Document 01 78 00 (Submittal Procedures), executed or supplied by Subcontractors, suppliers, and manufacturers.

1. Provide table of contents and assemble in 8½ inches by 11 inches three-ring binder with durable plastic cover, appropriately separated and organized.

2. Assemble in Specification Document order.

B. Submit material prior to final Application for Payment.

1. For equipment put into use with District's permission during construction, submit within 14 Days after first operation.

2. For items of Work delayed materially beyond Date of Substantial Completion, provide updated Submittal within 14 Days after acceptance, listing date of acceptance as start of warranty period.

C. Warranties are intended to protect District against failure of Work and against deficient, Defective, and faulty materials and workmanship, regardless of sources.

D. Limitations: Warranties are not intended to cover failures that result from the following:

1. Unusual or abnormal phenomena of the elements

2. Vandalism after Substantial Completion

3. Insurrection or acts of aggression including war

E. Related Damages and Losses: Remove and replace Work which is damaged as result of Defective Work, or which must be removed and replaced to provide access for correction of warranted Work.

F. Warranty Reinstatement: After correction of warranted Work, reinstate warranty for corrected Work to date of original warranty expiration or to a date not less than one year after corrected Work was done, whichever is later.

G. Replacement Cost: Replace or restore failing warranted items without regard to anticipated useful service lives.

H. Warranty Forms: Submit drafts to District for approval prior to execution. Forms shall not detract from or confuse requirements or interpretations of Contract Documents.

1. Warranty shall be countersigned by manufacturers.

2. Where specified, warranty shall be countersigned by Subcontractors and installers.

I. Rejection of Warranties: District reserves right to reject unsolicited and coincidental product warranties that detract from or confuse requirements or interpretations of Contract Documents.

J. Term of Warranties: For materials, equipment, systems, and workmanship, warranty period shall be one year minimum from date of Final Completion of entire Work except where:

1. Detailed Specifications for certain materials, equipment or systems require longer warranty periods.

2. Materials, equipment or systems are put into beneficial use of District prior to Final Completion as agreed to in writing by District.

K. Warranty of Title: No material, supplies, or equipment for Work under Contract shall be purchased subject to any chattel mortgage, security agreement, or under a conditional sale or other agreement by which an interest therein or any part thereof is retained by seller or supplier. Contractor warrants good title to all material, supplies, and equipment installed or incorporated in Work and agrees upon completion of all Work to deliver premises, together with improvements and appurtenances constructed or placed thereon by Contractor, to District free from any claim, liens, security interest, or charges, and further agrees that neither Contractor nor any person, firm, or corporation furnishing any materials or labor for any Work covered by Contract shall have right to lien upon premises or improvement or appurtenances thereon. Nothing contained in this paragraph, however, shall defeat or impair right of persons furnishing materials or labor under bond given by Contractor for their protection or any rights under law permitting persons to look to funds due Contractor in hands of District.

1.8 TURN-IN

A. Contract Documents will not be closed out and final payment will not be made until all keys issued to Contractor during prosecution of Work and letters from property owners are turned in to District.

1.9 RELEASE OF CLAIMS

A. Contract Documents will not be closed out and final payment will not be made until Document 00 88 00 (Agreement and Release of Any and All Claims) is completed and executed by Contractor and District.

1.10 FIRE INSPECTION COORDINATION

A. Coordinate fire inspection and secure sufficient notice to District to permit convenient scheduling (if applicable).

1.11 BUILDING INSPECTION COORDINATION

A. Coordinate with District a final inspection for the purpose of obtaining an occupancy certificate (if applicable).

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF DOCUMENT

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

D. DSA forms

1.2 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.3 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:

1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.

2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.

3. Submit one set of revised final documents in electronic form within 10 days after final inspection.

C. Warranties and Bonds:

1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.

2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.

3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as

the beginning of the warranty period.

D. DSA Forms

1. Complete form DSA 6-C at completion of the work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:

1. Drawings.
2. Addenda.
3. Change Orders and other modifications to the Contract.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Record Drawings : Legibly mark each item to record actual construction including:

1. Field changes of dimension and detail.
2. Details not on original Contract drawings.

3.2 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.3 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include:

1. Section 02 41 19 "Selective Demolition" for demolition of selected portions of the building.
2. Section 07 84 13 "Through-Penetration Firestopping" for patching fire-rated construction.
3. Divisions 2 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other Work.

1.4 INFORMATIONAL SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least ***[15]*** working days prior to the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.

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5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time services and systems will be disrupted.
    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection. Structural elements include but are not limited to:
    1. Foundation construction.
    2. Bearing and retaining walls.
    3. Structural concrete.
    4. Structural steel.
    5. Wood framing.
    6. Stair systems.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    1. Primary operational systems and equipment.
    2. Fire separation assemblies.
    3. Air or smoke barriers.
    4. Fire-suppression systems.
    5. Mechanical systems piping and ducts.
    6. Control systems.
    7. Communication systems.
    8. Fire-detection and alarm systems.
    9. Conveying systems.
    10. Electrical wiring systems.

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11. Operating systems of special construction.

C. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtainwall construction.
4. Sprayed fire-resistive material.
5. Equipment supports.
6. Piping, ductwork, vessels, and equipment.
7. Noise- and vibration-control elements and systems.

D. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. Comply with requirements for sustainable design and construction practices and procedures, using products for patching that comply with requirements in Section 01 81 13 "Sustainable Design Requirements."

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

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1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining aras or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 11 00 "Summary of Work."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size

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required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

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I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

1. Thoroughly clean piping, conduit, ductwork, and similar features before paint or other finishes are applied.

END OF SECTION 01 73 29

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SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Demolition and removal of selected portions of existing buildings or structures.
   2. Demolition and removal of selected existing site elements.
   3. Salvaging existing items for reinstallation or delivery to Owner.

B. Related Sections include:
   1. Division 1 Section for temporary construction, protection facilities, and environmental-protection measures for selective demolition operations.
   2. Division 1 Section for temporary protection of existing trees and plants that are affected by selective demolition.
   3. Division 1 Section for cutting and patching procedures.
   4. Division 1 Section for construction waste management and administrative and procedural requirements for salvaging and recycling of demolition waste.
   5. Division 1 Section for photographic documentation of existing buildings and sitework prior to selective demolition.
   6. Division 22 Sections for demolishing or relocating plumbing items.
   7. Division 23 Sections for demolishing or relocating mechanical items.
   8. Division 26 Sections for demolishing or relocating electrical items.
   9. Section 31 10 00 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.3 REFERENCES

A. American National Standards Institute (ANSI)/American Society of Safety Engineers (ASSE):
   1. ANSI/ASSE A10.6: Safety Requirements for Demolition Operations.

B. Cal/OSHA Standards - California Code of Regulations, Title 8, Chapter 4, Division of Industrial Safety.

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C. Code of Federal Regulations (CFR):
   1. 40 CFR, Part 82: Protection of Stratospheric Ozone.

D. EPA: United States Environmental Protection Agency.

E. National Fire Protection Association (NFPA):
   1. NFPA 51B: Standard for Fire Prevention During Welding, Cutting, and Other Hot Work.
   2. NFPA 241: Standard for Safeguarding Construction, Alteration, and Demolition Operations.

F. Resilient Floor Covering Institute (RFCI):
   1. Recommended Work Practices for Removal of Resilient Floor Coverings.

1.4 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction in a manner to prevent damage, and deliver to Owner.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are to be undisturbed and left in place.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.5 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
   1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.6 COORDINATION

A. Arrange demolition schedule so as not to interfere with Owner's on-site operations.

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1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structures.
3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review and finalize protection requirements for areas of existing construction to remain.
6. Review procedures for noise control and dust control.
7. Review procedures for protection of adjacent buildings.
8. Review items to be salvaged and returned to Owner.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control, and for noise control. Indicate proposed locations and construction of barriers.

D. Schedule of Selective Demolition Activities: Indicate the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Coordinate to avoid interruptions to Owner's on-site operations.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Shutoff and capping, and continuation of utility services.
4. Locations of temporary protection of means of egress, including for other tenants affected by selective demolition operations, if applicable.
5. Coordination of Owner's continuing occupancy of portions of existing buildings and of Owner's partial occupancy of completed Work.

E. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit prior to beginning Work.

F. Record drawings of removed, relocated, or abandoned utilities in accordance Division 1 Section for project closeout requirements.
1. Locate and dimension work with reference to permanent landmarks. Indicate materials and sizes of all components.

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G. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

H. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.9 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.10 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.11 FIELD CONDITIONS

A. Owner will occupy portions of the building immediately adjacent to selective demolition areas. Conduct selective demolition so Owner's operations will not be disrupted.

1. Provide not less than 10 working days notice to Owner of activities that will affect Owner's operations.
2. Maintain access to existing walkways, exits, and other adjacent occupied or used facilities.

B. Owner assumes no responsibility for buildings and structures to be demolished.

1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner as far as practical. Minor variations may occur as a result of Owner's salvaging operations prior to start of selective demolition work.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous materials will be removed by Owner's separate contractor before start of Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

F. On-site storage or sale of removed items or materials is not permitted.

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G. Utility Service: Maintain existing utilities serving building and protect them against damage during selective demolition operations, unless indicated otherwise.

1. Do not interrupt fire-protection service during selective demolition operations.

1.12 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

1. Roof warranty.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are the same as those indicated in Project Record Documents.

C. Determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations. If required, engage a professional engineer to perform an engineering survey of condition of building.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

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E. Survey of Existing Conditions: Record by use of preconstruction photographs or video, existing conditions that might be misconstrued as damage caused by demolition operations.

1. Inventory and record the condition of items to be removed and salvaged.
2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Utilities to be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

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4. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
5. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.
   5. Protect site improvements and landscaping to remain.
   6. Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate fumes and noise from selective demolition areas from occupied adjacent portions of building. Comply with Division 1 requirements for temporary facilities.

B. Temporary Shoring: Design, provide and maintain shoring, bracing, or structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
   1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Do not damage portions of existing construction indicated to remain. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

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2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. If using cutting torches, comply with applicable requirements of Cal/OSHA Standards (California Code of Regulations, Title 8), Chapter 4 - Division of Industrial Safety, Subchapter 7 – General Industry Safety Orders, Article 88 Fire Prevention in Welding and Cutting Operations, and NFPA 51B.
    a. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
    b. Maintain fire watch during and for at least 1 hour after flame-cutting operations.
    c. Maintain adequate ventilation when using cutting torch
5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
6. Equipment: Disconnect equipment indicated to be removed at nearest fitting connection to services, complete with service valves. Remove as whole units, complete with controls.
7. Remove debris from elevated portions by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
    a. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Concrete and Asphalt Paving: Cleanly saw-cut in straight lines, perimeter of area to be removed, then break up and remove portion indicated.
    a. At utility trenches occurring in existing paved areas to remain, remove portion occurring over width of trench.
    b. At concrete paving, use existing joints to define area of removal, unless indicated otherwise.
10. Dispose of demolished items and materials promptly. Comply with requirements in Division 1 Section for construction waste management and disposal.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:

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1. Items to be removed and salvaged are indicated on Drawings.
2. Comply with the following:
    a. Clean salvaged items of dirt and demolition debris.
    b. Remove premanufactured building components as whole units, intact and undamaged.
    c. Disconnect equipment at nearest fitting connection to services, complete with service valves. Remove as whole unit, complete with controls.
    d. Pack or crate items after cleaning. Identify contents of containers.
    e. Store items in a secure area until delivery to Owner.
    f. Transport items to storage area designated by Owner.
    g. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of container.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

E. Structural Steel: Dismantle field connections without bending or damaging steel members.

F. Roofing: Remove not more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. Refer to Division 7 Section for new roofing requirements.
1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roof system down to substrate.

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3.7 REPAIRS

A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.

B. Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

C. Restore landscaping plants to condition matching existing appearance prior to start of selective demolition work.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove from Project site, and legally dispose of, all demolished materials. Comply with all applicable regulations for salvaging and recycling of demolition waste materials. Materials to be disposed of in landfill, are to be disposed of in EPA-approved landfill acceptable to authorities having jurisdiction. Refer to Division 1 Section for construction waste management for additional requirements for salvaging and recycling demolition waste materials.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.

3.9 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

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SECTION 03 10 00

CONCRETE FORMWORK

PART I – GENERAL

1.1 Description of Work

A. Work under this section includes the furnishing and installing of all form work for cast-in-place concrete, complete, with all related accessories, items and incidentals required.

1.2 Applicable Standards (latest editions apply)

A. ACI- American Concrete Institute

1. 301, Specifications for Structural Concrete for Buildings.

2. 318, Building Code Requirements for Reinforced Concrete.

3. 347, Recommended Practice for Concrete Formwork.

B. ICC – International Code Council, Inc.

1. CBC 2016 California Building Code (California Code of Regulations, Title 24, Part 2)

PART II – PRODUCTS

2.1 Forming Materials

A. Unless otherwise indicated, materials for formwork shall be wood, steel, fiber or reinforced plastic and of suitable quality to achieve required finishes. Contractor shall conform with considerations and recommendations in ACI-347, Chapter 3, Materials for Formwork.

B. Unless otherwise indicated, contact surfaces in fabricated forms shall be smooth and uniform without warps, bends, dents, sags or irregular absorptive conditions and imperfections which might telegraph or product objectionable irregularities in the exposed concrete finish.

C. Form ties and spreaders shall leave a hole not larger than 7/8-inch nor less than ½-inch in diameter in the concrete surface. The portion of the tie remaining in the concrete shall be at least 1-inch back from the concrete surface that will be exposed to view, painted, damp proofed or waterproofed.

D. Chamfer strips: Milled from clear straight-grain lumber, surfaced on all sides. Other material of equal quality may be used only as authorized by Architect.

2.2 Form Coatings: Form coating and bond breaking materials shall be non-staining and completely compatible with finish materials and other surface treatment materials to be used.

PART III – EXECUTION

3.1 Construction of Forms:

A. The forms shall be constructed smooth, mortar-tight, true to the required lines and grade, and with sufficient strength to resist springing out of shape during the placing and vibrating of concrete. All dirt, chips, sawdust and other foreign matter shall be completely removed before concrete is placed. Forms previously used shall be thoroughly cleaned of all dirt, mortar and foreign matter before being used.

B. Before reinforcing steel is placed in forms, all inside surfaces of the forms shall be thoroughly coated with an approved form sealer. The form sealer shall be of high penetrating quality leaving no film on the surface of the forms that can be absorbed by the concrete or be incompatible with concrete paint.

C. All exposed edges shall be chamfered with triangular fillets ½-inch by ½-inch.

D. Joints in formwork for exposed walls and curbs shall be taped, where directed by Architect.

3.2 Stripping:

A. Forms shall be removed in such manner as to insure the complete safety of the structure. Conform to minimum requirements established by ACI 347 for specific conditions.

B. Formwork for walls and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations.

C. Whenever the formwork is removed during the curing period, the exposed concrete shall be protected and cured by one of the methods specified in Section 03 30 00.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCEMENT

PART I – GENERAL

1.1 Description of Work

A. Work under this Section includes the furnishing and installing of all steel reinforcing for cast-in-place concrete, complete, with all related items, accessories and incidentals required, such as ties, spacing devices inserts and all other material required to complete installation.

1.2 Applicable Standards (latest editions apply)

A. ACI- American Concrete Institute:

1. 301, Specifications for Structural Concrete for Buildings.

2. 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.

3. 318, Building Code Requirements for Reinforced Concrete.

B. ASTM- American Society for Testing and Materials, Referenced Standards

C. CRSI- Concrete Reinforcing Steel Institute:

1. Manual of Standard Practice

2. Recommended Practice for Placing Reinforcing Bars

E. ICC- International Code Council:

1. CBC – 2016 California Building Code (California Code of Regulations, Title 24, Part 2)

1.3 Submittals

A. Shop Drawings of all reinforcing steel shall be submitted for approval.

B. Mill Reports for each different heat to be used on the job shall be submitted for approval. Comply with CBC, Section 1913A.2.

1.4 Quality Assurance

A. Welders shall be qualified in accordance with AWS D1.4.

PART II – PRODUCTS

2.1 Materials

A. Reinforcing bars: Deformed, new billet-steel bars conforming to ASTM Designation A615, Grade 60 or ASTM A706 unless noted otherwise.

B. Reinforcement supports

1. At reinforcing placed over sand or earth, use precast concrete cubes.

2. At reinforcing placed over forms, provide supports with legs which are hot dip galvanized, stainless steel or plastic protected.

2.2 Fabrication: Except where specified otherwise herein or shown otherwise on the plans, reinforcing steel shall be cleaned, fabricated, placed, tied and supported in accordance with ACI 301 and ACI 315.

PART III – EXECUTION

3.1 Installation

A. Reinforcing bars shall be accurately placed and shall be supported and secured against displacement by the use of adequate and proper supporting and spacing devices, tie wire, etc., so that it will remain in its correct location in the finished work. No supporting devices shall be used that will impede the flow of concrete.

B. Do not bend or straighten reinforcing in any manner that will injure the material.

C. Install splices for reinforcing bars in accordance with drawings and ACI 318. Stagger splices in adjacent bars 5' – 0".

D. Reinforcing mesh shall be laid flat in place. Lap mesh at sides and ends 12 inches. Wire mesh together at 24 inches on center.

3.2 Clearances

A. Where not shown otherwise on the drawings, the minimum concrete coverage for steel reinforcement shall be as follows:

1. Where concrete is deposited against ground 3"

2. Concrete in forms exposed to earth or weather 2"

B. The clear spacing between parallel bars shall be not less than 1-1/2 times the normal diameter of the maximum size aggregate, and in no case less than 1-1/2 inches, except at splices which may be wired together.

3.3 Field Quality Control

A. Contractor shall examine placement of all reinforcement and embedded items prior to inspection by Owner's Testing Agency to ensure the proper clearances have been maintained and that all reinforcement and inserts are firmly tied to resist displacement.

B. The Owner's Testing Agency will inspect

1. In-place reinforcing steel

2. Field welding of reinforcing steel

3.4 Notification: Notify the Architect two working days in advance of concrete placement.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART I – GENERAL

1.1 Description of Work

A. Work under this Section includes the furnishings and installing of all concrete work, complete, with all related accessories, items and incidentals required.

B. Coordinate installation of all inserts and embedded items required or indicated.

1.2 Applicable Standards (latest editions apply)

A. ACI- American Concrete Institute:

1. 301, Specifications for Structural Concrete for Buildings.

2. 305, Recommended Practice for Cold Weather Concreting.

3. 306, Recommended Practice for Hot Weather Concreting.

4. 318, Building Code Requirements for Reinforced Concrete.

B. ASTM- American Society of Testing and Materials, Referenced Standards.

C. ICC- International Code Council:

1. CBC - 2016 California Building Code (California Code of Regulations, Title 24, Part 2)

1.3 Submittals

A. Mix Design and Tests:

1. Submit mix designs and compressive strength test reports from previous applications for specified types of concrete.

2. One copy of all test reports shall be forwarded to DSA, the Architect, the Structural Engineer, the Inspector of Record within fourteen days of the test. Test reports shall comply with all requirements of CCR Title 24, Part 1, Section 4-335.

3. The concrete mixes shall be based on designs of a professional testing laboratory, verified by test, also in accordance with ACI 318, Sections 5.3 and 5.4 and 2016 CBC section 1905A.

PART II – PRODUCTS

2.1 Materials

A. General: Materials for cast-in-place concrete shall be set as forth in ACI 301 except as modified herein and as otherwise indicated in project documents.

B. Portland Cement: ASTM C150 Type II modified, with maximum alkali content of 0.6 percent (from only one source). Comply with Title 24, Section 1903A. Test cement per Title 24, Section 1913A

C. Aggregates: ASTM C33, (from source as approved by the Testing Agency). Comply with Title 24, Sections 1903A.6, 1905A and ACI 318 Section 3.3

D. Water: clean, potable, free of injurious materials.

E. Admixtures: Only brand products documented to have had not less than five years of satisfactory performance shall be used. Admixtures containing chlorides shall not be used. Comply with ACI-318, Section 3.6.

1. Air Entraining: ASTM C260

F. Grout: Manufactured pre-mixed. Non-ferrous, non-staining, flowable grout which will not shrink as it cures, 5000 psi @ 7 days.

G. Fly Ash: Shall conform to CBC Section 1903A.5

2.2 Concrete Mix

A. Ready-Mix Concrete: ASTM C94.

2.3 Proportion and Mixture

A. Proportioning mixtures and production of concrete shall be in accordance with ACI 318, Section 5.2 and 2016 CBC section 1905A and shall be in accordance with mix designs submitted by Laboratory and approved by the Owner's Testing Agency. All concrete shall have at least 5 sacks of cement per cubic yard of mix.

B. Concrete shall have 3% +/- 1%, air entrainment when approved by Testing Agency.

C. Water reducing admixtures may be used in concrete when approved by Testing Agency. Such admixtures shall not interfere with or reduce required air content dosage of air-entrained concrete.

D. Use a minimum of 5 sacks of cement per cubic yard for all concrete.

E. Concrete Mix Requirements: The following table presents a schedule of elements of concrete, compressive strength in psi after 28-days when tested in accordance with ASTM C39, maximum aggregate and maximum slump, which shall be as follows:

Concrete Element	*Strength*	*Max. Size Aggregate (Inch)*	*Max. Slump (Inch)*
All Concrete	per drawings	per drawings	per drawings

PART III – EXECUTION

3.1 Inspection

A. Areas in which concrete is to be placed shall be inspected by Contractor for defects which would prohibit satisfactory placement of concrete or related miscellaneous items. Such defects shall be corrected prior to commencement of work.

B. Concrete shall not be deposited or placed until all forms, reinforcing steel and construction joints have been inspected by Owner's Testing Agency and accepted in advance within the entire extent of the pour. Architect shall be notified 48 hours prior to first pour.

3.2 Field Quality Control

A. The Owner's Testing Agency will:

1. Review concrete mix designs.

2. Perform testing in accordance with ACI 318 and CBC Sections: 1903A and 1905A and 1913A.

3. Continuously monitor concrete temperature and inspect concrete placement.

4. Test concrete to control slumps according to ATSM C31 and ASTM C172.

5. Test concrete for required compressive strength in accordance with ACI 318, Section 5 and CBC 2016 Section 1905A and 1913A.

a. Make and cure three specimen cylinders according to ATSM C31 for each 50 cubic yards per ACI 318, Section 5.6 and 2016 CBC section 1905A, or fraction thereof, of each class poured at site each day.

b. Retain one cylinder for 7-day test and two for the 28-day test.

c. Number each cylinder 1A, 1B, 1C, 2A, 2B, 2C, etc; date each set; and keep accurate record of pour each set represents.

d. Transport specimen cylinders from job to laboratory after cylinders have cured for 24-hours on site. Cylinders shall be covered and kept at air temperatures between 60 and 80 degrees Fahrenheit.

e. Test specimen cylinders at age 7-days and age 28-days for specified strength according to ASTM C39.

f. Base strength value on average of two cylinders taken for 28-day test.

B. The Contractor shall:

1. Submit ticket for each batch of concrete delivered to job site. Ticket shall bear the following information:

a. Design mix number.

b. Signature or initials of ready mix representative.

C. Comply with Title 24, ACI 318, Section 5 and CBC 2016 Section 1905A

3.3 Workmanship

A. All concrete shall be placed, finished and cured, and all other pertinent construction practices shall be in accordance with the Specifications for Structural Concrete for Buildings (ACI 301) hereby made a part of these specifications.

B. In addition to the requirements of ACI 301, the following shall prevail:

1. Concrete shall be placed so that a uniform appearance of surface will be obtained.

2. The concrete shall be free of all rock pockets, honeycombs and voids.

3. Concrete shall be deposited as nearly as practical in its final position.

4. The sub-grade shall be slightly moist when the concrete is placed for floor slabs to prevent excessive loss of water from the concrete mix.

5. Place concrete within 90 minutes of mixing.

C. Vibrators and Vibrating:

1. Employ as many vibrators and tampers as necessary to secure the desired results. Minimum: one per each 20 cubic yards of concrete placed per hour.

2. Eliminate the following applications:

a. Pushing of concrete with vibrator.

b. External vibration of forms.

c. Allowing vibrator to vibrate against reinforcing steel where steel projects into green concrete.

d. Allowing vibrator to vibrate contact faces of forms.

3. Vibrators shall function at a minimum frequency of 3600 cycles per minute when submerged in concrete.

4. Supplement vibration by forking and spading along the surfaces of the forms and between reinforcing whenever flow is restricted.

D. Curing:

1. General: Freshly deposited concrete shall be protected from premature drying and excessively hot or cold temperatures and shall be maintained with minimal moisture loss at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete. Also comply with ACI 318, Section 5.11 and 2016 CBC Section 1905A.

2. Initial Curing: Initial curing shall immediately follow the finishing operation. Concrete shall be kept continuously moist at least over night. One of the following materials or methods shall be used:

   a. Ponding or continuous sprinkling.

   b. Absorptive mat or fabric kept continuously wet.

3. Final Curing: Immediately following the initial curing and before the concrete has dried, additional curing shall be accomplished by one of the following materials or methods:

   a. Continuing the method used in initial curing.

   b. Slabs to receive finish flooring materials to be continuously wet cured for 7 days.

   c. Waterproof paper conforming to "Specifications for Waterproof Paper for Curing Concrete" (ASTM C171).

   d. Curing compounds conforming to "Specifications for Liquid Membrane-Forming Compounds for Curing Concrete" (ASTM C309). Such compounds shall be applied in accordance with the recommendations of the manufacturer and shall not be used on any surfaces against which additional concrete or other cementitious finishing materials (such as ceramic tile) are to be bonded, nor on surfaces on which such curing is prohibited by the project specifications.

   e. Other moisture-retaining coverings as approved.

4. Duration of Curing: The final curing continues until the cumulative number of days or fractions thereof, not necessarily consecutive, during which temperature of the air in contact with the concrete is above 50 degrees F., has totaled 7 days.

5. Formed Surfaces: Steel forms heated by the sun and all wood forms in contact with the concrete during the final curing period shall be kept wet. If forms are to be removed during the curing period, one of the above curing materials or methods shall be employed immediately. Such curing shall be continued for the remainder of the curing period.

E. Construction Joints

1. Joints not shown on the drawing shall be so made and located as to least impair the strength of the structural element and shall be approved by the Owner and Structural Engineer.

2. The surfaces of all concrete at all joints shall be thoroughly cleaned and all laitance removed by sandblasting.

3. Concrete surfaces at designated joints shall be roughened to ¼" relief with roto hammer or similar method.

4. Moisten all joints immediately prior to placement of concrete.

F. Embedded Items:

1. All sleeves, inserts, anchors and embedded items required for adjoining work or for its support shall be placed prior to concreting. Embedded items shall be positioned accurately and supported against displacement. Voids in sleeves, inserts and anchor bolt slots shall be filled temporarily with a readily removable material to prevent entry of concrete into the voids.

G. Grouting Column Bases:

1. The grout shall be mixed and placed in strict accordance with manufacturer's instructions.

2. Care shall be taken in the grouting to insure that there is full bearing between the base plates and the grout.

3.4 Defective Work: Work considered to be defective may be ordered to be replaced, in which case the Contractor shall remove the defective work at his expense. Work considered to be defective shall include, but not be limited to, the following:

A. Concrete in which defective or inadequate reinforcing steel has been placed.

B. Concrete incorrectly formed, or not conforming to details and dimensions on the drawings or with the intent of these documents, or concrete the surfaces of which are out of plumb or level.

C. Concrete below specified strength.

D. Concrete containing wood, cloth or other foreign matter, rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings.

3.5 Correction of Defective Work

A. The Contractor shall, at his expense, make all such corrections as directed by the engineer and approved by DSA.

B. Concrete work containing rock pockets, voids, honeycombs, cracks or cold joints not scheduled or indicated on the drawings shall be chipped out until all unconsolidated material is removed.

END OF SECTION

SECTION 03 54 13

GYPSUM-BASED UNDERLAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Gypsum-based cementitious underlayment for use below interior finish floor materials.

B. Related Sections include:
   1. Division 9 Sections for patching and leveling compounds used with floor coverings specified in individual sections.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Manufacturer Certificates: Signed by manufacturers of both underlayment and floor covering system certifying that products are compatible.

C. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

B. Product Compatibility: Manufacturers of both underlayment and floor covering system certify in writing that products are compatible.

C. Mockups: Apply gypsum-based underlayment mockups to demonstrate surface finish, bonding, texture, tolerances, and standard or workmanship.
   1. Apply mockups approximately 100 sq. ft. in area in location as directed by Architect.
   2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or detrimental effects.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature and humidity, ventilation, and other conditions affecting underlayment performance.

1. Place gypsum-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

1.7 COORDINATION

A. Coordinate application of underlayment with requirements of floor covering products, including adhesives, specified in Division 9 Sections, to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 GYPSUM-BASED UNDERLAYMENT

A. General: Self-leveling underlayment formulated from high-strength gypsum cements.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Maxxon Corporation; Gyp-Crete 2000.

2. Compressive Strength: Not less than 2000 psi.
3. Point Loading Capacity: 2,500 lbs. on one-inch diameter disc.
4. Weight: Not more than 7.2 lbs. /sq. ft. at 3/4-inch thickness.
5. Dry Density: 115 lbs. /cu ft.
6. Surface Burning Characteristics: As follows, per ASTM E 84:

a. Flame Spread Index: 0.

b. Smoke Developed Index: 0.

B. Sand Aggregate: Coarse sand, 1/8-inch or less, and as recommended by underlayment manufacturer.

1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable, and at a temperature of not more than 70 deg F.

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2.2 MISCELLANEOUS MATERIALS

A. Primer: Product of underlayment manufacturer recommended in writing for substrate conditions, and application indicated.

B. Sealer: Underlayment manufacturer's standard spray-applied sealer for application to underlayment surfaces to receive finish flooring materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance.
   1. Do not proceed with application until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.
   1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
   2. Fill substrate voids to prevent underlayment from leaking.

B. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coating that might impair underlayment bond and remove sanding dust.

C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

A. General: Install underlayment components according to manufacturer's written instructions.
   1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
   2. Coordinate application of components to provide optimum underlayment-to-substrate and intercomponent adhesion.
   3. At substrate expansion, isolation, and other moving joints, allow joint same width to continue through underlayment.

B. Apply underlayment to produce uniform, level surface.
   1. Thickness of underlayment (not including sound-deadening mat): 1 inch.
   2. Within each area, place underlayment in a continuous operation.

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C. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing process.

1. Provide continuous ventilation and adequate heat as required to remove moisture from area.

D. Apply sealer over cured underlayment according to manufacturer's written instructions.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 FIELD QUALITY CONTROL

A. Tests: Perform testing of gypsum underlayment material according to written recommendations of manufacturer.

1. Test cube samples as recommended by manufacturer in accordance with modified ASTM C 472.
    a. Testing Frequency: One set of three molded cube samples from each day's pour during underlayment application.
2. Slump: One test at point of placement for each day's pour during underlayment application.
    a. Slump Level: As per manufacturer's written recommendations.
3. Dryness: Five to seven days after pour, tape a 24 inch by 24 inch section of plastic to the surface of underlayment. Check plastic after 48 hours for moisture.
    a. If signs of moisture are present, allow underlayment to cure for an additional five days, and then perform test again. Repeat test until no signs of moisture are present.

B. Correct deficiencies in the Work that testing and inspection indicates does not comply with manufacturer's written guidelines.

3.5 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 03 54 13

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SECTION 05 12 00

STRUCTURAL STEEL

PART I – GENERAL

1.1 Description of Work

A. Section includes:

1. Structural steel.
2. Reinforcing steel welded to structural steel.
3. Grout for base plates and bearing plates.

1.2 Applicable Standards (latest editions apply)

A. ASTM – American Society for Testing and Materials

1. A6 – Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use.
2. A36 – Specification for Steel.
3. A53 – Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
4. A123 – Specification for Zinc (Hot Dip Galvanized) Coating on Iron and Steel Products.
5. A153 – Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. A307 – Specification for Carbon Steel Externally Threaded Standard Fasteners.
7. A325 – Specification for Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength.
8. A354 – Specification for Quenched and Tempered Steel Bolts and Studs and Other Externally Threaded Fasteners.
9. A449 – Specification for Quenched and Tempered Steel Bolts and Studs.
10. A490 – Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
11. A500 – Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing.
12. A563 – Specification for Carbon and Alloy Steel Nuts, 2013 Edition.

13. A572 – Specification for High Strength Low Alloy Columbium-Vanadium Steel of Structural Quality.

14. A615 – Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

15. A706 – Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.

16. A780 – Specification for Repair of Damaged Hot-Dip Galvanized Coatings.

17. A913 – Specification for High Strength Low Alloy Shapes of Structural Quality Produced by Quenching and Tempering Process.

18. A992 – Specification for Steel for Structural Shapes for use in Building Framing.

19. C1107 – Specifications for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

20. F844 – Specification for Washers, Steel, Plain (Flat) Unhardened for General Use.

B. AISC – American Institute of Steel Construction

1. Specification – AISC Manual of Steel Construction

2. Specification – ANSI/ AISC 360-10 Specifications for Structural Steel Buildings, 2010.

3. Specification – ANSI/ AISC 341-10 Seismic Provisions for Structural Steel Buildings, 2010.

4. Code – Code of Standard Practice for Steel Buildings and Bridges, 2010 Edition. Articles 3.2 and 3.3 and Section 4 and 9 of AISC Code are superseded by requirements of the General Conditions, Special Conditions and Contract Documents.

C. AWS – American Welding Society

1. D1.1 – Structural Welding Code (Latest Edition).

2. D1.4 – Structural Welding Code – Reinforcing Steel, (Latest Edition).

3. D1.8 – Seismic Supplements.

D. ICC – International Code Council:

1. CBC – California Building Code, 2016 Edition.

E. SSPC – Steel Structures Painting Council's, "Systems and Specifications".

1. SP1 – Solvent Cleaning.

2. SP2 – Hand Tool Cleaning.

3. SP3 – Power Tool Cleaning.

4. SP6 – Commercial Blast Cleaning.

1.3 Definitions:

A. Architecturally Exposed Structural Steel (AESS).

1. Structural steel framing exposed to view from the building exterior.

2. Structural steel framing noted as AESS on Drawings.

B. Heavy Shapes: ASTM A6, Group 3 shapes with flanges thicker than 1 1/2 inches and Group 4 shapes and Group 5 shapes; welded built-up members with plates exceeding 2-inches in thickness.

C. Demand Critical Weld:

1. Complete penetration welds in beam to column connections, including flange, flange reinforcement, stiffener plate and doubler plate welds.

2. Complete penetration welds of column splices and of columns to base plates.

3. Other complete penetration welds indicated as "Demand Critical" on Drawings.

1.4 Submittals

A. Shop Drawings:

1. Provisions of AISC Code, Section 4, are superseded by requirements of General Conditions, and Special Conditions.

2. Show size and location of structural members; give complete information necessary for the fabrication of members including cuts, copes, holes, stiffeners, camber, type and size of bolts and welds, surface preparation and finish; show methods of assembly.

3. Indicate welded connections using standard AWS symbols and clearly distinguish between shop and field welds.

4. Identify high strength bolted connections (snug-tight or slip-critical).

B. Certificates of compliance with specified standards.

1. All steel.

2. Fasteners, including nuts and washers.

3. Welding electrodes.

4. Studs.

5. Non-shrink Grout.

6. Reinforcing steel.

7. Primer Paint.

C. Certified manufacturer's test reports: Submit to Testing Laboratory for record purposes.

1. All Steel: Tensile tests and chemical analysis, welds. Include all trace elements for steel to receive Seismic Critical Welds.

2. High Strength bolts: As per ASTM A325-14, Section 1.4; or A490-14, Section 1.6.

3. Reinforcing Steel: Chemical, tensile and bend tests.

4. Heavy Shapes: Charpy V-Notch

D. Product Data

1. Welding Electrodes

E. Welder Certification

F. Written Welding Procedure Specification (WPS) in accordance with AWS D1.1 requirements for each different welded joint proposed for use, whether prequalified or qualified by testing.

1. Indicate as-detailed configuration and also the maximum and minimum fit-up configurations.

2. Identify specific electrode and manufacturer.

3. List actual values of welding parameters to be used so that clear instruction is provided to welders.

G. Procedure Qualification Record (PQR) in accordance with AWS D1.1 for all procedures qualified by testing.

H. Samples: As requested by the Testing Laboratory.

1.5 Quality Assurance

A. Code and Standards: Comply with provisions of following, except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges", 2010 Edition. Articles 3.2 and 3.3 and Sections 4 and 9 of AISC Code are superseded by requirements of the General Conditions, Special Conditions and Contract Documents.

2. AWS D1.1 "Structural Welding Code – Steel" and AWS D1.8"Seismic Supplement".

3. CBC Chapter 22A, Section 2205A.

4. Research Council on Structural Connections – "Specifications for Structural Joints Using ASTM A325 or A490 Bolts"

5. ANSI/ AISC 360-10 Specifications for Structural Steel Buildings.

6. Specification – ANSI/ AISC 341-10 Seismic Provisions for Structural Steel Buildings, 2010.

B. Qualifications for Welding Work: Qualify welding procedures and welding operators in accordance with AWS D1.1, "Qualification" requirements.

1. Qualify welders in accordance with AWS D1.1 for each process, position and joint configuration.

2. WPS's for each joint type shall indicate proper AWS qualification and be available where welding is being performed.

3. Welders who have not performed the required welding procedure for a period of six or more months shall be requalified.

4. Welders whose work fails to pass inspection shall be requalified before performing further welding.

5. If recertification of welders is required, retesting will be Contractor's responsibility.

C. Field Measurement: Field verify all existing conditions affecting steel members and steel member placement prior to fabricating and installation of steel members.

D. Pre-Fabrication/Pre-Erection Conferences: Contractor shall schedule meeting with Structural Engineer, Testing Laboratory and the Steel Fabricator and Erector's personnel supervising shop and field welding to review welding procedures and inspection requirements for "Seismic Critical Welds."

E. Welding Inspector Qualifications: All welding inspectors shall be AWS certified welding inspectors (CWI) as defined in AWS Standard and Guide for Qualification and Certification of Welding Inspectors, latest edition. Welding inspector's qualifications shall be submitted to the Structural Engineer for approval. Inspectors shall be trained and thoroughly experienced in inspecting welding operations. Comply with AWS section 6.1.3.

1.6 Scheduling and Sequencing

A. Ensure timely delivery of items to be embedded in work of other sections such as cast-in-place concrete; furnish setting drawings or templates and directions for installation.

PART II – PRODUCTS

2.1 Materials

A. General: All steel shall be identified as required by ICC CBC Section 2203A. Steel which is not properly identified shall be tested to show conformance with requirements of applicable ASTM Standard at Contractor's expense.

B. Exposed Surfaces: For fabrication of work that will be exposed to view, use only materials that are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding or by welding and grinding, prior to cleaning, treating and applying surface finishes.

C. Steel W Shapes: ASTM A992

1. Heavy Shapes (see "Definitions" in this Section) shall be supplied with Charpy V-Notch testing in accordance with ASTM A6 Supplementary Requirement S5. The impact test shall meet a minimum average value of 20 ft-lbs absorbed energy at +70 degrees Fahrenheit and shall be conducted in accordance with ASTM A673, frequency H, with the following exceptions:

a) The center longitudinal axis of the specimens shall be located as near as practical to midway between the inner flange surface and the center of the flange thickness at the intersection with the web mid-thickness.

b) Tests shall be conducted by the producer on material selected from a location representing the top of each ingot or part of an ingot used to produce the product represented by these tests.

F. Steel Channels and Angles: ASTM A36; or dual certified ASTM A36/A572.

G. Steel Plates and Bars:

1. ASTM A36 where designated on Drawings.

2. ASTM A572, Grade 50, unless indicated otherwise.

H. Steel Pipes: ASTM A53, Type S, Grade B.

I. Steel Tubing: ASTM A500, Grade B.

J. Standard Threaded Fasteners: ASTM A307, Grade A, bolts with ASTM A563 hex nuts.

K. High Strength Bolts:

1. ASTM A325, type 1; unless indicated otherwise.

2. ASTM A490 where designated on Drawings.

3. Nuts: ASTM A563

4. Washers: ASTM F436

5. Load indicating devices: requires approval of the Architect and DSA

L. Anchor Bolts (unless otherwise indicated on Drawings):

1. F1554, Grade as indicated on Structural Drawings; unless indicted otherwise.

2. Washers: ASTM F844; 5/16-inch minimum thickness.

3. Nuts: ASTM A563

M. Welding Materials: AWS D1.1; type required for base metals being welded.

1. Electrodes shall be low hydrogen.

2. Electrodes for "Demand Critical Welds" shall have a minimum Charpy V-notch toughness of 20 ft-lbs at -20 degrees Fahrenheit.

N. Shop Primer:

1. Type A Primer: Conforming to federal, state and local v.o.c. regulations; containing no lead or chromates; Tnemec Series 88HS, or approved equal.

2. Type B Primer: Organic zinc-rich urethane; conforming to federal, state and local v.o.c. regulations; Class A coating, Tnemec "90-97 Tneme-Zinc", or approved equal.

O. Studs

1. Headed Shear Connector Studs; AWS D1.1, Type B; as-welded size as shown on Drawings.

2. General Purpose Studs; AWS D1.1, Type A; as-welded size and configuration as shown on Drawings.

P. Reinforcing Steel: ASTM A706, deformed.

Q. Nonshrink Grout:

1. Premixed, nonmetallic, noncorrosive product, complying with ASTM C1107, Class B or C, at flowable consistency for 30 minutes for temperature extremes of 45 to 90 degrees F.

2. Subject to compliance with requirements, provide one of the following:
Masterflow 928, Master Builders.
Five Star Grout, U.S. Grout Corp.
Sika Grout 212, Sika Corp.

2.2 Fabrication

A. Fabricate structural steel in accordance with AISC Specification and AISC Code.

1. Architecturally Exposed Structural Steel conform to Section 10 of AISC Code.

2. Fabricate joints in heavy shapes in accordance with additional requirements of Section A 3.1(c) of AISC Specification.

3. Fabrication of flange cuts for RBS connections shall be in accordance with AISC 358 Section 5.7.

B. Connections: Where connection is not shown, design in accordance with standard practice unless otherwise directed by the Architect.

C. Drill, not punch, holes centered 6" or less from an edge to be complete penetration welded.

D. Assembly with High Strength Bolts

1. Construct connections in accordance with ICC CBC, Chapter 22A, using provisions for slip-critical joints, unless snug-tight bolts are indicated on Drawings.

2. Use standard holes (bolt diameter plus 1/16 inch), unless otherwise indicated on Drawings.

E. Assembly with Standard Threaded Fasteners

1. Draw up tight, check threads with chisel or provide approved lock washers or self-tightening nuts.

2. Provide beveled washers under bolt heads or nuts resting on surfaces exceeding five percent slope with respect to head or nut.

F. Welded Construction

1. Examine fit-up of joint for conformance with welding procedure specification. Do not proceed with welding until fit-up is inspected by Testing Laboratory.

2. Weld in accordance with AISC Specification using manual shielded arc method or flux cored arc method in accordance with AWS D1.1. Weld only in accordance with welding procedure specifications (WPS) for joint, which are to be available to welders and inspectors during the production process.

3. Groove welds shall be complete joint penetration welds, unless specifically designated otherwise on Drawings. Groove preparation is at Contractor's option, subject to qualification in accordance with AWS D1.1. Runoff plates shall be in accordance with AWS D1.1; end dams shall not be used.

4. Remove back-up plates for complete joint penetration wields where indicated in Contract Documents or when requested by Testing Laboratory to perform nondestructive testing. Remove at no additional cost to Owner.

5. Complete penetration groove weld Heavy Shapes in accordance with AISC Specification Section J1.7 for tension splices.

6. The following additional requirements apply to "Seismic Critical Welds":

a) Use electrodes specified for Seismic Critical Welds.

b) At beam flange to column welds, remove back-up plates, back gouge, clean by grinding and back weld with reinforcing fillet, unless Drawings specifically indicate that back-up bar may remain. Do not place reinforcing fillet until Testing Lab has inspected groove weld.

c) Cut off runoff plates 1/8-inch from edges and grind smooth (not flush).

7. Weld reinforcing steel to structural steel in accordance with AWS D1.4 using prequalified procedures.

8. Grind exposed welds of Architecturally Exposed Structural Steel smooth and flush with adjacent finished surface.

G. Column Bases: Finish in accordance with AISC Specification. Lack of contact bearing with column shall not exceed 1/16 inch.

H. Bearing Plates: Provide for attached or unattached installation under beams, and girders resting on footings, piers, and walls.

I. Headed Studs: Automatically end weld in accordance with AWS D1.1 and manufacturer's recommendations in such a manner as to provide complete fusion between the end of the stud and steel member.

2.3 Finishes

A. Preparation of Surfaces

1. All surfaces shall be cleaned per SSPC-SP1 "Solvent Cleaning" to remove oil and grease prior to any other surface preparation.

2. After fabrication, prepare the following steel surfaces in accordance with SSPC-SP2 "Hand Tool Cleaning":

a) Steel work to be spray-fireproofed.

b) Steel work to be encased in concrete.

c) Steel work to be hot-dip galvanized.

3. After fabrication, prepare the following steel surfaces in accordance with SSPC-SP3 "Power Tool Cleaning":

a) Interior steelwork to be painted with Type A Primer.

4. After fabrication, prepare the following steelwork in accordance with SSPC-SP6 "Commercial Blast Cleaning":

a) Exterior steelwork.

b) Architecturally Exposed Structural Steel.

c) Interior steelwork to receive Type B primer.

B. Painting

1. Apply one coat of primer to all structural steel surfaces unless otherwise noted. Do not paint the following surfaces:

   a) Surfaces to be encased in concrete except initial two inches.

   b) Surfaces to contact high-strength bolt connections, except surfaces painted with Type B Primer.

   c) Surfaces to be field welded.

   d) Surfaces to be spray fireproofed.

   e) Top surfaces of beams to receive metal deck.

2. Use Type A Primer applied at 2.0 mils minimum dry film thickness on all normal environment interior steelwork.

3. Use Type B Primer applied at 2.5 mils minimum dry film thickness on all exterior steelwork and on interior steelwork subjected to wet conditions or corrosive fumes (noted on Drawings).

4. Permit thorough drying before shipment.

C. Hot dip galvanizing:

1. Hot dip galvanize the following items:

   a) Items noted on Drawings as galvanized.

   b) Fasteners which connect galvanized components, except A490 bolts shall not be hot-dip galvanized.

2. Galvanized in accordance with the following:

   a) Steel members and fabrications: ASTM A123.

   b) Bolts, nuts, washers: ASTM A153.

3. Treat faying surfaces of slip-critical high strength bolted connections to achieve Class C surface in accordance with ICC CBC Chapter 22A.

2.4 Source Quality Control

A. Inspection and testing will be performed under provisions of Section 01400.

B. The Testing Laboratory will:

1. Review manufacturer's test reports for compliance with specified requirements.

2. Verify material identification.

3. Inspect high-strength bolted connections as required by CBC Section 1705A and 2204A.2 for conformance with CBC Chapter 22A.

4. Inspect welding as required by CBC Section 1705A and ICC CBC Section 2204A.1 in accordance with AWS D1.1. The following should be performed with each weld:

   a) Verify Welding Procedure Specification (WPS) sheet has been provided and has been reviewed with each welder performing the weld. Welds not executed in conformance with the WPS are rejectable.

   b) Verify fit-up meets tolerances of WPS and mark joint prior to welding.

   c) Verify welding consumables per Contract Documents and WPS.

   d) Verify welder qualification and identification.

   e) Verify amperage and voltage at the arc with hand-held meters.

   f) Observe preheat and interpass temperatures, weld pass sequence and size of weld bead.

5. For Seismic Critical Welds, inspect removal of back-up and run-off plates, prepatory grinding and execution of reinforcing fillet.

6. Nondestructive test all complete penetration groove welds larger than 5/16 inches by ultrasonic methods for conformance with the weld qualify and standard of acceptance of AWS D1.1 for welds subject to tensile stress. Pass sound through the entire weld volume from two crossing directions to extent feasible.

7. Ultrasonically inspect base metal thicker than 1/2-inches for discontinuities behind welds in accordance with CBC Section 2204A.1.

8. Periodically, inspect and test stud welding as required by CBC Section 1705A and CBC Sections 2204A, 2213A in accordance with AWS D1.1; review preproduction testing and qualification, periodically inspect welding and perform verification inspection and testing.

PART III – EXECUTION

3.1 Examination

A. Examine existing structure to support construction and verify the following:

   1. Location and elevation of bearings and anchor bolts are correct.

   2. Other conditions adversely affecting erection of steel are absent.

B. Do not begin erection before unsatisfactory conditions have been corrected.

3.2 Preparation

A. Supervise setting of anchor bolts and other embedded items required for erection of structural steel. Be responsible for correct bearing of steel and correct location of anchor bolts.

3.3 Erection

A. Erect structural steel in accordance with AISC Specification and AISC Code.

B. Grouting Baseplates and Bearing Plates: Prior to erection, clean and roughen concrete surface beneath baseplate to full ¼" amplitude; clean bottom surface of baseplate of bond-reducing materials. After columns have been positions and plumbed, flow nonshrink grout solidly between bearing surfaces to ensure no voids remain. Comply with manufacturer's recommendations for mixing, placing, finishing and curing of grout.

C. Where erection requires performing work of fabrication on site, conform to applicable standards of Fabrication Article.

D. Field corrections of major members will not be permitted without the Architect's prior approval.

E. Gas Cutting: Use of flame cutting torch will be permitted only after the Architect's prior approval and only where metal cut will not carry stress during cutting, stresses will not be transmitted through flame-cut surface and cut surfaces will not be visible in finished work.

1. Make cuts smooth and regular in contour.

2. To determine effective width of members so cute, deduct 1/8-inch from least width at cut edge.

3. Make radius of cut fillet as large as practical, but in no case less than one inch.

4. Do not use flame cutting torch to align bolt holes.

F. Field Touch-Up Painting: After erection, touch-up or paint field connections and abrasions in shop paint with same paint used for shop painting. Touch up galvanized surfaces in accordance with ASTM A780.

3.4 Cleaning

A. After erection, thoroughly clean surfaces to foreign or deleterious matter such as dirt, mud, oil, or grease that would impair bonding of fire-retardant coating, paint or concrete.

3.5 Field Quality Control

A. The owner's Testing Laboratory will:

1. Inspect erected structural steel as required to establish conformity of Work with reviewed shop drawings and Contract Drawings.

2. Inspect high-strength bolted connections as required by CBC Section 1705A and 2204A.2 for conformance with CBC Chapter 22A.

3. Inspect welding as required by CBC Section 1705A and ICC CBC Section 2204A.1 in accordance with AWS D1.1. The following should be performed with each weld:

   a) Verify Welding Procedure Specification (WPS) sheet has been provided and has been reviewed with each welder performing the weld. Welds not executed in conformance with the WPS are rejectable.

   b) Verify fit-up meets tolerances of WPS and mark joint prior to welding.

   c) Verify welding consumables per Contract Documents and WPS.

   d) Verify welder qualification and identification.

   e) Verify amperage and voltage at the arc with hand-held meters.

   f) Observe preheat and interpass temperatures, weld pass sequence and size of weld bead.

4. For Seismic Critical Welds, inspect removal of back-up and run-off plates, prepatory grinding and execution of reinforcing fillet.

5. Nondestructive test all complete penetration groove welds larger than 5/16 inches by ultrasonic methods for conformance with the weld qualify and standard of acceptance of AWS D1.1 for welds subject to tensile stress. Pass sound through the entire weld volume from two crossing directions to extent feasible.

6. Periodically, inspect and test stud welding as required by CBC Section 1705A and CBC Sections 2204A, 2213A in accordance with AWS D1.1; except that test studs shall be subjected to a 90° bend test by striking them with a hammer. Review preproduction testing and qualification, periodically inspect welding and perform verification inspection and testing.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Metal guardrails and handrails.
   2. Metal ladders.
   3. Shelf and support angles.
   4. Miscellaneous steel framing and supports for anchorage of items specified in other Sections.
   5. Miscellaneous steel trim.
   6. Premanufactured metal items:
      a. Aluminum access ladders.
      b. Slotted channel framing.
   7. Bar Grating and associated accessories

B. Related Sections include:
   1. Section 32 31 19 "Decorative Metal Fencing and Gates" for manufactured decorative metal site fencing and gates.
   2. Section 05 12 00 "Structural Steel" for structural steel framing, including exterior canopy framing.
   3. Section 09 91 00 "Painting" for field painting of metal fabrications.

1.3 PERFORMANCE REQUIREMENTS

A. General: In engineering railings and screens to withstand structural loads indicated, determine allowable working stresses of railing materials based on the following:
   1. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.
   2. Stainless Steel: 60 percent of minimum yield strength.
   3. Steel: 72 percent of minimum yield strength.

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B. Structural Performance: Provide metal fabrications capable of withstanding the effects of gravity loads and the following minimum loads and stresses within limits and under conditions indicated:

1. Handrails:
    a. Uniform load of 50 lbf/ft applied in any direction along entire length.
    b. Concentrated load of 200 lbf applied in any direction at any point.
    c. Uniform and concentrated loads need not be assumed to act concurrently.

C. Thermal Movements: Provide metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured item specified, including:

1. Aluminum access ladders.
2. Stainless steel access ladders.
3. Stainless steel guardrail
4. Grout.
5. Paint products.
6. Bar Grating and accessories

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.
3. For installed products and items indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For professional engineer.

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1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code - Steel."
   2. AWS D1.2, "Structural Welding Code - Aluminum."
   3. AWS D1.3, "Structural Welding Code - Sheet Steel."
   4. AWS D1.6, "Structural Welding Code - Stainless Steel."

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located, and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of handrails and guardrails that are similar to those indicated for this Project in material, design, and extent.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicated measurements on Shop Drawings.
   1. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

C. Schedule installation of railings so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 Articles where titles below introduce lists, the following requirements apply to product selection:
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited, products specified.

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2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited, manufacturers specified.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 STEEL AND IRON

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Rolled-Steel Floor Plate: ASTM A 786, rolled from plate complying with ASTM A 36 or ASTM A 283, Grade C or D.

C. Steel Tubing: ASTM A 500, cold-formed steel tubing.

D. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

2.4 STAINLESS STEEL

A. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304.

B. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

C. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

D. Stainless-Steel Pipe: ASTM A 312, Grade TP 304.

2.5 ALUMINUM

A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6, except as noted otherwise below:

1. Alloy 5052-H32 at manufactured accessible utility trench cover and liner.

B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6, except as noted otherwise.

C. Aluminum Castings: ASTM B 26, Alloy 443.0-F.

2.6 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum and stainless steel. Select fasteners for type, grade, and class required.

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B. Steel Bolts, Threaded Rods, and Nuts: Regular hexagon-head bolts and threaded rods, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1 (A1).

D. Anchor Bolts: ASTM F 1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated galvanized.

E. Eyebolts: ASTM A 489.

1. Closed eye with shoulder; lag screw, where indicated.

F. Machine Screws: ASME B18.6.3.

G. Lag Bolts: ASME B18.2.1.

H. Wood Screws: Flat head, ASME B18.6.1.

I. Plain Washers: Round, ASME B18.22.1.

J. Lock Washers: Helical, spring type, ASME B18.21.1.

K. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four(4) times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153.

L. Post-Installed Anchors: Fastener systems with working capacity calculated according to ICC-ES Acceptance Criteria indicated, and ACI 318 greater than or equal to design load, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency, and according to evaluation report acceptable to authorities having jurisdiction, based on applicable substrate type.

1. At Concrete: One of the following:

a. Torque-Controlled Expansion Anchors: Working capacity calculated according to ICC-ES AC01.

i) Product: Subject to compliance with requirements, provide one of the following:

a) Hilti, Inc.; Kwik-Bolt TZ (KB-TZ), sizes as indicated on Drawings.

-Product Report: ICC-ES Evaluation Report #ESR-3785.

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b) Simpson Strong-Tie Company; Strong-Bolt 2, sizes as indicated on Drawings.

-Product Report: ICC-ES Evaluation Report #ESR-3037.

c) Equal product in accordance with Division 1 requirements for product substitutions.

ii) Expansion Anchor Material: As indicated in referenced Product Report, and as follows:

a) Exterior: Stainless-steel, Alloy Group 1 (Type 304), ASTM F 593 and ASTM F 594.

b) Interior: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn5, unless otherwise indicated.

b. Adhesive Anchors: Working capacity calculated according to ICC-ES AC308.

i) Product: Subject to compliance with requirements, provide one of the following:

a) Hilti, Inc.; HY 200, with HAS anchor rod, sizes as indicated on Drawings.

-Product Report: ICC-ES Evaluation Report #ESR-3187.

b) Simpson Strong-Tie Company; ET-HP, with anchor rod sizes as indicated on Drawings.

-Product Report: ICC-ES Evaluation Report #ESR-3372.

c) Equal product in accordance with Division 1 requirements for product substitutions.

ii) Anchor Rod and Nut Material: As indicated in referenced Product Report, and as follows:

a) Exterior: Stainless-steel, Alloy Group 1 (Type 304), ASTM F 593 and ASTM F 594.

b) Interior: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn5, unless otherwise indicated.

2.7 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

1. For aluminum, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

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1. Provide product that complies with local regulatory limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR, Part 59, Subpart D (EPA Method 24).
2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer, if zinc-rich primer occurs on project.

C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
1. Use primer with a VOC content of 420 g/L (3.5 lb/gal) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Available Products:
a. Tnemec Company, Inc.; Tneme-Zinc.

D. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

G. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.8 MANUFACTURED ITEMS

A. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-4.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Unistrut Corporation; P1000 Series.
b. Equal product in accordance with Division 1 requirements for product substitutions.
2. Size of Channels: 1-5/8 inches by 1-5/8 inches.
3. Material: Galvanized steel, complying with ASTM A 653, structural steel, Grade 33, 0.108-inch (12 gage) thick.
4. Finish: Galvanized.
5. Fittings: Manufacturer's standard line of fittings for securing mechanical, plumbing, and electrical lines and equipment to channel framing and for

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connecting channel framing members to each other and adjacent construction; steel, ASTM A 36.

a. Finish: Galvanized, per ASTM A 153.

b. Fasteners: Temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

B. Bar Grating:

1. Available Manufacturers:
   a. McNichols
2. Construction Type: Welded
3. Series Type & Name: GW-100-A (19-W-4)
4. Product Spacing: 19-W-4
5. Primary Material: Stainless Steel
6. Alloy, Grade, or Type: Type 304
7. Material Finish: Mill Finish
8. Bearing Bar Size & Shape: 1 inch height x 1/8 inch thick rectangular bar
9. Bearing Bar Height: 1 inch
10. Bearing Bar Thickness: 1/8 inch
11. Bearing Bar Shape: Rectangular
12. Bearing Bar Shaping: 1 3/16 inch on center
13. Clear Space Between Bearing Bars: 1 1/16 inch
14. Bearing Bar Surface: Smooth
15. Bearing Bar Direction (span): Parallel to the length of the panel
16. Cross Bar Type: Twisted Rod spaced on 4 inch centers

C. Grating Accessories:

1. Available Manufacturers:
   a. McNichols
2. Accessory Type: Fasteners
3. Primary Material: Stainless Steel
4. Alloy, Grade, or Type: Type 304
5. Material Finish: Mill Finish
6. Profile: Type CB Saddle Clip
7. Weight: 0.04 lbs/each

2.9 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to the greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use

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connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously and cope components at connections to provide close fit. Comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

2.10 FABRICATION, RAILINGS

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Connections: Fabricate railings with welded connections, unless otherwise indicated.

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C. Form changes in direction as follows:

1. By radius bends of radius indicated.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

E. Close exposed ends of railing members with welded cap plate. Grind edges flush with profile of railing member.

F. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns.

1. Locate wall bracket for handrail at 6 inches from end of handrail return, unless otherwise indicated.

G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

H. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.11 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

C. Fabricate supports for operable partitions from continuous steel beams or channels of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize items occurring at exterior locations.

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2.12 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete or masonry construction as needed to complete the Work. Provide each unit with integrally welded anchors for embedding in concrete or masonry as indicated on Drawings.

2.13 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel anchors as indicated on Drawings for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

2.14 METAL LADDERS

A. General:

1. Comply with ANSI A14.3, unless otherwise indicated.
2. Support each ladder at top and bottom and not more than 60 inches on center with welded or bolted brackets, made from same metal as ladder.

B. Aluminum Access Ladder: Configure as indicated on Drawings.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Alaco Company.
   b. O'Keeffe's, Inc.
   c. Manufacturer of equal products in accordance with Division 1 requirements for product substitutions.
2. Provide siderail extensions with handrails at top of ladder.
   a. Extension Above Upper Roof Edge: 42 inches.
3. Space siderails distance apart as indicated on Drawings.
4. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches deep, 3/4 inch wide, and 1/8 inch thick.
5. Rungs: Extruded-aluminum tubes, not less than 3/4 inch deep and not less than 1/8 inch thick, with rubbed tread surfaces.
6. Fit rungs in centerline of siderails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.

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2.15 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.16 STEEL AND IRON FINISHES

A. Finish steel and iron items as follows:
   1. Hot-dip galvanize after fabrication, all items occurring at exterior locations.
      a. Steel pipe and tube downspouts to receive galvanized coating on both inner and outer surfaces.
   2. Shop prime all items occurring at interior locations, except those items indicated to be galvanized or left unprimed.

B. Galvanizing: Hot-dip galvanize items as indicated.
   1. Comply with applicable standard listed below:
      a. ASTM A 123, for galvanizing steel and iron products.
      b. ASTM A 153, for galvanizing steel and iron hardware.
   2. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
   1. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.17 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Satin Finish: No. 4.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

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2.18 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

G. Install manufactured items in accordance with written instructions of manufacturer.

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3.2 INSTALLATION, RAILINGS

A. Unless indicated otherwise, use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

B. Space posts at spacing indicated or, if not indicated, as required by design loads.

C. Set posts plumb in each direction within a tolerance of 1/16 inch in 3 feet.

D. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

E. Adjust railings before anchoring to ensure matching alignment at abutting joints.

F. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

G. Anchoring of posts into concrete: As indicated and as follows:
   1. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than outside diameter of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
   2. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch buildup, sloped away from post.

H. Attaching Handrails to Walls: As indicated, and as follows:
   1. Attach handrails to walls with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
   2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
   3. Secure wall brackets to building construction as follows:
      a. For concrete and solid masonry anchorage, use drilled-in expansion shields and lag bolts.
      b. For wood stud partitions, use wood screws of size and type required to support structural loads, set into solid wood backing between studs. Coordinate with carpentry work to locate backing members.
      c. For metal stud partitions, use self-tapping screws of size and type required to support structural loads, set into metal backing plate between studs. Coordinate with cold-formed metal framing work to locate backing plate.

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3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturer's written instructions and requirements indicated on Shop Drawings.

3.4 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting of Nongalvanized Steel and Iron Items: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

C. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

D. Check and adjust all operating hardware and moving parts for proper operation.

END OF SECTION 05 50 00

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SECTION 06 01 44

REFACING OF EXISTING WOOD CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Refacing of existing wood cabinets with high-pressure plastic laminate.

B. Section 06 41 00 "Architectural Wood Cabinets" for new wood cabinets with plastic laminate facing.

1.3 REFERENCES

A. ASTM International:
   1. ASTM B 209: Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.
   2. ASTM B 221: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

B. California Department of Public Health (CDPH):
   1. Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers – Version 1.1, February 2010.

C. California Green Building Standards Code (CALGreen) – California Code of Regulations, Title 24, Part 11.

D. National Electrical Manufacturers Association (NEMA):
   1. NEMA LD-3: High-Pressure Decorative Laminates.

E. South Coast Air Quality Management District (SCAQMD):
   1. Rule 1168 – Adhesive and Sealant Applications.

1.4 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site to review pertinent issues related to refacing of existing wood cabinets.
   1. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

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1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including:
   1. High-pressure decorative laminate facing.

B. Samples for Initial Selection: Manufacturer's full range of colors and patterns for the following, for selection by Architect:
   1. High-pressure decorative laminate.
      a. Minimum Number of Colors for Selection: 230.

C. Samples for Verification:
   1. High-pressure decorative laminate facing products, 4 inches by 6 inches for each type, color, pattern, and surface finish.
   2. Extruded aluminum trim piece, 4 inches long.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Entity that employs skilled workers who have a record of successful in-service performance for cabinet refacing projects similar in scope and complexity to this Project.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups of typical cabinet refacing, showing plastic laminate refacing on two adjacent surfaces, with edge termination, and corner transition conditions.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 CALGREEN REQUIREMENTS

A. General: Conform with all applicable requirements of the California Green Building Standards Code (CALGreen).

B. Provide adhesives and adhesive primers which comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, except as noted otherwise below. Such products shall also comply with Rule 1168 prohibition of the use of certain toxic compounds (chloroform, ethylene, dichloride, methylene chloride, perchloroethylene, and trichloroethyelen).

2.2 PLASTIC LAMINATE SURFACING

A. High-Pressure Decorative Laminate Surfacing for Refacing Existing Vertical Cabinet Surfaces: Manufacturers high-pressure laminate designed for application over existing substrates; NEMA LD 3, Grade VGS (0.028-inch nominal thickness).

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1. Product: Subject to compliance with requirements, provide one of the following:
   a. Wilsonart, LLC; RE-COVER.
2. Colors, Patterns, and Finishes: As specified in Section 09 06 00 "Colors and Finishes."

2.3 MISCELLANEOUS MATERIALS

A. Adhesives: Water-resistant type recommended by decorative laminate manufacturer to suit products and substrate conditions indicated.
   1. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.

B. Edge/Corner Trim: Aluminum, ASTM B 209 or ASTM B 221; profile and dimensions as indicated on Drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installing decorative laminate surfacing, examine substrates to receive surfacing, to ensure substrates are free of cracks, ridges, depressions, and other surface irregularities that could telegraph through decorative laminate surfacing material. Fill cracks, holes, and depressions with patching compound as recommended in writing by decorative laminate surfacing manufacturer. Remove bumps, ridges, and other projections as required to produce a uniform and smooth substrate.

B. Proceed with installation only after unsatisfactory conditions have been corrected.\

3.2 REFACING OF EXISTING CABINETS

A. Install decorative laminate surfacing at locations indicated in accordance with written instructions of manufacturer.
   1. Trim decorative laminate surfacing to conform to edges and profiles of existing cabinets for proper fit, flushness, and alignment without gaps at edges or where abutting adjacent surfaces.
   2. Fully adhere decorative laminate surfacing sheet to substrate.

B. Install metal trim at edge and corner conditions as indicated.

END OF SECTION 06 01 44

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SECTION 06 10 00

ROUGH CARPENTRY

PART I – GENERAL

1.1 Description Of Work

A. Work Included:

1. Wood framing and sheathing systems.
2. Wood furring, blocking and nailers.
3. Backing for wall mounted equipment, railings, toilet partitions, toilet accessories, etc.
4. Rough hardware, including tie-downs, post caps, etc.
5. Acoustical sealant, where indicated, at wood plates and plywood.
6. Prefabricated wood products

1.2 Applicable Standards (latest editions apply)

A. AITC- American Institute of Timber Construction Standards

1. 110 – Standard Appearance Grades for Structural Glued Laminated Timber.
2. 111 – Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection.
3. 113 – Standard for Dimensions of Glued Laminated Structural Members.
4. 115 – Standard for Fabricated Structural Timber
5. 103 – Standard for Structural Glued Laminated Timber

B. ANSI- American National Standards Institute

1. ANSI/AITC A190.1 Structural Glued Laminated Timber
2. ANSI/ASME B18.2.1 Square and Hex Bolts and Screws (Inch Series)
3. ANSI/ASME B18.6.1 Wood Screws (Inch Series)

C. APA- American Plywood Association Product Standard PS 1-09.

D. ASTM- American Society for Testing and Materials: D05055-90, Establishing and monitoring Structural Capacities of Prefabricated Wood I Joists.

E. AWPA- American Wood Preservers Association Standards

F. AWPI- American Wood Preservers Institute LP-2

G. ICC- International Code Council, Inc.

1. CBC- California Building Code, 2016 Edition

H. FS- Federal Specifications

I. TPI- Truss Plate Institute: Design Specification for Metal Plate Connected Wood Trusses.

J. WCLIB- West Coast Lumber Inspection Bureau, Grading Rule No. 17

1.3 Submittals

A. Shop drawings of glued laminated beams plus AITC or equal certificate of conformance with product standard ANSI/AITC 190.1

B. Shop drawings of prefabricated wood I joists including:

1. Plan layout of members and bridging, design loads and installation instructions.

2. Details of member connections, stiffeners, blocking and web openings.

3. Structural calculations stamped and signed by California Registered Civil Engineer.

C. Product information for rough hardware.

1.4 Store lumber and plywood off ground in manner to insure proper ventilation and protection from weather; and to prevent damage by either decay or insects. Store plywood under cover and cover lumber as required to avoid twisting and warping.

1.5 Coordinate work of this Section with work by others. Check lines and levels indicated on such other work as has been completed, before commencing work of this Section. Report discrepancies in writing to the Owner for correction and adjustment, or in the event of failure to do so, correct errors without additional cost to the Owner.

1.6 Install temporary bracing as required. Make proper provision to take care of stresses resulting from construction loads, whenever piles of materials, erection equipment or other loads are carried by frame during its erection.

PART II – PRODUCTS

2.1 Wood: Materials shall conform to grades and grading rules as hereinafter specified. Each piece of lumber and plywood shall be grade-stamped or certified by a competent agency approved by the Owner.

A. Plywood: (APA Grade) Structural I, CD with exterior glue, 5-ply construction, all Group 1 wood, minimum span rating 24/0 for roof sheathing, and 48/24 for floor sheathing.

B. Framing Lumber: Douglas Fir – Larch conforming to "WCLIB Standard Grading and Dressing Rules No. 17" as follows:

1. Structural Light Framing: 2" to 4" thick 2" to 6" wide D.F. No. 1

2. Structural Joists & Planks: 2" to 4" thick, 6" and wider D.F. No. 1 or better

3. Beams & Stringers: 5" and thicker, Rectangular width more than 2" greater than thickness D.F. No. 1, free of heart centers

4. Posts & Timbers: 5" x 5" and larger, width not more than 2" greater than thickness D.F. No. 1 free of heart centers

5. Sills: Pressure treated D.F. No. 1, AWPB Stamped, Ammoniacal Copper Quat (ACQ) treated AWPA Standard C2, minimum 4/10" penetration, incised

C. Glued Laminated Timber

1. Lumber; Douglas Fir (Laminating Grades), Grade Combination No. A (F_B = 2,400 psi) graded in accordance with the Standard Grading and Dressing Rules of WCLIB.

2. Glues: Exterior type adhesive conforming to ASTM D2559, resin adhesive of phenol, or melamine base applied in accordance with the manufacturer's recommendation.

3. Fabrication shall comply with the Standards established by the American Institute of Timber Construction, (AITC 103, 110, 113, 115 and ANSI / A190.1)

4. Provide extra length of at least six (6) inches at each end for field trim of all members, or verify field dimensions prior to fabrication of members to ensure proper fit.

5. Glu-lam beam fabrication shall be continuously inspected by a DSA certified inspector per 1705A.5.4 of the 2016 CBC, where required.

D. Prefabricated Wood I-joists: Red-I Joist by RedBuilt or an approved equal manufacturer. Fabrication of I-joists to take place under the supervision of an independent inspection agency.

1. Flanges: Continuous Laminated Veneer Lumber (LVL) proof loaded per ANSI A-190.1, moisture content not to exceed 15 percent ; F_t = 2000 psi, E = 2.0 x 10^6 psi.

2. Webs: CD Structural I plywood with exterior glue, grade marked by APA, in accordance with Product Standard PS1-83 or other recognized equal which complies with APA standards as substantiated by performance verification data and verified by an independent testing agency.

3. Adhesive: adhesives shall comply with ASTM D2559

4. Metal Bridging: Metal bridging shall be 20 gauge "TB-tension bridging" (nail type) as manufactured by Simpson Strong-Tie, or approved equal.

E. Laminated Veneer Lumber (LVL): "Microlam" as manufactured by Weyerhaeuser Co. or approved equal.

F. Parallel Strand Lumber (PSL): "Parallam" as manufactures by Weyerhaeuser Co. or approved equal.

G. Additional Grading Requirements

1. In order to qualify as "structural lumber", each piece including plywood, shall be marked with the grade of the lumber by some competent and reliable organization whose regular business is to establish lumber grades and whose trade-mark shall also appear on each piece; except that, a certificate from such an organization may be accepted in lieu of such grade and trade-marks. All plywood must be grade stamped on each piece with the APA trade-mark.

2. There shall be no boxed heart in any framing lumber 4" and larger in the least dimension.

2.2 Preservative Treatment

A. Use waterborne preservatives complying with AWPI LP-2.

B. All preservative treated lumber shall be retreated where cut on site.

2.3 Rough Hardware

Nails, bolts, nuts, washers, lag bolts, screws, anchor and other fastenings as shown or as required for complete installation. Galvanized or cadmium-plate for exterior work. Comply with the following specifications:

A. Wire Nails: Common. Plywood nails are acceptable at diaphragms and walls. Provide minimum penetration as required for common nails.

B. Bolts, Nuts, ASTM A307, (upset threads are prohibited)

C. Lag Screws and Lag Bolts: FF-B-561.

D. Wood Screws: FF-S-111.

E. Framing Clips, Boots, Hangers, hold-downs etc.: by Simpson Strong Tie or approved equal.

2.4 Glue: AFG – 01 approved. PL Premium" polyurethane construction adhesive by Chem Pex, Inc., or equal.

PART III – EXECUTION

3.1 General Framing

A. Joists, rafters and beams shall be cut as required to provide a full even and horizontal seating on the support, unless otherwise shown. Do not overcut.

B. Notches and bored holes in joists and beams shall be limited as shown on the drawings.

3.2 Framing For Pipes

A. Frame members for passage of pipes and ducts to avoid cutting structural members. Do not cut, notch or bore framing members for passage of pipes or conduits without architect's authorization.

B. Pipes 1" diameter or less may pass through a neatly bored hole in the center of the plates. Hole location is subject to the Architect's acceptance.

3.3 Fire stops: Provide 2" nominal fire stops in conformance with Section 708.2 of the CBC.

3.4 Blocking: Provide solid blocking in all walls for wall mounted items.

3.5 Furring: Provide furring, stripping, blocking, backing and grounds where indicated or where necessary to support, or to furnish suitable spacings for finish materials and accessories.

3.6 Nailing:

A. All nailing shall conform to CBC Table 2304.10.1, except where more stringent requirements are shown on drawings.

B. Penetration of nails or spikes into piece receiving point shall be not less than 1/2 length of nail or spike, except, that 16 penny nails may be used to connect pieces of 2" thickness.

C. Drive nails and spikes no closer together than 2/3 their length nor closer to edge of member than ½ their length, except when detailed otherwise.

D. Place nails without splitting wood. Pre-drill holes whenever nailing tends to split wood or plywood. Replace split members.

E. Use of machine nailing is subject to a satisfactory job site demonstration. Authorization is subject to continued satisfactory performance. If nail heads penetrate the outer ply of plywood more than would be normal for a hand hammer or if the minimum allowable edge distances are not maintained the performance will be deemed unsatisfactory.

3.7 Bolts And Lag Screws:

A. Provide bolts and lag screws, bearing on wood, with malleable iron or steel plate washers of sizes indicated under heads and nuts. All nuts and screws shall be tightened when placed and re-tightened at completion of the job or immediately prior to closing with finish construction. Nuts shall be secured against loosening.

B. Except where otherwise indicated on the details, bore holes for bolts with a bit 1/32" to 1/16" larger than nominal diameter as the bolt.

C. Bore lag screw holes the same diameter and depth as shank, continue hole to depth equal to length of lag screw and with a diameter equal to 40% to 70% of the diameter of the shank.

D. Screw all lag screws; do not drive into place. Embed threaded portion of lag screws in each timber a minimum of seven (7) times their shank diameter.

3.8 Preservative Treatment: Treat all framing in direct contact with concrete or masonry construction with wood preservative, as follows:

A. Wood bucks and nailing blocks: Dip in preservative 15 minutes prior to incorporation in concrete.

B. All treated lumber shall be marked or branded.

3.9 Glue Plywood Floor Sheathing to supporting members

3.10 Prefabricated Wood: Install prefabricated wood products in accordance with the recommendations of the manufacturer. All trusses and I-joists must be securely braced during erection and after permanent installation. Erection bracing shall hold trusses and I-joists straight and plumb and in safe condition until decking and permanent bracing has been fastened forming a structurally sound framing system. All erection and permanent bracing shall be installed and all trusses permanently fastened before application of any loads. Do not impose construction loads which cause stresses beyond design limits. Materials used in bracing are to be furnished by the erection contractor.

3.11 Removal Of Debris: Remove all wood, including form lumber, chips, shavings and sawdust in or on the ground from the area under the floor. No wood shall be buried in any fill.

END OF SECTION

SECTION 06 10 53

MISCELLANEOUS CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Miscellaneous wood framing.
   2. Plywood panel siding.

B. B. Related Sections include:
   1. Section 06 20 00 "Finish Carpentry" for exterior and interior wood trim.
   2. Section 09 91 00 "Painting" for field painting of miscellaneous carpentry work.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A 153: Specification for Zinc Coating (Hot-Dip) of Iron and Steel Hardware.
   2. ASTM A 307: Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
   3. ASTM A 563: Specification for Carbon and Alloy Steel Nuts.
   4. ASTM A 653: Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   5. ASTM B 633: Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
   6. ASTM E 488: Test Methods for Strength of Anchors in Concrete and Masonry Elements.
   7. ASTM F 593: Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
   8. ASTM F 594: Specification for Stainless Steel Nuts.
   9. ASTM A 666: Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   10. ASTM F 1667: Specification for Driven Fasteners: Nails, Spikes, and Staples.

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B. American Society of Mechanical Engineers (ASME International):
   1. ASME B18.2.1: Square and Hex Bolts and Screws (Inch Series).
   2. ASME B18.6.1: Wood Screws (Inch Series).

C. APA - The Engineered Wood Association.

D. California Building Code (California Code of Regulations, Title 24, Part 2).

E. ICC Evaluation Service, Inc.
   1. NES NER-272: Pneumatic or Mechanically Driven Staples, Nails, P-Nails and Allied Fasteners for Use in All Types of Building Construction.

F. Redwood Inspection Service (RIS).
   1. Standard Specifications for Grades of California Redwood Lumber.

G. U.S. Department of Commerce, National Institute of Standards and Technology:
   1. DOC PS1: U.S. Product Standard for Construction and Industrial Plywood.

H. West Coast Lumber Inspection Bureau (WCLIB):
   1. Standard No. 17: Grading Rules for West Coast Lumber.

I. Western Wood Products Association (WWPA):
   1. Western Lumber Grading Rules.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber and plywood flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.

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PART 2 - PRODUCTS

2.1 LUMBER

A. General: Provide lumber complying with applicable rules of indicated grading agency for grading and inspection, unless noted otherwise.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or other unexposed surface of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.

B. Douglas Fir:
   1. Grade: D.F. No. 1 per WCLIB or WWPA grading rules, unless otherwise indicated.
   2. Provide dressed lumber, S4S, unless otherwise indicated.
   3. Wood-Preservative Treatment by Pressure Process: Comply with performance requirements of AWPA C2 for wood-preservative treatment.
      a. Preservative Chemicals: Acceptable to authorities having jurisdiction.
      b. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
      c. Mark lumber with appropriate classification marking of an inspection agency acceptable *to* authorities having jurisdiction.
         i) For exposed lumber indicated to receive a stained or natural finish, mark end or other unexposed surface of each piece, or omit marking and provide certificates of treatment compliance issued by inspection agency.
      d. Kiln-dry lumber after treatment to a maximum moisture content of 19%. Do not use material that is warped or does not comply with requirements for untreated material.
      e. Application: Items receiving wood-preservative treatment are as indicated on Drawings, and also as follows:
         i) Wood framing, sills, sleepers, blocking, furring, stripping and similar members in contact with masonry or concrete.

C. Redwood:
   1. Grade: Construction Heart per RIS grading rules, unless otherwise indicated.
      a. Texture: Surfaced, unless otherwise indicated

2.2 PLYWOOD SIDING

A. Plywood Type: APA-rated siding.
   1. Face Grade: 303-6-W.
   2. Thickness: 1/2-inch, unless indicated otherwise.

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3. Face Species: Douglas fir.
4. Pattern: Match existing siding panels.
5. Surface: Match existing siding panels
6. Panel Size: 4 x 8 feet, unless indicated otherwise.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
   1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Wood Screws: ASME B18.6.1.

D. Lag Bolts: ASME B18.2.1.

E. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers.

F. Power-Driven Fasteners: NES NER-272.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn5. for interior installations, delete if not applicable
   2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2. for exterior installations, delete if not applicable
   3. Product: Subject to compliance with requirements, provide the following:
      a. Hilti Corporation; Kwik-Bolt 3 (KB-3), size as indicated on Drawings.
      b. Equal product in accordance with Division 1 requirements for product substitutions.

2.4 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Simpson Strong-Tie Co., Inc.
   2. Manufacturer of equal products in accordance with Division 1 requirements for product substitution.

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B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, which meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Galvanized Steel Sheet: Hop-dip, zinc-coated steel sheet complying with ASTM A 653, G60 (Z180) coating designation.

1. Use at locations not exposed to the exterior.

D. Stainless-Steel Sheet: ASTM A 666, Type 304.

1. Use at locations exposed to the exterior.

E. Basis-of-Design: Product designation numbers of Simpson Strong-Tie Co., Inc. are basis of design.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prime all surfaces of redwood to be painted, including unexposed faces and edges. Cut to required lengths, and prime ends. Comply with requirements in Section 09 91 00 "Painting."

B. Prime all surfaces of plywood siding panels, including backside and edges. Comply with requirements in Section 09 91 00 "Painting."

3.3 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

C. Install carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut carpentry to fit adjoining work.

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2. Coordinate carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate carpentry.
3. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

3.4 INSTALLATION, WOOD FRAMING

A. Metal Framing Anchors and Connectors: Where occurs, install metal framing anchors to comply with manufacturer's written instructions.

B. Do not splice structural members between supports, unless otherwise indicated.

C. Do not notch or bore holes in any framing member except as indicated on Drawings or allowed in writing by Architect and Engineer.

D. Provide blocking and framing as indicated and as required to support wall-mounted items, facing materials, fixtures, specialty items, and trim.

E. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

G. Securely attach carpentry work to substrate by anchoring and fastening as indicated.

H. Use common wire nails for nailing, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Do not countersink nail heads, unless otherwise indicated.
1. Except as indicated otherwise on Drawings, comply with the following 2016 California Building Code requirements for nailing:
   a. Table 2304.9.1 "Fastening Schedule," except where more stringent requirements are indicated.
2. Place nails without splitting wood. Predrill holes where required to prevent splitting lumber. Replace split members.
3. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

I. Bore holes for bolts with a diameter 1/32 to 1/16 inch larger than the diameter of the bolt. Tighten nuts when placed, and retighten immediately prior to closing in construction with finish materials, or at completion of project.
1. Provide malleable iron or steel washers under nuts and bolt heads.

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J. Bore holes for lag screws in member being fastened of the same diameter and depth of the shank. Continue hole in member being fastened to with a diameter of 75 percent of the diameter of the shank and of a depth equal to the penetration of the lag screw.

1. Provide lag screws with length as required to embed in solid framing member a distance of seven times the shank diameter.
2. Screw lag screws into place. Do not drive into place.
3. Provide malleable iron or steel washers under lag screw heads.

K. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Comply with indicated fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
2. Use finishing nails, unless otherwise indicated.

3.5 INSTALLATION, PLYWOOD SIDING

A. Install plywood siding to comply with manufacturer's written instructions.

B. Install panels with edges over framing or blocking. Nail at 6 inches on center at panel perimeter and 12 inches on center at intermediate supports unless indicated otherwise. Leave 1/16-inch gap between adjacent panels and 1/8-inch gap at perimeter, openings, and horizontal joints unless otherwise indicated.

1. Seal butt joints at inside and outside corners and at trim locations.
2. Install continuous metal flashing at horizontal panel joints.
3. Conceal fasteners to greatest practical extent by placing in grooves of siding pattern or by concealing with applied trim or battens as detailed. Do not nail through overlapping pieces.

END OF SECTION 06 10 53

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SECTION 06 20 00

FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Exterior:
      a. Trim.
      b. Backpriming of exterior finish carpentry work.
   2. Interior:
      a. Trim.

B. Related Sections:
   1. Section 06 10 53 "Miscellaneous Carpentry" for exterior plywood siding panels.
   2. Section 06 41 00 "Architectural Wood Casework" for cabinets.
   3. Section 09 91 00 "Painting" for field painting of exterior and interior finish carpentry to receive opaque finish.

1.3 DEFINITIONS

A. Inspection agencies, and the abbreviations used to reference them, include the following
   1. NHLA - National Hardwood Lumber Association.
   2. NLGA - National Lumber Grades Authority.
   3. RIS - Redwood Inspection Service.
   4. WI - Woodwork Institute.
   5. WWPA - Western Wood Products Association.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer.

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B. Quality Standard: Comply with the following standard:

1. Manual of Millwork of the Woodwork Institute, Version 3.0.
    a. Section 6 for exterior trim and millwork; Grade: Custom.
    b. Section 6 for interior trim and millwork; Grade: Custom.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

B. Deliver interior finish carpentry only when environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed according to manufacturer's written instructions and warranty requirements and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by the American Lumber Standards' Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.

B. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.

2.2 EXTERIOR STANDING AND RUNNING TRIM

A. Lumber Trim for Painted Applications: Kiln-dried, solid lumber with surfaced (smooth) face and of the following species and grade:

1. Species: Redwood.
2. Grade: Clear, RIS.

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2.3 INTERIOR STANDING AND RUNNING TRIM

A. Lumber Trim for Opaque Finish (Painted): Finished lumber (S4S), either finger-jointed or solid lumber, of one of the following species and grades:
   1. Species: Sugar Pine or Ponderosa Pine.
      a. Optional Material: Primed MDF of same actual dimensions as lumber indicated may be used in lieu of lumber.
   2. Grade: WI Custom.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws of the following materials, in sufficient length to penetrate minimum of 1-1/2 inches into substrate, unless otherwise recommended by manufacturer:
   1. Stainless steel.
   2. Hot-dip galvanized steel.

B. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
   1. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153.

C. Glue: Aliphatic-resin or phenolic-resin wood glue recommended by manufacturer for general carpentry use.

D. Flashing: Comply with requirements of Section 07 62 00 "Flashing and Sheet Metal" for flashing materials installed in finish carpentry.

E. Sealants: Comply with requirements of Section 07 92 00 "Joint Sealants" for materials required for sealing exterior finish carpentry work.

2.5 FABRICATION

A. General: Comply with fabrication requirements of specified WI Grades.

B. Wood Moisture Content: Comply with requirements of specified inspection agencies and with manufacturer's written recommendations for moisture content of finish carpentry at relative humidity conditions existing during time of fabrication and in installation areas.

C. Back out or kerf backs of the following members, except members with ends exposed in finished work:
   1. Exterior standing and running trim wider than 5 inches.
   2. Interior standing and running trim, except shoe and crown molds.

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D. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours, unless longer conditioning is recommended by manufacturer.

C. Prime all surfaces of lumber for exterior applications to be painted, including unexposed faces and edges. Cut to required lengths, and prime ends. Comply with requirements in Section 09 91 00 "Painting."

1. Where finish carpentry materials to be painted are exposed in interior areas of high humidity, prime all faces and edges.

3.3 INSTALLATION, GENERAL

A. Install finish carpentry work in accordance with requirements of specified WI Grade.

B. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

1. Do not use manufactured units with defective surfaces, sizes, or patterns.

C. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
3. Install to tolerance of 1/8 inch in 96 inches.for level and plumb. Install adjoining finish carpentry with 1/32 inch maximum offset for flush installation and 1/16 inch maximum offset for reveal installation.
4. Coordinate finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate finish carpentry.

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3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 36 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

1. Match color and grain pattern across joints.
2. Install trim after gypsum board joint finishing operations are completed.
3. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
4. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.
5. Fit exterior joints to exclude water. Apply flat grain lumber with bark side exposed to the weather.

3.5 ADJUSTING

A. Replace finish carpentry that is damaged or does not comply with requirements. Finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean finish carpentry on exposed and semi exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 20 00

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SECTION 06 41 00

ARCHITECTURAL WOOD CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Plastic-laminate-faced architectural cabinets.
   2. Plastic-laminate-faced countertops and splashes.
   3. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.

B. Related Sections include:
   1. Section 06 10 53 "Miscellaneous Carpentry" for concealed wood blocking and hanging strips in wood stud-framed walls for anchoring cabinets.
   2. Section 06 20 00 "Finish Carpentry" for interior standing and running trim and other interior woodwork.
   3. Division 22 Sections for plumbing fixtures installed in cabinets.

1.3 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A208.1: Particleboard.
   2. ANSI A208.2: Medium Density Fiberboard (MDF) for Interior Applications.

B. American National Standards Institute (ANSI)/International Cast Polymer Association (ICPA):
   1. ANSI/ICPA SS-1: Performance Standard for Solid Surface Materials.

C. ASTM International:
   1. ASTM A 36: Standard Specification for Carbon Structural Steel.
   2. ASTM C 920: Standard Specification for Elastomeric Joint Sealants.
   3. ASTM D 523: Standard Test Method for Specular Gloss.

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D. Builders Hardware Manufacturers Association (BHMA):
   1. BHMA A156.9: Cabinet Hardware.
   2. BHMA A156.18: Materials and Finishes.

E. California Air Resources Board:
   1. Airborne Toxic Control Measure to Reduce Formaldehyde Emissions From Composite Wood Products.

F. California Building Code (CBC) – California Code of Regulations, Title 24, Part 2.

G. California Code of Regulations, Title 17 – Public Health.

H. California Green Building Standards Code (CALGreen) – California Code of Regulations, Title 24, Part 11.

I. Laminating Materials Association (LMA):
   1. LMA EDG-1: Voluntary Product Standard and Typical Physical Properties of Edgebanding Materials.

J. National Electrical Manufacturers Association (NEMA):
   1. NEMA LD-3: High-Pressure Decorative Laminates.

K. South Coast Air Quality Management District (SCAQMD):
   1. Rule 1168 – Adhesive and Sealant Applications.

L. Woodwork Institute/Architectural Woodwork Manufacturer's Association of Canada (WI/AWMAC):
   1. North American Architectural Woodwork Standards – 3.0, U.S Version.

M. Woodwork Institute (WI):
   1. Certified Compliance Program.

1.4 DEFINITIONS

A. Composite Wood: Wood panel product, including medium-density fiberboard and particleboard, manufactured from wood materials in the form of particles combined with a resin binder and bonded together under heat and pressure.

B. DSA: Division of the State Architect.

C. Plastic-Laminate: High-pressure decorative laminate.

D. PVC: Polyvinyl chloride.

E. VOC: Volatile organic compound.

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1.5 COORDINATION

A. Coordinate sizes and locations of concealed framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that architectural wood cabinets can be supported and installed as indicated.

B. Coordinate locations of utilities that will penetrate countertops or splashes.

1.6 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site to review pertinent issues related to architectural wood cabinets.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including:
   1. Composite wood products.
   2. Cabinet hardware and accessories.
   3. High-pressure decorative laminate.
   4. Low-pressure decorative laminate.
   5. PVC edgebanding material.
   6. Sealant.
   7. Adhesives for bonding plastic-laminates and wood veneers.
   8. Finishing materials and processes.

B. Shop Drawings: Submit shop drawings in conformance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 1, showing location of each item, dimensioned plans and elevations, large-scale construction details, attachment devices, and other components. Shop drawings shall be reviewed by an independent WI Inspector (not the millwork contractor) and bear the WI Certified Compliance Program label, affixed to the first page of each set of the shop drawings.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking/backing and reinforcement specified in other Sections.
   3. Show countertop materials, finishes, edge, backsplash, and endsplash profiles, methods of joining, and cutouts for plumbing fixtures and other items occurring in countertop or splash.
      a. Show locations and details of joints.
      b. Show directional pattern, if any.
   4. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, appliances, electrical switches and receptacles, and other items installed in architectural wood cabinets.
   5. Include keying schedule with schematic keying diagram indexing each key set to cabinet doors and drawers.

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C. Samples for Initial Selection: Manufacturer's full range of colors and patterns for the following, for selection by Architect:

1. PVC edgebanding.
    a. Minimum Number of Colors for Selection: As required to match color of adjacent plastic-laminate facing.

D. Samples for Verification:

1. High-pressure decorative laminate-clad panel products, 4 inches by 6 inches for each type, color, pattern, and surface finish, with corresponding PVC edgebanding applied to one edge.
2. Low-pressure decorative laminate-surfaced panel products, 4 inches by 6 inches for each type, color, pattern, and surface finish.
3. Cabinet hardware and accessories, one unit for each type and finish.

E. CALGreen Submittals:

1. Manufacturer's product data for adhesives, sealants, and transparent wood finishes indicating compliance with product requirements specified in "CALGreen Requirements" Article.
2. Manufacturer's product data for composite wood products indicating compliance with product requirements specified in "CALGreen Requirements" Article.

1.8 INFORMATIONAL SUBMITTALS

A. Woodwork Quality Standard Compliance Certificates: WI Certified Compliance Program Certificates as specified in "Quality Assurance" Article.

B. Qualification Data: For Installer and fabricator. Demonstrate capabilities and experience.

1. Include list of completed projects with project names, addresses, and names of Owners and Architects.

1.9 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

C. Quality Standard: Unless otherwise indicated, comply with the AWI/AWMAC/WI Architectural Woodwork Standards, Edition 2, for grades of architectural wood cabinets and countertops indicated for construction, finishes, installation, and other requirements.

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1. WI Quality Marking: Mark each unit of the following types of architectural wood cabinets with WI Certified Compliance Label indicating compliance with specified quality grade.
    a. Cabinets.
    b. Plastic-laminate countertops and splashes.
2. WI Certificate of Compliance: Before delivery to the jobsite, obtain from WI, a Certified Compliance Certificate for materials and workmanship certifying that cabinet products fully meet requirements of the grades specified.
    a. Upon completion of installation, obtain from WI, a Certified Compliance Certificate, certifying that installation is in compliance with specified AWI/AWMAC/WI requirements.
3. The Contract Documents may contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with such selections and requirements in addition to the quality standard.
4. If, for any reason, a reinspection is requested of Work required to be manufactured in accordance with the Architectural Woodwork Standards, and for which a fee is charged, said fee (if millwork is found to be non-conforming in any manner) shall be the responsibility of the Contractor and subsequently deducted from the contract price in form of a deductive change order.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and execution.
1. Build mockups of typical architectural wood base cabinet and upper cabinet as shown on Drawings
2. Cabinet sample shall have removable countertop; one drawer; door with one adjustable shelf, toe space/base, complete with hardware as specified.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect cabinets during transit, delivery, storage, and handling to prevent damage.

B. Do not deliver cabinets until painting and similar operations that could damage cabinets have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

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1. Comply with cabinet fabricator and Installer's recommendations for optimum temperature and humidity conditions for cabinets during storage and installation. Maintain recommended conditions through remainder of construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
2. Verify dimensions of countertops by field measurements after base cabinets are installed, but before countertop fabrication is complete.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Single-Source Manufacturing and Installation Responsibility: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural wood cabinets specified in this Section, including fabrication and installation.

2.2 CALGREEN REQUIREMENTS

A. General: Conform with all applicable requirements of the California Green Building Standards Code (CALGreen).

B. Provide adhesives and sealants which comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, except as noted otherwise below. Such products shall also comply with Rule 1168 prohibition of the use of certain toxic compounds (chloroform, ethylene, dichloride, methylene chloride, perchloroethylene, and trichloroethyelen).

1. Aerosol adhesives and similar unit sizes of adhesives, and sealants (in units of product, less packaging, which do not weigh more than one pound and do not consist of more than 16 fluid ounces) shall comply with statewide VOC standards and other requirements, including prohibitions of use of certain toxic compounds, of the California Code of Regulations, Title 17, commencing with Section 94507.

C. Composite Wood Products: Provide architectural wood cabinets and, where applicable, countertops, manufactured from composite wood products which meet requirements of California Air Resources Board "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions From Composite Wood Products" for formaldehyde resin emission limits (in ppm) for composite wood products and as specified below:

1. Particleboard: 0.09.

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2. Medium-Density Fiberboard: 0.11.

2.3 PERFORMANCE REQUIREMENTS

A. Design wall-hung and -anchored cabinets, storage shelving and connections with sufficient strength to resist stresses imposed by design loads as follows:

1. Vertical Design Loads: Per 2016 California Building Code, Table 1607A.1, Item 36, Minimum Uniformly Distributed Live Loads and Minimum Concentrated Live Loads.
2. Seismic Loads: Earthquake motions determined according to requirements of the California Building Code and Seismic Design Category specific to project.
3. Adjustable Shelf Loading: Provide 50 lbs/sq ft load bearing capacity, as per AWI/AWMAC/WI Architectural Woodwork Standards, Section 10 (maximum deflection: L/144).

2.4 PLASTIC-LAMINATE-FACED CABINETS

A. Quality Standard: Comply with applicable requirements of AWI/AWMAC/WI Architectural Woodwork Standards Section 10, "Casework."

1. Grade: Premium.
   a. This grade requirement applies to cabinets in storage rooms and closets, janitor (custodian) rooms and closets, and utility rooms, and supersedes the exception for these locations as occurs in AWI/AWMAC/WI Architectural Woodwork Standards (Edition 2), Section 10, Rule 10.1, Basic Considerations, Item 14.10.
2. Where Contract Documents indicate requirements beyond those of specified quality standard, comply with those requirements in addition to the quality standard.

B. AWI/AWMAC/WI Construction Style: Frameless.

C. AWI/AWMAC/WI Cabinet/Door Interface Style: Flush Overlay.

1. At cabinet doors, exposed-knuckle hinges shall be let into door edge as required to maintain proper gap tolerance between adjacent cabinet door panels.

D. Door and Drawer Front Profile: Square edge.

E. Finish by Surface Category (as defined in AWI/AWMAC/WI standard):

1. Exposed Exterior Surfaces: High-pressure decorative laminate, NEMA LD 3.
   a. Grades:
      i) Horizontal Surfaces: Grade HGS (0.048-inch nominal thickness)
      ii) Vertical Surfaces: Grade VGS (0.028-inch nominal thickness).
      iii) Postformed Surfaces: Grade HGP (0.042-inch nominal thickness).

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2. Exposed Interior Surfaces (includes open shelving without doors, surfaces around and behind open shelving without doors, behind glass doors, backside of doors, edges of doors and drawers, and underside of exposed shelving): High-pressure decorative laminate, same material, pattern, color and thickness as exposed exterior surfaces.
3. Semi-Exposed Surfaces: Low-pressure decorative laminate.
4. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL (0.020-inch nominal thickness).

F. Edge Treatment:
1. Cabinet Doors and Drawers: PVC edgebanding, 3 mm thickness.
2. Exposed Edge of Shelving: PVC edgebanding, 1 mm thickness, except as noted below:
a. Front Edge of Open Shelving (No Doors in Front of Shelving): High-pressure decorative laminate to match face of shelving.

G. Colors/Patterns: As specified in Section 09 06 00 "Colors and Finishes."

2.5 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Comply with applicable requirements of AWI/AWMAC/WI Architectural Woodwork Standards Section 11, "Countertops."
1. Grade: Premium.
2. Where Contract Documents indicate requirements beyond those of specified quality standard, comply with those requirements in addition to the quality standard.

B. High-Pressure Decorative Laminate Grade for Horizontal Surfaces: NEMA LD 3, Grade HGS (0.048-inch nominal thickness), except as follows:
1. Vertical Surfaces: Grade VGS (0.028-inch nominal thickness).
2. Post-Formed Surfaces: Grade HGP (0.042-inch nominal thickness).

C. Edge Treatment: As indicated on Drawings.

D. Splash Profile: Square top and coved base, unless indicated otherwise.
1. Splash Height: As indicated on Drawings.

E. Core Material: Particleboard or medium-density fiberboard.
1. Core Thickness: 1-1/8 inch.
2. At sink areas, core material to be moisture-resistant grade, dyed green per WI standards, with Type II water-resistant adhesive, per AWI/AWMAC/WI Architectural Woodwork Standards, Appendix, "Adhesives Guidelines."

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F. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL (0.020-inch nominal thickness), on underside of countertop substrate.

G. Where end of countertop terminates at a wall, provide end splash.

H. Where end of cabinet is exposed (e.g. does not abut a wall), round off front corner of countertop to 3/4 inch radius.

I. Colors/Patterns: As specified in Section 09 06 00 "Colors and Finishes."

2.6 CABINET AND COUNTERTOP MATERIALS

A. General: Provide materials that comply with requirements of the AWI/AWMAC/WI quality standard for each type of cabinet and quality grade specified, unless otherwise indicated. Modifications of AWI/AWMAC/WI standards contained herein, and on the Drawings, shall govern and take precedence over AWI/AWMAC/WI grade rules.

B. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
2. Wood Moisture Content: 5 to 10 percent.

C. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
   a. Recycled Content:
      i) Preconsumer: 92 percent minimum.
2. Particleboard: ANSI A208.1, Grade M-2.
   a. Recycled Content:
      i) Preconsumer: 92 percent minimum.
3. Formaldehyde Emissions:
   a. Complies with requirements specified in "CALGreen Requirements" Article.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or, if not indicated, as required by AWI/AWMAC/WI quality grade.

1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminate by one of the following:
   a. Wilsonart International; Division of Premark International, Inc.
2. Color(s): Refer to "Plastic-Laminate-Faced Cabinets" and "Plastic-Laminate Countertops" Articles for colors.

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E. Low-Pressure Decorative Laminate: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

F. Edgebanding: PVC, of thickness indicated; complying with LMA EDG-1.

1. Manufacturer: Subject to compliance with requirements, provide edgebanding by the following:

a. Doellken Woodtape.

2. Color(s): Refer to "Plastic-Laminate-Faced Cabinets" Article for colors.

2.7 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items which are specified in Section 08 71 00 "Door Hardware."

1. Hardware Finishes: Where BHMA finish designations are referenced, provide finish that complies with BHMA A156.18.

a. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

b. Satin Stainless-Steel: BHMA 630.

B. Hinges: BHMA A156.9, Grade 1; 2-3/4-inch, 5-knuckle wrap-around type; offset for overlay doors; from .095 inch steel; hospital tips; 270 degree swing; finish: BHMA 652 (satin chromium).

1. Product: Rockford Process Control, Inc.; #374.

C. Drawer Slides for Other Than File Drawers: BHMA A156.9, Grade 1; 150 lb per pair load rating; full-extension; steel ball bearings; progressive movement; rail mount/disconnect; finish: clear zinc.

1. Product: Accuride; #4032.

D. Drawer Slides for File Drawers up to 42 inches wide: BHMA A156.9, Grade 1HD-200; 200 lb per pair load rating; 1-inch overtravel; finish: clear zinc.

1. Product: Accuride; #3640.

E. Drawer and Door Pulls: Back mounted, solid metal wire pull; 4 inches center-to center, 7/8-inch clearance, 5/16 inch in diameter; finish: BHMA 630 (satin stainless steel).

1. Trimco/Builders Brass Works; #562-4.

F. Door Catches: Magnetic catch, adjustable; self-aligning; pull strength, 5 lbs; finish: aluminum.

1. Door Catches: Ives; #325.

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G. Elbow Catches: Designed for use on inactive leaf of pair of locking cabinet doors; finish: BHMA 626.
   1. Product: Ives; #2.

H. Adjustable Shelf Supports: Steel with pins for 5 mm diameter drilled holes; provide top pin for shelves occurring 5 feet or higher above floor; finish: satin nickel plated.
   1. Product:
      a. Shelves less than 5 feet above floor: Hafele; #282-24-710.
      b. Shelves 5 feet or higher above floor: Hafele; #282-24-720.

I. Cable Grommets: Molded plastic, circular shape, 2 inch diameter; two-piece with removable cap with flip-top access slot; color: As selected by Architect from manufacturer's full range.
   1. Product: Doug Mockett & Company; Model #TG3.

J. Locks: Pin tumbler type with retractable bolt; provide manufacturer's standard feature allowing replacement of cylinder without removal of lock assembly; keyed alike within each room, keyed different for each room, masterkeyed alike; finish: BHMA 626 (satin chromium).
   1. Product:
      a. Doors: CompX National; #C8173.
      b. Drawers: CompX National; #C8179.

K. Panel Clips: Two-piece hardware to allow removal of panel, consisting of cleat fitting for mounting on back of removable panel, and support bracket for mounting on frame or substrate; fabricated from polycarbonate.
   1. Product: Subject to compliance with requirements, provide the following:
      a. Hafele; Keku System.

2.8 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: As indicated on Drawings, or if not indicated, select material type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, floors, and elsewhere as required for corrosion-resistance. Provide metal expansion sleeves or expansion bolts for post-installed anchors.

C. Adhesives: Type recommended by adhesive manufacturers to suit products and substrate conditions indicated.
   1. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.

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D. Joint Sealant: Silicone joint sealant; ASTM C 920, Type S (single-component), Grade NS (nonsag), Class 12.5.

1. Color: Translucent.

2. Where being installed in food-handling areas, FDA-approved for direct contact with food.

   a. Comply with 21 CFR 177.2600.

3. Unless precluded by use in food-handling areas, provide mildew-resistant type, where occurs in areas subject to moisture.

4. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.

E. Metal Fabrications: Steel plate, ASTM A 36; thicknesses as indicated; ground all welds smooth; dimensions as indicated.

1. Anchorage Clips: Bent plate.

2. Connection Bracket at End of Sliding Markerboard Tracks: Welded construction.

2.9 FABRICATION

A. Provide cabinets complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Fabricate cabinets to dimensions, profiles, and details indicated.

D. Complete fabrication, including assembly, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

E. Shop-cut openings, to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of cutout openings in countertop subtops and plastic-laminate-faced countertops with a coat of varnish.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Before installing architectural cabinets and countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

1. Examine substrates to receive countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before installation, condition cabinets and countertops to average prevailing humidity conditions in installation areas.

3.3 INSTALLATION

A. Quality Standard: Install cabinets and countertops to comply with requirements of AWI/AWMAC/WI Architectural Woodwork Standards and quality grade specified for each type of cabinet and countertop in Part 2 of this Section.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. Install cabinets and countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut cabinets and countertops to fit adjoining work, refinish cut surfaces and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking/backing built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

1. DSA approved anchorages: Install cabinets in accordance with details shown. If Contractor wishes to use different anchorage methods, submittal of proposed methods must be made to Architect. Submittal must indicate prior approval by DSA.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

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1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches on center with No. 12 screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips, or No. 12 sheet metal screws through metal backing or metal framing behind wall finish.

G. Countertops and Splashes: Anchor securely to base cabinets or other supports as indicated.
1. Install countertops and splashes level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to tolerance of 1/8 inch in 8 feet.
2. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
3. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
4. Plastic-Laminate Countertops:
   a. Anchor plastic-laminate countertops by screwing through corner blocks of base cabinets or other supports into underside of countertop.
   b. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
      i) Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
5. Seal junctures of tops, splashes, and walls with silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.
   a. Where occurring in food preparation area, use sealant approved for use in such areas.
   b. Where occurring in areas subject to moisture but not involving food preparation, use mildew-resistant sealant.

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets and countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

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C. Clean cabinets and countertops on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 41 00

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SECTION 06 67 02

PEGBOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes pegboard panels and accessories, for wall storage system.

B. Related Sections include:

1. Section 06 10 00 "Rough Carpentry" for concealed wood blocking in wood stud-framed walls for anchoring wall-mounted pegboard.

1.3 COORDINATION

A. Coordinate sizes and locations of concealed framing, blocking, backing, furring, reinforcements, and other related Work specified in other Sections to ensure that pegboard can be supported and installed as indicated.

1.4 ACTION SUBMITALS

A. Product Data: For pegboard system. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1. Include manufacturer's full range of available hook types.

B. Samples for Verification:

1. Pegboard: 12 inches by 12 inches.
2. Hooks: One of each type.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For pegboard to include in maintenance manuals. Include manufacturer's written cleaning instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions for delivery, storage, and handling of pegboard.

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1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install pegboard until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are at levels to be maintained after building is occupied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain pegboard system, including all accessories and related items, as complete units from a single source or manufacturer.

2.2 PEGBOARD

A. Pegboard: Perforated rigid panel for use with pegboard hooks and other accessories for storage of tools and other types of equipment.
   1. Product: Subject to compliance with requirements, provide the following:
      a. Triton Products; DuraBoard.
   2. Material: Polypropylene.
   3. Panel Dimensions: 24 inches by 48 inches.
   4. Thickness: 1/4 inch.
   5. Perforated Hole Size and Grid Spacing: 9/32-inch diameter holes at 1 inch on center both ways.
   6. Color: White.

B. Hooks: Repositionable hooks with double-locking base consisting of tab which interlocks with pegboard hole and locking screw engaging with adjacent pegboard hole.
   1. Product: Subject to compliance with requirements, provide the following:
      a. Triton Products; DuraHook.
   2. Material: Zinc-plated steel.
   3. Types: As selected by Architect from manufacturer's full range of available hook types.

C. Accessories:
   1. Fasteners: As recommended by manufacturer for intended substrate and backing.
   2. Spacers: Steel spacer rings for use with fasteners to hold pegboard 3/8 inch away face of mounting surface.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking/backing and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install pegboard in accordance with manufacturer's written instructions, in locations indicated. Provide clips, spacers, backing materials, brackets, anchors, trim, and accessories necessary for complete installation.

B. Install units level, plumb, and firmly anchored in locations and at heights indicated, using fasteners appropriate to substrate indicated and recommended by manufacturer.

3.3 CLEANING

A. Clean exposed surfaces as recommended by manufacturer.

3.4 SCHEDULE

A. Provide 40 repositionable hooks for pegboard.

END OF SECTION 06 67 02

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SECTION 06 67 03

LEGO BASEPLATE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes baseplates for LEGO interlocking plastic toy bricks.

1.3 ACTION SUBMITALS

A. Product Data: For baseplate for LEGO interlocking plastic toy bricks. Include color(s).

B. Samples for Verification:

1. Baseplate for LEGO interlocking toy bricks: One unit.

PART 2 - PRODUCTS

2.1 BASEPLATE FOR LEGO INTERLOCKING TOY BRICKS

A. Toy Brick Baseplate: Semi-rigid plastic sheet with grid pattern of raised circular studs, for receiving manufacturer's interlocking plastic toy bricks.

1. Manufacturer: Provide baseplate by the following:
   a. LEGO.
2. Dimensions of Sheet: 10 inches by 10 inches.
3. Grid Pattern: 32 rows of raised studs, both ways, arranged in straight (inline) grid pattern.
4. Color: Green.

B. Accessories:

1. Adhesive: Compatible with both plastic baseplate material and substrate being adhered to.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install baseplate units level, plumb, and firmly anchored in locations and at heights indicated, using adhesive appropriate to substrate indicated and recommended by manufacturer.

3.3 CLEANING

A. Clean exposed surfaces as recommended by manufacturer.

END OF SECTION 06 67 03

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SECTION 07 13 26

SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Modified bituminous sheet waterproofing.
   2. Molded-sheet drainage panels.

B. Related Sections include:
   1. Section 33 46 13 "Subdrainage" for below-grade perforated drain lines and drainage course.
   2. Section 31 20 00 "Earthwork" for backfilling after installation of self-adhering sheet waterproofing.

1.3 REFERENCES

A. ASTM International (American Society for Testing and Materials):
   1. ASTM C 836: Specification for High Solids Content, Cold Liquid-Applied Elastormeric Waterproofing Membrane for Use With Separate Wearing Course.
   2. ASTM D 412: Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastormers – Tension.
   3. ASTM D 570: Test Method for Water Absorption of Plastics.
   4. ASTM D 1970: Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
   5. ASTM D 4258: Practice for Surface Cleaning Concrete for Coating.
   6. ASTM D 4263: Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
   7. ASTM D 5385: Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes.
   8. ASTM D 6135: Practice for Application of Self-Adhering Modified Bituminous Waterproofing.
   9. ASTM E 96: Test Methods for Water Vapor Transmission of Materials.
   10. ASTM E 154: Test Methods for Water Vapor Retarders Used in Contact With Earth Under Concrete Slabs, on Walls, or as Ground Cover.

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1.4 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

C. Samples: For the following products:

1. 12-inch by 12-inch square of waterproofing and flashing sheet.
2. 4-inch by 4-inch square of drainage panel.

D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

E. Qualification Data: For Installer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by at qualified testing agency, for waterproofing.

G. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is acceptable to waterproofing manufacturer for installation of waterproofing required for this Project.

B. Source Limitations: Obtain waterproofing materials, protection course, and molded-sheet drainage panels through one source from a single manufacturer.

C. Mockups: Before beginning installation, install waterproofing to 100 sq ft of wall to demonstrate surface preparation, crack and joint treatment, corner treatment, and execution quality.

1. Approved mockups may become part of the completed Work if undisturbed as time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

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1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing withing the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Failure includes, but is not limited to, failure of waterproofing due to failure of substrate prepared and treated according to requirements of formation of new joints and cracks in substrate exceeding 1/16 inch in width.
2. Warranty Period: 5 years from date of Substantial Completion.

B. Special Installer's Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of 2 years.

1. Warranty includes removing and reinstalling drainage panels.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: 60-mil-thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil-thick, polyethylene film with release liner on adhesive side and formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction..

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1. Physical Properties:
    a. Tensile Strength: 325 psi minimum; ASTM D 412, Die C, modified.
    b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
    c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
    d. Puncture Resistance: 50 lbf minimum; ASTM E 154.
    e. Hydrostatic-Head Resistance: 210 feet minimum; ASTM D 5385.
    f. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
    g. Vapor Permeance: 0.05 perms maximum; ASTM E 96, Water Method.
2. Products: Subject to compliance with requirements, provide one of the following:
    a. Carlisle Coatings & Waterproofing, Inc.; CCW MiraDRI 860/861.
    b. Grace Construction Products; Bituthene 4000.
    c. Meadows, W.R. & Company; SealTight Mel-Rol.
    d. Equal product in accordance with Division 1 requirements for product substitutions.

2.2 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
    1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of sheet waterproofing material.

C. Liquid Membrane: Elastomeric, two-component liquid, cold fluid-applied, trowel grade or low viscosity.

D. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.

2.3 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft.
    1. Products: Subject to compliance with requirements, provide one of the following:

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a. Carlisle Coatings & Waterproofing, Inc.; CCW MiraDRAIN 6000.
b. Grace Construction Products; Hydroduct 220.
c. Meadows, W.R. & Company; Mel-Drain.
d. Equal product in accordance with Division 1 requirements for product substitutions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
   1. Verify that concrete has cured and aged for a minimum time period recommended by waterproofing manufacturer.
   2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
   1. Install sheet strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.

F. Bridge and cover discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips.
   1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

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1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:
    a. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and according to recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2 inch minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.
    1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

D. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.

E. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic.

F. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.

G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

H. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.4 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. After waterproofing membrane has been installed and inspected by manufacturer's representative, immediately place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

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1. Do not leave waterproofing membrane exposed to sunlight beyond time limits indicated in writing by manufacturer.

B. Refer to Section 33 46 13 "Subdrainage" for installation of below-grade perforated drain lines at base of wall.

3.5 FIELD QUALITY CONTROL

A. Engage a full-time site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; membrane application, flashings, protection, and drainage components; and to furnish daily reports to Architect.

3.6 PROTECTION AND CLEANING

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 13 26

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SECTION 07 21 00

BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Thermal blanket (batt) insulation.
   2. Sound attenuation blanket (batt) insulation.
   3. Rigid board Insulation.

B. Related Sections:
   1. Section 09 29 00 "Gypsum Board" for acoustical sealant at partitions with sound attenuation blankets.
   2. Division 23 Section for HVAC duct insulation.

1.3 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

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1. Surface-Burning Characteristics: ASTM E 84.
2. Fire-Resistance Ratings: ASTM E 119.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. CertainTeed Corporation.
2. Johns Manville.
3. Knauf Insulation.
4. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

C. Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft vapor retarder on one face.

D. Recycled Content of Glass-Fiber Blanket Insulation: Provide products with recycled content such that sum of postconsumer recycled content plus one-half of preconsumer recycled content is not less than 20 percent of overall weight of product.

E. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
1. 3-1/2 inches thick with a thermal resistance of 13 deg F x h x sq. ft. /Btu at 75 deg F.
2. 6-1/4 inches thick with a thermal resistance of 19 deg F x h x sq. ft. /Btu at 75 deg F.
3. 10-1/4 inches thick with a thermal resistance of 30 deg F x h x sq. ft. /Btu at 75 deg F.

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2.2 INSULATION FASTENERS

A. Adhesively-Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:
   1. Components:
      a. Plate: Perforated galvanized carbon-steel sheet, 0.030-inch thick by 2 inches square.
      b. Spindle: Copper-coated, low carbon steel, fully annealed, 0.105-inch in diameter, length to suit depth of insulation indicated.

B. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
   1. Available Products:
      a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
      b. Eckel Industries of Canada, Limited; Stic-Klip Type N Fasteners.
      c. Gemco; Spindle type.

C. Nails and Staples: Steel wire; electroplated or galvanized; type and size to suit application.

2.3 AUXILIARY INSULATING MATERIALS

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.

B. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates, of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

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3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF BLANKET INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated.

1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

C. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures, except where light fixtures are rated for contact with insulation.
4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
5. For wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

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6. For wood-framed construction, install mineral-fiber blankets according to ASTM C 1320 and as follows:
    a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

3.5 INSTALLATION OF RIGID BOARD INSULATION

A. Install board insulation on substrates with adhesively-attached or mechanically-attached, spindle-type insulation anchors as follows:
    1. Fasten insulation anchors to substrates with insulation anchor adhesive or fasteners according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
    2. After anchors are installed, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
    3. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.6 PROTECTION

A. Protect installed insulation and vapor retarder facings from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.7 INSULATION SCHEDULE

A. Install blanket (batt) insulation with vapor-retarder facing with thermal resistivity as follows:
    1. Exterior stud-framed walls.
        a. 4-Inch Stud Framing: R-13 (3-1/2-inch thick batts).
        b. 6-Inch Stud Framing: R-19 (6-1/4-inch thick batts).
    2. Roof and Ceiling Assemblies.
        a. 6-Inch Deep Joists: R-19 (6-1/4-inch thick batts).
        b. 8-Inch Deep Joists: R-19 (6-1/4-inch thick batts).
        c. 10-Inch and Deeper Joists: R-19 (6-1/4-inch thick batts).
        d. Deeper Than 10-Inch Joists: R-30 (10-1/4-inch thick batts).
        e. 18-Inch Deep Truss Joists: R-30 (10-1/4-inch thick batts).

B. Install unfaced blanket (batt) insulation for sound attenuation at interior partitions as indicated on Drawings.
    1. 4-Inch Stud Framing: 3-1/2-inch thick batts (R-13).

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2. 6-Inch Stud Framing: 6-1/4-inch thick batts (R-19).

END OF SECTION 07 21 00

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SECTION 07 51 13

BUILT-UP ASPHALT ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Patching of existing built-up asphalt roofing system, including the following components:
      a. Substrate board.

B. Related Sections include:
   1. Section 06 10 53 "Miscellaneous Carpentry" for wood nailers, cants, curbs, and blocking installed in conjunction with roofing system.
   2. Section 07 62 00 "Sheet Metal Flashing and Trim" for sheet metal roof flashings and counterflashings.

1.3 REFERENCES

A. ASTM International (American Society for Testing and Materials):
   1. ASTM C 728: Specification for Perlite Thermal Insulation Board.
   2. ASTM C 794: Test Method for Adhesion of Peel of Elastomeric Joint Sealants.
   3. ASTM C 1371: Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
   4. ASTM C 1549: Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
   5. ASTM D 41: Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
   6. ASTM D 312: Specification for Asphalt Used in Roofing.
   7. ASTM D 522: Test Methods for Mandrel Bend Test of Attached Organic Coatings.
   8. ASTM D 1079: Terminology Relating to Roofing, Waterproofing, and Bituminous Materials.
   9. ASTM D 1653: Test Methods for Water Vapor Transmission of Organic Coating Films.

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10. ASTM D 2178: Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
11. ASTM D 2370: Test Method for Tensile Properties of Organic Coatings.
12. ASTM D 3617: Practice Sampling and Analysis of New Built-Up Roof Membranes.
13. ASTM D 3746: Standard Test Method for Impact Resistance of Bituminous Roofing Systems.
14. ASTM D 3909: Specification for Asphalt Roll Roofing (Glass Felt) Surfaced With Mineral Granules.
15. ASTM D 4586: Specification for Asphalt Roof Cement, Asbestos-Free.
16. ASTM D 4601: Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
17. ASTM D 4798: Standard Practice for Accelerated Weathering Test Conditions and Procedures for Bituminous Materials (Xenon Arc Method).
18. ASTM D 4897: Specification for Asphalt-Coated Glass-Fiber Venting Base Sheet Used in Roofing.
19. ASTM D 6083: Specification for Liquid Applied Acrylic Coating Used in Roofing.
20. ASTM D 6163: Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
21. ASTM E 108: Test Methods for Fire Tests of Roof Coverings.
22. ASTM E 119: Test Method for Fire Tests of Building Construction and Materials.
23. ASTM E 548: Guide for General Criteria Used for Evaluating Laboratory Competence.
24. ASTM E 903: Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
25. ASTM E 1980: Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
26. ASTM G 21: Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
27. ASTM G 152: Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials.
28. ASTM G 154: Standard Practice for Operating Flurorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.
29. ASTM G 155: Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials.

B. Asphalt Roofing Manufacturer's Association/National Roofing Contractors Association (ARMA/NRCA):
   1. Quality Control Guidelines for the Application of Built-up Roofing.

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C. California Building Code (CBC) – California Code of Regulations, Title 24, Part 2.

D. Code of Federal Regulations (CFR):

1. 40 CFR, Part 59, Subpart D (EPA Method 24): National Volatile Organic Compound Emission Standards.

E. Cool Roof Rating Council (CRRC):

1. CRRC-1: Product Rating Program.

F. Factory Mutual Global (FMG):

1. FM Global 4470: Approval Standard for Class 1 Roof Covers.

G. International Code Council (ICC):

1. ICC-ES: ICC Evaluation Service.

H. National Roofing Contractors Association (NRCA):

1. The NRCA Roofing and Waterproofing Manual.

I. Underwriters Laboratories (UL):

1. UL 790: Standard Test Methods for Fire Tests of Roof Coverings.

1.4 DEFINITIONS

A. Built-Up Asphalt Roofing System: Built-up asphalt roof membrane and flashings, substrate board, above-deck insulation and cover board, attachment system components, and accessories necessary for a complete weathertight roofing system.

B. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to Work of this Section.

C. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mop-applied roofing asphalt and 75 centipoise for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg F, measured at the mop cart or mechanical spreader immediately before application.

D. VOC: Volatile Organic Compounds.

1.5 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site. Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing system Installer, roofing system manufacturer's representative, deck Installer, and installers whose work

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interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

B. Preinstallation Roofing Conference: Conduct conference at Project site. Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing system Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

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1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Include product test report indicating built-up asphalt roofing system complies with solar reflectance and thermal emittance requirements.

B. Shop Drawings: For built-up roofing. Include plans, elevations, sections, details, and attachments to other work, including:
   1. Base flashings, cants, and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Crickets, saddles, and tapered edge strips, including slopes.
   4. Insulation/cover board fastening and adhesivepatterns for corner, perimeter, and field-of-roof locations.
   5. Substrate board fastening and adhesive patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Initial Selection: Roofing system manufacturer's full range of colors for roofing walkway cap-sheet granules, for selection by Architect.

D. Samples for Verification: For the following products:
   1. 12-inch by 12-inch square of mineral-granule-surfaced cap sheet with roof coating applied.
   2. 12-inch by 12-inch square of flashing sheet.
   3. 12-inch by 12-inch square of cap-sheet walkway.
   4. Six substrate board fasteners of each type, length, and finish.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that built-up asphalt roofing system complies with requirements specified in "Performance Requirements" Article.
   1. Submit evidence of compliance with performance requirements.

C. Installer Certificates: Signed by built-up asphalt roofing manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

D. Product Test Reports: For components of built-up roofing, for tests performed by manufacturer and witnessed by a qualified testing agency.

E. Research/Evaluation Reports: For components of built-up roofing, from the ICC-ES.

F. Field quality-control reports.

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G. Warranty: Manufacturer's statement of conformance with terms and conditions of existing roof warranty.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For built-up roofing to include in maintenance manuals.
   1. Include inspection frequencies, penetration addition policies, temporary repairs, and leak call procedures.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed and FM Global approved for built-up asphalt roofing identical to that used for this Project.
   1. Firm experienced in manufacturing products or systems similar to those indicated for this Project and with a minimum 10-year record of successful in-service performance, as well as sufficient production capacity to produce required units.
   2. Provide technical personnel to attend preinstallation conferences, perform periodic inspections during installation, and conduct final inspection and prepare written report upon completion of roofing system installation.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by built-up asphalt roofing manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
   1. Provide full-time supervisor who is experienced in installing roofing systems similar in type and scope to this Project.

C. Source Limitations: Obtain components for built-up asphalt roofing system from same manufacturer as built-up asphalt roofing or from manufacturer as approved by built-up asphalt roofing manufacturer.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect substrate board materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with substrate/cover board and insulation manufacturer's written instructions for handling, storing, and protecting during installation.

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D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.12 WARRANTY

A. Special Warranty: Manufacturer agrees, without monetary limitation (no dollar limit), to comply with terms and conditions of existing roof warranty, including replacement of components of built-up asphalt roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks and uplift.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Existing Warranty: Installed built-up roofing system, including patching of existing roofing system, shall meet all requirements of manufacturer of existing roof membrane system as required to meet conditions for maintaining existing roofing warranty.

B. General Performance: Installed built-up roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation or other defects in construction. Built-up roofing and base flashings shall remain watertight.

1. Accelerated Weathering: Built-up asphalt roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.

C. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by built-up roofing manufacturer based on testing and field experience.

D. Wind Uplift Resistance: Provide asphalt built-up roofing system capable of withstanding wind uplift forces as calculated based on requirements of the California Building Code using factors defined therein and applicable to local site conditions and specific project parameters.

1. Wind Speed (Ultimate Design Wind Speed V_{ult}): 115 mph.

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E. Energy Performance: Provide roofing system that meets the following requirements:
   1. Rated in accordance with Cool Roof Rating Council product rating program CRRC-1 as follows:
      a. 3-Year Aged Solar Reflectance: 0.63 minimum in accordance with CRRC testing requirements (ASTM E 903 or ASTM C 1549).
      b. Initial Thermal Emittance: 0.75 minimum in accordance with CRRC testing requirements (ASTM C 1371).

F. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.2 BUILT-UP ASPHALT ROOFING SYSTEM, GENERAL

A. General: Roof membrane assembly consisting of three plies of asphalt-impregnated glass-fiber felts and asphalt-impregnated and –coated glass-fiber cap sheet, each embedded in solid mopping of hot roofing asphalt.
   1. Manufacturers: Provide built-up asphalt roofing system by manufacturer of existing roofing membrane system:
      a. GAF Materials Corporation.
         i) Specification #: 104M/P6(C).
   2. In addition to ply sheets and cap sheet, built-up asphalt roofing assembly includes the following components:
      a. Substrate board.
      b. Base sheet and sheathing paper.

2.3 BASE-SHEET MATERIALS

A. Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq ft.

B. Base Sheet: ASTM D 4601, Type II, nonperforated, asphalt-impregnated and asphalt coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.

2.4 BUILT-UP ASPHALT ROOFING MEMBRANE SHEET MATERIALS

A. Ply Sheet: ASTM D 2178, Type VI, asphalt-impregnated, glass-fiber felt.

B. Cap Sheet: ASTM D 3909, asphalt-impregnated and asphalt-coated, glass-fiber cap sheet, with white coarse mineral-granule top surfacing and fine mineral surfacing on bottom surface.

2.5 BASE FLASHING SHEET MATERIALS

A. Backer Sheet: ASTM D 4601, Type II, asphalt-impregnated and asphalt-coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.

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B. Granule-Surfaced Flashing Sheet: ASTM D 6163, Grade G, Type II, glass-fiber-reinforced, SBS-modified asphalt sheet; granular-surfaced base flashing; suitable for application method specified and as follows:

1. Granule Color: White.

2.6 ASPHALT MATERIALS

A. Asphalt Primer: ASTM D 41.

B. Roofing Asphalt: ASTM D 312, Type III or IV as recommended by built-up roofing manufacturer for application.

2.7 AUXILIARY BUILT-UP ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with built-up roofing.

1. Liquid-type auxiliary materials shall comply with local regulatory limits for VOC content when calculated according to 40 CFR, Part 59, Subpart D (EPA Method 24).

B. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing manufacturer for application.

C. Mastic Sealant: Polyisobutylene, plain or modified bitumen, nonhardening, nonmigrating, nonskinning, and nondrying.

D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening built-up roofing components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing manufacturer.

E. Sheet Metal Flashing: As specified in Section 07 62 00"Sheet Metal Flashing and Trim."

F. Miscellaneous Accessories: Provide miscellaneous accessories recommended by built-up asphalt roofing manufacturer.

2.8 SUBSTRATE BOARD AND ACCESSORIES

A. Substrate Board: ASTM C 728, perlite board, match existing thickness, seal coated.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistant provisions in FM Global 4470, designed for fastening substrate board to roof deck.

C. Cant Strips: ASTM C 728, perlite insulation board.

D. Wood Nailer Strips: Comply with requirements in Section 06 10 53 "Miscellaneous Carpentry."

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E. Tapered Edge Strips: ASTM C 728, perlite insulation board

2.9 COATING MATERIALS

A. Roof Coating: Acrylic elastomer emulsion coating, meeting requirements of ASTM D 6083, and formulated for use on bituminous membrane roofing surfaces; meeting requirements for energy performance as specified in "Performance Requirements" Article, and complying with requirements of California Energy Code (Title 24, Part 6) for liquid-applied roof coatings.

1. Color: White.
2. Physical Properties:
   a. Initial Percent Elongation (Break), per ASTM D 2370:
      i) At 73 deg F: 200 percent minimum.
      ii) At 0 deg F: 60 percent minimum.
   b. Initial Tensile Strength (Maximum Stress), per ASTM D 2370:
      i) At 73 deg F: 100 psi minimum.
      ii) At 0 deg F: 200 psi minimum.
   c. Final Percent Elongation (Break) After Accelerated Weathering 1000 Hours, per ASTM D 2370:
      i) At 73 deg F: 100 percent minimum.
      ii) At 0 deg F: 40 percent minimum.
   d. Permeance: 50 perms maximum, per ASTM D1653.
   e. Adhesion: 4.0 lbs per lineal inch (dry) and 2.0 lbs per lineal inch (wet) minimum, per ASTM C 794.
   f. Low Temperature Flexibility: Passing 1-inch mandrel bend at -15 deg F, per ASTM D 522.
   g. Accelerated Weathering, 1000 Hours: No cracking or checking, per ASTM D 4798.
   h. Fungi Resistance: Meeting requirements of ASTM G 21.

2.10 WALKWAYS

A. Walkway Cap-Sheet Strips: ASTM D 6163, Grade G, Type I or II, glass-fiber-reinforced, SBS modified asphalt sheet; granular surfaced; suitable for application method specified, and as follows:

1. Granule Color: Gray (contrasting with color of roofing system coating material).

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of the Work:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
2. Verify that cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that wood deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch out of plane relative to adjoining deck.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 BUILT-UP ASPHALT ROOFING SYSTEM INSTALLATION, GENERAL

A. Comply with built-up asphalt roofing manufacturer's written instructions for installation of all components of roofing system, including substrate boards, insulation and cover boards, base sheets, and membrane sheet materials.

B. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging built-up asphalt roofing components or adjacent building construction.

C. Install roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and so as not to void existing roof warranty.

3.4 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

1. Fasten substrate board to wood deck to resist pressure at corners, perimeter, and field of roof with fasteners at spacing and in pattern required to meet specified performance requirements for wind uplift resistance.

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3.5 BASE SHEET INSTALLATION

A. Loosely lay one course of sheathing paper, lapping edges and ends a minimum of 2 inches and 6 inches, respectively.

B. Install one lapped course of base sheet, extending sheet over and terminating beyond cants. Attach base sheet as follows:

1. Mechanically fasten to substrate.

3.6 ROOFING MEMBRANE INSTALLATION

A. Install built-up asphalt roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-Up Roofing."

1. Number of Ply Sheets (Not Including Base Sheet, If Occurs): Four.
2. Number of Cap Sheets: One.

B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.

C. Where roof slope exceeds 1/2 inch per 12 inches (1:24), install roofing membrane sheets parallel with slope.

1. Backnail roofing membrane sheets to substrate according to roofing system manufacturer's written instructions.

D. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.

E. Coordinate installation of roofing system so insulation and other components of built-up roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed built-up roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

F. Asphalt Heating: Do not raise roofing asphalt temperature above equiviscous temperature range more than 1 hour before time of application. Do not exceed roofing asphalt manufacturer's recommended temperature limits during roofing asphalt heating. Do not heat roofing asphalt within 25 deg F of flash point. Discard roofing asphalt maintained at a temperature exceeding finished blowing temperature for more than four hours.

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G. Install ply sheets starting at low point of roofing system. Align ply sheets without stretching. Shingle side laps of ply sheets uniformly to achieve required number of plies throughout thickness of roofing membrane. Shingle in direction to shed water. Extend ply sheets over and terminate beyond cants.

1. Embed each ply sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing system manufacturer, to form a uniform membrane without ply sheets touching.

H. Cap Sheet: Install lapped granulated cap sheet starting at low point of roofing system. Offset laps from laps of preceding ply sheets and align cap sheet without stretching. Lap in direction to shed water. Extend cap sheet over and terminate beyond cants.

1. Embed cap sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing system manufacturer.

3.7 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to built-up asphalt roofing system manufacturer's written instructions and as follows:

1. Backer Sheet Application:

a. Mechanically fasten backer sheet to nailable walls or parapets. Adhere backer sheet over roofing membrane at cants in a solid mopping of hot roofing asphalt.

2. Flashing Sheet Application: Adhere flashing sheet to substrate in a solid mopping of hot roofing asphalt applied at not less than 425 deg F, or as otherwise recommended in writing by roofing system manufacturer. Apply hot roofing asphalt to back of flashing sheet if recommended by roofing system manufacturer.

B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of built-up roofing.

C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

1. Seal top termination of base flashing with a strip of glass-fiber fabric set in asphalt roofing cement.

D. Install stripping, according to roofing system manufacturer's written instructions, where metal flanges and edgings are set on built-up roofing.

1. Flashing-Sheet Stripping: Install flashing-sheet stripping in a continuous coating of asphalt roofing cement or in a solid mopping of hot roofing asphalt applied at not less than 425 deg F, and extend onto roofing membrane.

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E. Roof Drains: Set 30-inch by 30-inch metal flashing in bed of asphalt roofing cement on completed built-up roofing. Cover metal flashing with built-up roofing cap-sheet stripping and extend a minimum of 6 inches beyond edge of metal flashing onto field of built-up roofing. Clamp built-up roofing, metal flashing, and stripping into roof-drain clamping ring.

1. Install stripping according to roofing manufacturer's written instructions.

3.8 COATING INSTALLATION

A. Apply coatings to built-up roofing and base flashings according to manufacturer's written instructions, by spray, roller, or other suitable application method, and as required to achieve energy performance specified in "Performance Requirements" Article.

1. Ensure roofing system has fully cured prior to coating application.
2. Do not apply coating until roofing system manufacturer's technical personnel has inspected roof as specified in "Field Quality Control" Article. Any deficiencies in roofing membrane shall be corrected prior to application of coating.
3. Prior to application of coating, prepare and clean surface of roofing membrane by power washing or other method as recommended in writing by coating manufacturer.

3.9 WALKWAY INSTALLATION

A. Walkway Cap-Sheet Strips: Install walkway cap-sheet strips, approximately 36 inches wide and lengths not exceeding 10 feet, leaving a space of 6 inches between strips. Adhere in hot roofing asphalt in accordance with manufacturer's written instructions.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.

B. Test Cuts: Test specimens will be removed to evaluate problems observed during quality-assurance inspections of built-up roofing as follows:

1. Approximate quantities of components within built-up roofing will be determined according to ASTM D 3617.
2. Test specimens will be examined for interply voids according to ASTM D 3617 and to comply with criteria established in Appendix 3 of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."
3. Repair areas where test cuts were made according to roofing system manufacturer's written instructions.

C. Arrange for built-up roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

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1. Notify Architect and Owner 5 working days in advance of date and time of inspection.

D. Repair or remove and replace components of built-up roofing system to address the following:
   1. Where test results or inspections indicate that they do not comply with specified requirements.
   2. Where roofing system manufacturer's report identifies areas of work not in conformance with manufacturer's and other specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 PROTECTING AND CLEANING

A. Protect built-up roofing from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove built-up roofing that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

D. Verify that all drains, scuppers, and downspouts are functioning properly.

END OF SECTION 07 51 13

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SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Formed sheet metal flashings and fabrications, including the following
      a. Wall flashings.
      b. Roof penetration flashings.
      c. Roof termination flashings and counterflashings.
      d. Edge termination flashings.
      e. Head and sill flashings.
      f. Miscellaneous building sheet metal flashings.
      g. Miscellaneous sheet metal fabrications.
   2. Manufactured reglets with removable counterflashings.
   3. Sealants associated with shop fabrication of sheet metal work.

B. Related Sections:
   1. Section 05 50 00 "Metal Fabrications" for steel pipe downspouts.
   2. Section 07 65 00 "Flexible Flashing" for flexible sheet flashing installed in conjunction with sheet metal flashings.
   3. Section 07 92 00 "Joint Sealants" for field-applied building sealants installed in conjunction with sheet metal work.
   4. Section 08 91 00 "Louvers and Vents" for metal blade louvers.
   5. Section 09 91 00 "Painting" for field painting of non-factory-finished sheet metal items exposed to view.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:

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1. Wind Zone 1: For velocity pressures of 21 to 30 lbf/sq. ft.: 60lbf/sq. ft. perimeter uplift force, 90-lbf/sq. ft. corner uplift force, and 30 lbf/sq. ft. outward force.

C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:

1. Identify material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details of transitions, terminations, and other non-typical conditions. Provide 3-dimensional isometric views where needed to fully illustrate condition.
4. Details of fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
5. Details of expansion provisions, including showing direction of expansion and contraction.

C. Samples for Initial Selection: For each type of sheet metal flashing and trim indicated with factory-applied color finishes; full range of available colors for selection by Architect.

D. Samples for Verification: For each type of exposed factory-applied finish required, prepared on 12-inch long samples.

E. Mockup Samples: Build sheet metal mockups to demonstrate qualities of materials and execution and aesthetic effects, of the following conditions. Include fasteners, cleats, clips, closures, and other attachments.

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1. Roof penetration flashings.
2. Roof edge termination flashings.
3. Door and window head and sill flashings.
4. Exposed trim and fascia.

1.5 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section for project management and coordination.
   1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
   2. Review methods and procedures related to sheet metal flashing and trim.
   3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
   4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.7 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005, Temper suitable for forming and structural performance required, but not less than H14, finished as follows:

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1. Finish: High-performance organic finish; AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    a. Fluoropolymer 2-Coat System: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
        i) Color: Matching adjacent aluminum storefront/window framing.
2. Thickness: 0.0403-inch (18 gage), except as indicated otherwise.

B. Stainless-Steel Sheet: ASTM A 240, Type 304.
1. Finish: No. 2D (dull, cold rolled), except, No. 4 (fine reflective, polished directional satin) where exposed.
2. Thickness: 0.0250-inch (24 gage), except as indicated otherwise.

C. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653, G90 (Z275) coating designation; structural quality.
1. Surface: Smooth, flat and mill phosphatized for field painting.
2. Thickness: 0.0239-inch (24 gage), except as indicated otherwise.

D. Lead Sheet: ASTM B 749, Type L51121, copper-bearing lead sheet.
1. Thickness: 4.0 lb/sq. ft. hard tempered, except as indicated otherwise.

2.2 UNDERLAYMENT MATERIALS

A. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

B. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing an trim installation.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

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4. Spikes and Ferrules: Same material as gutter; with spike and ferrule matching internal gutter width.

C. Solder for Stainless-Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Solder for Lead: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.

E. Solder for Zinc: ASTM B 32, 60 percent lead and 40 percent tin with low antimony, as recommended by manufacturer.

F. Drawbands: Stainless-steel hose clamp; worm drive.

G. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

H. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

J. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Through-Wall Ribbed Sheet Metal Flashing: Manufacturer through-wall sheet metal flashing for embedment in masonry with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
   1. Stainless Steel: 0.0188 inch thick (26 gage).
   2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Cheney Flashing Company, Inc.

B. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated, with factory-mitered and -welded corners and junctions.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Fry Reglet Corporation.
         i) Surface-Mounted Type: Model SM

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ii) Stucco Type: Model ST.

iii) Concrete Type: Model CO.

iv) Masonry Type: Model MA.

2. Material: Stainless steel, 0.0188 inch thick (26 gage).
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Stucco Type: Provide with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
5. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.
6. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
7. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
8. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Fabricate sheet metal flashing and trim in longest practicable lengths to minimize number of end joints while still meeting requirements for expansion allowance.

D. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

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E. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

F. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

1. Expansion joints to be of a flat profile, unless otherwise indicated.

G. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

H. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" and FMG Loss Prevention Data Sheet 1-49 for application but not less than thickness of metal being secured.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing and Fascia Caps: Fabricate in minimum 96-inches long, but not exceeding 10-foot long, sections. Furnish with 6-inch wide joint cover plates.

1. Material: Galvanized steel.
   a. Thickness: 0.0299 inch (22 gage).

B. Copings: Fabricate minimum of 96-inches long, but not exceeding 10-foot long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.

1. Material: Galvanized steel.
   a. Thickness: 0.0359 inch (20 gage), except where indicated otherwise.
   b. Joint Style: Butt, with 12 inch wide concealed backup plate.

C. Base Flashings, Flashing Receivers, and Counterflashings:

1. Material: Galvanized steel.
   a. Thickness: 0.0299 inch (22 gage).

D. Roof Drain Flashing:

1. Material: Lead.
   a. Weight: 4.0 lb/sq. ft.

E. Vent Stack Roof Penetration:

1. Material: Lead.
   a. Weight: 4.0 lb/sq. ft.

F. Splash Pans:

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1. Material: Stainless steel.
    a. Thickness: 0.0250 inch (24 gage).

2.7 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch long, but not exceeding 12 foot long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch high end dams.
    1. Material: Stainless steel.
        a. Thickness: 0.0250 inch (24 gage).

B. Openings Flashing in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high end dams.
    1. Material: Galvanized steel.
        a. Thickness: 0.0299 inch (22 gage).

2.8 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within l/2 of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
    1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
    2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use

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fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

1. Coat side of uncoated aluminum, stainless-steel, and lead sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.

C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Space cleats not more than 12 inches apart, except where indicated as continuous. Anchor each cleat with two fasteners. Bend tabs over fasteners.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner of intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

G. Fasteners: Use fasteners of sizes that will penetrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

1. Galvanized or Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners.
2. Aluminum: Use aluminum or stainless-steel fasteners.
3. Stainless Steel: Use stainless-steel fasteners.

H. Seal joints with elastomeric sealant as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant.

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When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2inches except where pretinned surface would show in finished Work.

1. Do not solder prepainted, metallic-coated steel and aluminum sheet.
2. Pretinning is not required for lead.
3. Stainless-Steel Soldering: Pretin edges of uncoated sheets to be soldered using solder recommended for stainless steel and phosphoric acid flux. Promptly wash off acid flux residue from metal after soldering.
4. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.

3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone as indicated.

1. Interlock bottom edge of roof edge flashing wit continuous cleats anchored to substrate at 24-inch centers.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.

1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 24-inch centers.
2. Anchor interior leg of coping with screw fasteners and washers at 24-inch centers.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4-inches over base flashing. Install stainless-steel drawband and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing.

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Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.

1. Secure in a waterproof manner by means of interlocking folded seam and sealant.

F. Roof Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:

1. Turn lead flashing down tightly inside vent piping, as required to provide clear, unobstructed airflow.
2. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

3.4 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Through-Wall Flashing in Masonry Walls: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

1. Install flashing as follows, unless otherwise indicated:
    a. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
    b. At masonry veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked behind wall underlayment, lapping at least 4 inches.
    c. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
    d. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 07 92 00 "Joint Sealants" for application indicated.
    e. Refer to applicable Division 4 Section for installation of weepholes in masonry.

C. Reglets: Install reglets in accordance with manufacturer's written instructions for applicable wall construction.

D. Openings Flashing in Frame Construction: Install continuous head, sill, and similar flashings to extend 4 inches beyond wall openings.

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3.5 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar repair procedures.

END OF SECTION 07 62 00

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SECTION 07 65 00

FLEXIBLE FLASHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes: edit following list to suit project
   1. Flexible self-adhering membrane flashing.

B. Related Sections include: edit following list to suit project
   1. Section 07 62 00 "Sheet Metal Flashing and Trim" for sheet metal flashings installed in conjunction with flexible membrane flashings.
   2. Section 07 92 00 "Joint Sealants" for building sealants.

1.3 REFERENCES

A. ASTM International (American Society for Testing and Materials).
   1. ASTM D 903: Test Method for Peel or Stripping Strength of Adhesive Bonds.
   2. ASTM D 1876: Standard Test Method for Peel Resistance of Adhesives (T-Peel Test).
   3. ASTM E 96: Standard Test Methods for Water Vapor Transmission of Materials.
   4. ASTM E 154: Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
   5. ASTM E 2112: Standard Practice for Installation of Exterior Windows, Doors, and Skylights.

1.4 SUBMITTALS

A. Product Data: For each type of flexible sheet membrane product and related accessories. Indicate component materials and data on moisture-infiltration based on testing according to referenced standards.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions for storage and handling of flexible sheet membrane materials.

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1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install flexible membrane flashing until temperature is within range indicated in manufacturer's written instructions and recommendations.

1.7 COORDINATION

A. Coordinate installation of flexible membrane flashing with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 FLEXIBLE MEMBRANE FLASHING

A. General: Composite, self-adhering, self-sealing flashing product consisting of a pliable-rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce a waterproof membrane; provided in continuous rolls; disposable silicone-coated release paper.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Fortifiber Building Systems Group; Fortiflash (25 mil).
   b. Grace Construction Products; Vycor Plus.
   c. Polyguard Products, Inc.; Polyguard 300.
   d. Equal product in accordance with Division 1 requirements for product substitutions.
2. Thickness: 25 mils.
3. Width: Manufacturer's standard widths as needed for full coverage.
4. Lap Peel Adhesion at Minimum Application Temperature: 9.0 lbf/inch of width, minimum, per ASTM D 903.
5. Permeance: 0.1 perm maximum per ASTM E 96, Method B.

2.2 ACCESSORY MATERIALS

A. Surface Conditioner: Manufacturer's standard fluid-applied water-based conditioner, as recommended for preparation of substrate.

B. Primer: Manufacturer's standard fluid-applied rubber-based primer, as recommended for substrate.

C. Sealing Tape: Manufacturer's pressure-sensitive tape for sealing joints and penetrations in flashing sheet.

D. Prefabricated Corners: Manufacturer's prefabricated plastic corner piece designed to fit around corner of wall openings and other similar profiles, for use in conjunction with flexible flashing material.

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E. Termination Mastic: Manufacturer's standard rubberized-asphalt-based mastic for sealing of edges, penetrations, and seams of flexible flashing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which flexible flashing materials are to be installed to verify actual locations, dimensions, and other conditions affecting performance of the Work.

1. Remove dirt, dust, and loose materials, and verify that substrate is free of protrusions, voids, and unsupported areas.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Apply surface conditioner to substrates when recommended by flexible flashing manufacturer.

B. Prime substrates as recommended by flexible flashing manufacturer.

3.3 FLEXIBLE FLASHING INSTALLATION

A. General: Install flexible sheet flashing materials to comply with manufacturer's written instructions; follow ASTM E 2112 guidelines for flexible membrane flashing; maintain continuity of waterproof membrane at all seams, corners, and terminations.

1. Do not allow self-adhering side of flexible flashing materials to come into contact with sealant or other materials deemed incompatible by manufacturer of flexible flashing.
2. Lap seams and junctures with other materials at least 4 inches, except that at flashing flanges of other construction, laps need not exceed flange width.
3. Lap flexible flashing over weather-resistive underlayment as indicated on Drawings.
4. After flexible flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates, and all trapped air and voids have been removed.
5. Where profile of substrate causes wrinkling in flashing membrane, follow manufacturer's written instructions to cut and lay flat affected area. Overlay with oversized piece of flashing membrane, tire-patch fashion, as required to maintain continuity of membrane.
    a. Use manufacturer's prefabricated corner pieces at corners of wall openings and other suitable applications. Lap flexible flashing material over flanges of prefabricated corner pieces in accordance with manufacturer's written instructions.

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6. At sill flashing applications for wall openings, turn up back edge and ends a minimum of 2 inches to form a dam.
7. Seal penetrations and tears in flexible flashing with manufacturer's sealing tape.

3.4 PROTECTION

A. Do not allow flexible flashing material to be exposed to sunlight for a time period longer than that recommended by manufacturer.

END OF SECTION 07 65 00

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SECTION 07 84 13

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Penetration firestopping systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:
      a. Fire-resistance-rated walls.
      b. Fire-resistance-rated floor assemblies.
      c. Smoke barriers.

B. Related Sections include:
   1. Section 07 84 13 "Sprayed Fire-Resistive Materials" for sprayed-on fire protection for structural framing members.
   2. Section 07 84 50 "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtainwall/edge-of-floor-slab conditions, and smoke barriers.

1.3 REFERENCES

A. ASTM International (American Society for Testing and Materials):
   1. ASTM E 84: Test Method for Surface Burning Characteristics of Building Materials.
   2. ASTM E 814: Test Method for Fire Tests of Penetration Firestop Systems.

B. California Department of Health Services:
   1. Standard Practice for the Testing of Volatile Organic Emissions from Various Sources using Small-Scale Environmental Chambers (including 2004 Addenda).

C. Code of Federal Regulations (CFR):
   1. 40 CFR, Part 59, Subpart D (EPA Method 24): National Volatile Organic Compound Emission Standards.

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D. Leadership in Energy & Environmental Design (LEED), United States Green Building Council:
   1. LEED 2009 for New Construction and Major Renovations.
   2. LEED 2009 for Commercial Interiors.
   3. LEED 2009 for Core & Shell Development.
   4. LEED 2009 for Schools New Construction and Major Renovations.

E. South Coast Air Quality Management District (SCAQMD):
   1. Rule 1168 – Adhesive and Sealant Applications.

F. Underwriters Laboratory (UL):
   1. Fire Resistance Directory.
   2. UL 1479: Fire Tests of Through-Penetration Firestops.

1.4 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Owner's testing agency at least 5 working days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

D. Do not cover up penetration firestopping installations that will become concealed behind other construction until Project Inspector has examined each installation.

1.5 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site to review pertinent issues related to penetration firestopping.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:
   1. IEQ Credit 4.1: Manufacturer's product data for penetration firestopping sealants used inside the weatherproofing system, including printed statement of VOC content and chemical components.
      a. Include written statement on manufacturer's letterhead certifying that product complies with specified testing and product requirements.

C. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

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1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacture's fire-protection engineer as an engineering judgment of equivalent fire-resistance-rated assembly.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestoping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Results: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
   a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
   b. Classification markings on penetration firestopping correspond to designations listed by the following:
      i) UL in "Fire Resistance Directory".

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

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B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

PART 2 - PRODUCTS

2.1 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestoping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. A/D Fire Protection Systems Inc.
    b. Grace Construction Products.
    c. Hilti, Inc.
    d. Johns Manville.
    e. Nelson Firestop Products.
    f. 3M Fire Protection Products.
    g. Tremco, Inc.; Tremco Fire Protection Systems Group.
    h. USG Corporation.
    i. Manufacturer of equal products in accordance with Division 1 requirements for product substitutions.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Fire-Resistance-Rated Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
2. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

1. L-Rating: Not exceeding 5.0 cfm/sq ft of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

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E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

G. VOC Content: Provide fire-resistive joint systems that comply with local regulatory limits for VOC content when calculated according to 40 CFR, Part 59, Subpart D (EPA Method 24).

1. In addition to local regulatory limits, comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule #1168.

[or]

2. In addition to local regulatory limits, comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers" (including 2004 Addenda).

H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:
   a. Slag-wool-fiber or rock-wool-fiber insulation.
   b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
   d. Fillers for sealants.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.2 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

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D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.3 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetrating firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by penetration firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

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3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed due to testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.6 PENETRATION FIRESTOPPING SCHEDULE

A. UL-classified systems indicated refer to system numbers listed in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Firestopping with No Penetrating Items:

1. Subject to requirements in Part 2 of this Section, provide UL-classified systems from within the following numbering designations:
   a. Concrete/masonry floors and walls: C-AJ-0001 thru 0999.
   b. Framed floors: F-C 0001 thru 0999.
   c. Framed walls: W-L-0001 thru 0999.
2. Type of Fill Materials: One or more of the following:
   a. Latex sealant.
   b. Silicone sealant.
   c. Intumescent putty.
   d. Mortar.

C. Firestop Systems for Metallic Pipes, Conduit, or Tubing:

1. Subject to requirements in Part 2 of this Section, provide UL-classified systems from within the following numbering designations:
   a. Concrete/masonry floors and walls: C-AJ-1001-1999.

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b. Framed floors: F-C-1001 thru 1999.
c. Framed walls: W-L-1001 thru 1999.

2. Type of Fill Materials: One or more of the following:
   a. Latex sealant.
   b. Silicone sealant.
   c. Intumescent putty.
   d. Mortar.

D. Firestop Systems for Nonmetallic Pipe, Conduit, or Tubing: Comply with the following:
   1. Subject to requirements in Part 2 of this Section, provide UL-classified systems from within the following numbering designations:
      a. Concrete/masonry floors and walls: C-AJ-2001 thru 2999.
      b. Framed floors: F-C-2000 thru 2999.
      c. Framed walls: W-L-2000 thru 2999.
   2. Type of Fill Materials: One or more of the following:
      a. Latex sealant.
      b. Silicone sealant.
      c. Intumescent putty.
      d. Intumescent wrap strips.
      e. Firestop device.

E. Firestop Systems for Electrical Cables: Comply with the following:
   1. Subject to requirements in Part 2 of this Section, provide UL-classified systems from within the following numbering designations:
      a. Concrete/masonry floors and walls: C-AJ-3001-3999.
      b. Framed floors: F-C-3000 thru 3999.
      c. Framed walls: W-L-3000-3999.
   2. Type of Fill Materials: One or more of the following:
      a. Latex sealant.
      b. Silicone sealant.
      c. Intumescent putty.
      d. Silicone foam.

F. Firestop Systems for Cable Trays: Comply with the following:
   1. Subject to requirements in Part 2 of this Section, provide UL-classified systems from within the following numbering designations:
      a. Concrete/masonry floors and walls: C-AJ-4000-4999.
      b. Framed walls: W-L-4000-4999.

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2. Type of Fill Materials: One or more of the following:
    a. Latex sealant.
    b. Intumescent putty.
    c. Silicone foam.
    d. Pillows/bags.

G. Firestop Systems for Insulated Pipes: Comply with the following:
1. Subject to requirements in Part 2 of this Section, provide UL-classified systems from within the following numbering designations:
    a. Concrete/masonry floors and walls: C-AJ-5001 thru 5999.
    b. Framed floors: F-C-5000 thru 5999.
    c. Framed walls: W-L-5000 thru 5999.
2. Type of Fill Materials: One or more of the following:
    a. Latex sealant.
    b. Intumescent putty.
    c. Silicone foam.
    d. Intumescent wrap strips.

H. Firestop Systems for Miscellaneous Electrical Penetrants: Comply with the following:
1. Subject to requirements in Part 2 of this Section, provide UL-classified systems from within the following numbering designations:
    a. Concrete/masonry floors and walls: C-AJ-6001 thru 6999.
    b. Framed floors: F-C-6000 thru 6999.
    c. Framed walls: W-L-6000 thru 6999.
2. Type of Fill Materials: One or more of the following:
    a. Latex sealant.
    b. Intumescent putty.
    c. Mortar.

I. Firestop Systems for Miscellaneous Mechanical Penetrations: Comply with the following:
1. Subject to requirements in Part 2 of this Section, provide UL-classified systems from within the following numbering designations:
    a. Concrete/masonry floors and walls: C-AJ-7001 thru 7999.
    b. Framed floors: F-C-7000 thru 7999.
    c. Framed walls: W-L-7000 thru 7999.
2. Type of Fill Materials: One or both of the following:
    a. Latex sealant.
    b. Mortar.

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J. Firestop Systems for Groupings of Penetrations: Comply with the following:

1. Subject to requirements in Part 2 of this Section, provide UL-classified systems from within the following numbering designations:
   a. Concrete/masonry floors and walls: C-AJ-8001 thru 8999.
   b. Framed floors: F-C-8000 thru 8999.
   c. Framed walls: W-L-8000 thru 8999.
2. Type of Fill Materials: One or more of the following:
   a. Latex sealant.
   b. Mortar.
   c. Intumescent wrap strips.
   d. Firestop device.
   e. Intumescent composite sheet

END OF SECTION 07 84 13

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SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes joint sealants and backing materials at the following locations:
   1. Exterior - Including, but not limited to:
      a. Joints between adjacent different materials.
      b. Other miscellaneous exterior joints occurring in exterior envelope.
   2. Interior - Including, but not limited to:
      a. Perimeter joints around door and window frames.
      b. Perimeter joints around plumbing fixtures.
      c. Joints between adjacent different materials.
      d. Acoustical joints in acoustically insulated partitions.
      e. Other miscellaneous interior joints occurring on the interior.

B. Related Sections include:
   1. Section 07 62 00 "Sheet Metal Flashing and Trim" for sealants related to sheet metal flashing.
   2. Section 08 81 00 "Glass Glazing" for sealants used in glazing.
   3. Section 09 30 00 "Ceramic Tile" for joint sealants installed in ceramic tile expansion joints.

1.3 REFERENCES

A. ASTM International:
   1. ASTM C 794: Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
   2. ASTM C 834: Standard Specification for Latex Sealants.
   3. ASTM C 919: Standard Practice for Use of Sealants in Acoustical Applications.
   4. ASTM C 920: Standard Specification for Elastomeric Joint Sealants.
   5. ASTM C 974: Standard Practice for Preparing Test Specimens from Basic Refractory Castable Products by Casting.

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6. ASTM C 1021: Standard Practice for Laboratories Engaged in Testing of Building Sealants.
7. ASTM C 1087: Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
8. ASTM C 1193: Standard Guide for Use of Joint Sealants.
9. ASTM C 1330: Standard Specification for Cylindrical Sealant Backing for Use With Cold Liquid Applied Sealants.
10. ASTM C 1521: Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
11. ASTM E 90: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss for Building Partitions and Elements.

B. California Green Building Standards Code (CALGreen) – California Code of Regulations, Title 24, Part 11.

C. Code of Federal Regulations (CFR):
1. 21 CFR, Chapter 1, Part 177, Section 177.2600: Substances for Use Only as Components of Articles Intended for Repeated Use.

D. South Coast Air Quality Management District (SCAQMD):
1. Rule 1168 – Adhesive and Sealant Applications.

1.4 DEFINTIONS

A. Interior Sealant: All sealants occurring within the building waterproofing membrane.

B. Exterior Sealant: Sealants occurring outside and inclusive of the primary and secondary weatherproofing system, including building waterproofing membrane and air- and water-resistive barrier materials.

C. VOC: Volatile organic compounds.

1.5 COORDINATION

A. Refer to Section 09 91 00 "Painting" for Paint Color Schedule where matching sealant colors to paint color of adjacent wall surface.

1.6 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site to review pertinent issues related to joint sealants, including, but not limited to the following:
1. Condition of substrates and preparatory work.
2. Mockups.

B. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

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1.7 ACTION SUBMITTALS

A. Product Data: For each joint sealant product.
   1. Include VOC content.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view, for selection by Architect.
   1. Minimum Number of Colors for Selection:
      a. Silicone Sealants: 13.
      b. Urethane Sealants: 8.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint Sealant Schedule: Include the following information:
   1. Joint sealant application, joint location, and designation.
   2. Joint sealant manufacturer and product name.
   3. Joint sealant formulation.
   4. Joint sealant colors.

E. CALGreen Submittals:
   1. Manufacturer's product data for sealants and sealant primers indicating compliance with product requirements specified in "CALGreen Requirements" Article.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: For each type of joint sealant, for tests performed by a qualified testing agency.

C. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

D. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

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E. Field-Adhesion Test Reports: For each sealant application tested.

F. Sample Warranties: For special warranties.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved for installation of sealants by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.10 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with stone and masonry substrates.
4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint sealant backings, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint sealant manufacturer(s) submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.

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3. Notify Architect 5 working days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
    a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
        i) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers

1.12 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
    1. When ambient and substrate temperature conditions are outside limits permitted joint sealant manufacturer.
    2. When joint substrates are wet.
    3. Where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
    4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.13 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
    1. Warranty Period: 2 years from date of Substantial Completion.

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B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period:
   a. Silicone Sealants: 20 years from date of Substantial Completion.
   b. Urethane Sealants: 5 years from date of Substantial Completion.

C. Special warranties specified in this Article exclude deterioration or failure of joint sealants from the following:

1. Movement of structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 CALGREEN REQUIREMENTS

A. Provide sealants and sealant primers which comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, except as noted otherwise below. Such products shall also comply with Rule 1168 prohibition of the use of certain toxic compounds (chloroform, ethylene, dichloride, methylene chloride, perchloroethylene, and trichloroethyelen).

2.2 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint sealant manufacturer, based on testing and field experience.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

C. Colors of Exposed Joint Sealants: As indicated in Joint Sealant Schedule at end of this Section.

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2.3 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50 minimum, Use NT (exposure), Use G, A, O (joint substrate).

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Dow Corning Corporation; 795 Silicone Building Sealant.
    b. Momentive Performance Materials, Inc./GE; SCS2000 SilPruf.
    c. Pecora Corporation; 890 FTS.
    d. Equal product in accordance with Division 1 requirements for product substitutions.
2. Colors: As indicated in Joint Sealant Schedule at end of this Section.

B. Mildew-Resistant, Single-Component, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, Use NT (exposure).

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Pecora Corporation; 898 NST.
    b. Equal product in accordance with Division 1 requirements for product substitutions.
2. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
3. Color(s): As indicated in Joint Sealant Schedule at end of this Section.

C. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, Use NT (exposure).

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Dow Corning Corporation; 786 Sealant.
    b. Momentive Performance Materials, Inc./GE; SCS1700 Sanitary.
    c. Tremco Incorporated; Tremsil 200.
    d. Equal product in accordance with Division 1 requirements for product substitutions.
2. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
3. Color(s): As indicated in Joint Sealant Schedule at end of this Section.

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2.4 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 35 minimum, Use NT (exposure), Use M,A, O (joint substrate).

1. Products: Subject to compliance with requirements, provide one of the following:
   a. BASF Building Systems; MasterSeal NP1.
   b. Pecora Corporation; DynaTrol I-XL.
   c. Sika Corporation, Construction Products Division; Sikaflex – 1a.
   d. Tremco Incorporated; Dymonic 100.
   e. Equal product in accordance with Division 1 requirements for product substitutions.
2. Colors: As indicated in Joint Sealant Schedule at end of this Section.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Pecora Corporation; AC-20 FTR.
   b. USG Corporation; SHEETROCK Acoustical Sealant.
   c. Equal product in accordance with Division 1 requirements for product substitutions.

2.6 JOINT SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), as approved in writing by joint sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

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2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    a. Concrete.
    b. Masonry.
    c. Cement plaster.
    d. Unglazed surfaces of ceramic tile.
3. Remove laitance and form-release agents from concrete.

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4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint sealant manufacturer or as indicated by preconstruction joint sealant substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
    1. Do not leave gaps between ends of sealant backings.
    2. Do not stretch, twist, puncture, or tear sealant backings.
    3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
    1. Place sealants so they directly contact and fully wet joint substrates.
    2. Completely fill recesses in each joint configuration.
    3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

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F. Tooling on Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
   a. Perform 5 tests for the first 500 feet of joint length for each type of sealant and joint substrate.
   b. Perform one test for each 500 feet of joint length thereafter or one test per each floor per elevation.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:
   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

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4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT SEALANT SCHEDULE

A. Exterior Joint Sealant Schedule:
1. Perimeter Joints Around Door and Window Frames, Storefront and Curtainwall Systems, and Metal Louvers, Occurring Adjacent to Non-Stone Surfaces:
a. Sealant Type: One of the following:
i) Single-component nonsag, neutral-curing silicone joint sealant.
b. Colors: As selected by Architect from manufacturer's full range.
i) For bidding purposes, assume two separate colors, in equal quantities for each color.
2. Other Miscellaneous Joints Occurring in Exterior Envelope:
a. Sealant Type: One of the following:
i) Single-component nonsag, neutral-curing silicone joint sealant.
b. Colors: As selected by Architect from manufacturer's full range.
i) For bidding purposes, assume two separate colors, in equal quantities for each color.

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B. Interior Joint Sealant Schedule:

1. Perimeter Joints Around Door, Window, Storefront, and Curtainwall Frames:
   a. Sealant Type: One of the following:
      i) Single-component nonsag, urethane joint sealant.
   b. Color: As selected by Architect from manufacturer's full range.
2. Joints at Material Transitions:
   a. Sealant Type: One of the following:
      i) Single-component nonsag, urethane joint sealant.
   b. Color: As selected by Architect from manufacturer's full range.
3. Perimeter Joints Around Plumbing Fixtures:
   a. Sealant Type: One of the following:
      i) Mildew-resistant, single-component, neutral-curing silicone joint sealant.
      ii) Mildew-resistant single-component, acid-curing silicone joint sealant.
   b. Color: White.
4. Joints in Wet Areas:
   a. Sealant Type: One of the following:
      i) Mildew-resistant, single-component, neutral-curing silicone joint sealant.
      ii) Mildew-resistant single-component, acid-currrinnng silicone joint sealant.
   b. Color: Translucent.
5. Joints in Sound-Rated Assemblies:
   a. Sealant Type:
      i) Acoustical joint sealant.

END OF SECTION 07 92 00

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SECTION 08 11 13

HOLLOW-METAL FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Hollow-metal steel frames for doors.
   2. Glazing stops for new glazing installed in existing hollow-metal frames.

B. Related Sections include:
   1. Section 08 14 16 "Flush Wood Doors" for wood doors installed in hollow-metal frames.
   2. Section 08 71 00 "Door Hardware" for finish hardware installed on hollow-metal doors and frames.
   3. Section 08 81 00 "Glass Glazing" for glass installed in existing hollow-metal frames.
   4. Section 09 91 00 "Painting" for field painting of hollow-metal doors and frames.

1.3 REFERENCES

A. ASTM International:
   1. ASTM A 653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM A 780: Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
   3. ASTM A 879: Standard Specification for Steel Sheet, Zinc-Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface.
   4. ASTM A 1008: Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy With Improved Formability, Solution Hardened, and Bake Hardenable.
   5. ASTM A 1011: Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy With Improved Formability, and Ultra-High Strength.
   6. ASTM C 665: Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

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7. ASTM E 136: Standard Test Method for Behavior of Materials in Vertical Tube Furnace at 750°C.

B. Builder's Hardware Manufacturers Association (BHMA):
   1. ANSI/BHMA A156.115: Standard for Hardware Preparation in Steel Doors and Steel Frames.

C. National Association of Architectural Metal Manufacturers/Hollow Metal Manufacturers Association (NAAMM/HMMA):
   1. NAAMM-HMMA 803: Steel Tables.

D. Society for Protective Coatings (SSPC):
   1. SSPC-Paint 20: Zinc-Rich Coating, Type I – Inorganic and Type II – Organic.
   2. SSPC-SP1 Solvent Cleaning.
   3. SSPC-SP 3: Power Tool Cleaning.
   4. SSPC-SP 6/NACE No. 3: Commercial Blast Cleaning.

E. Steel Door Institute (SDI):
   1. ANSI/SDI A250.4: Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, and Frame Anchors.
   2. ANSI/SDI A250.6: Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
   3. ANSI/SDI A250.8 (Formerly SDI-100): Recommended Specifications for Standard Steel Doors and Frames.
   4. ANSI/SDI A250.10: Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
   5. ANSI/SDI A250.11: Recommended Erection Instructions for Steel Frames.
   6. SDI 111-C: Recommended Louver Details for Standard Steel Doors.

1.4 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.5 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

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1.6 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site to review pertinent issues related to hollow-metal doors and frames.

1.7 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, fire-resistance and temperature-rise ratings, and finishes for each type of hollow-metal frame specified.

B. Shop Drawings: Include the following:

1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
2. Details and locations of reinforcement and preparations for hardware.
3. Details of each different wall opening condition.
4. Details of anchorages, joints, field splices, and connections.
5. Details of accessories.
6. Details of moldings, removable stops, and glazing.
7. Existing Conditions: Where new glazing is indicated to be installed in existing frames, field verify all existing conditions and dimensions. Notify Architect of any conditions that would prevent installation of scheduled glazing.

C. Samples for Verification:

1. Fabrication: Prepare Samples approximately 12 inches by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
   a. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.

D. Product Schedule: For hollow-metal frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

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C. Store hollow-metal frames vertically under cover at Project site with head up. Place on minimum 4-inch high wood blocking, except place on higher blocking when needed to protect hollow-metal work from moisture or other harmful conditions. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain hollow-metal frames through one source from a single manufacturer.

2.2 HOLLOW-METAL FRAMES, GENERAL

A. Hollow-Metal Frames: Complying with SDI A250.8 as indicated.

1. Manufacturers: Subject to compliance with requirements, provide hollow-metal doors and frames by one of the following:
   a. Ceco Door Products; an ASSA ABLOY Group company.
   b. Curries Company; an ASSA ABLOY Group company.
   c. Door Components, Inc.
   d. Steelcraft; an Allegion brand.
   e. Stiles Custom Metal, Inc.
   f. Manufacturer of equal products in accordance with Division 1 requirements for product substitutions.

2.3 HOLLOW-METAL FRAMES

A. Construct hollow-metal frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances and clearances, and as specified.

B. Interior Hollow-Metal Frames: Complying with SDI 250.8, Level 3 (Extra-Heavy-Duty), except as noted otherwise below.

1. Frame Material: 0.053-inch thick (16 gage) uncoated steel sheet.
2. Construction: Full-profile welded.
3. Finish: Factory-primed.
4. Concealed Stiffeners and Reinforcing: Fabricated reinforcement plates from uncoated steel sheet, in thickness and dimensions as required for proper reinforcing and support for hinges, locks, flush bolts, closers, holders, and other hardware items.
5. Loose Stops for Glazed Lites in Existing Frames: Fabricated from uncoated steel sheet, minimum 0.032 inch thick (20 gage). Prepared for countersink style screws. Finish to match frame.

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6. Anchors: Formed from same material as frames except as noted otherwise below:
    a. Jamb Anchors: Provide minimum size, type, and quantity required by applicable door and frame standard, and suitable for performance level indicated.
        i) Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, metallic-coated steel sheet not less than 0.042-inch thick (18 gage), with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or metallic-coated wire anchors not less than 0.177-inch thick.
        ii) Stud-Wall Type: Designed to engage studs, welded to back of frames; not less than 0.042-inch thick (18 gage).
        iii) Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location
    b. Floor Anchors: Formed from same material as frame, minimum thickness of 0.042-inch (18 gage), and as follows:
        i) Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
        ii) Separate Topping Concrete Slabs or Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of topping slab or underlayment.

2.4 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Frame Anchors: ASTM A 879, Commercial Steel, (CS), 04Z (12G) coating designation; mill phosphatized.
    1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008 or ASTM A 1011, hot-dip galvanized according to ASTM A 153, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips of other accessory devices for attaching hollow-metal frames of type indicated.

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F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

G. Glazing: Comply with requirements of Section 08 81 00 "Glass Glazing."

2.5 FABRICATION

A. Fabricate hollow-metal frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Welded Frames: Weld continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. At postinstalled expansion type anchors, provide countersunk screws.
    a. Dimple holes in frames for countersinking of screws to allow filling and finishing for flush appearance after painting.
3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
4. Jamb Anchors: Provide number and spacing of anchors as follows:
    a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches on center and as follows:
        i) Three anchors per jamb up to 60 inches in frame height.
        ii) Four anchors per jamb from 60 to 90 inches in frame height.
        iii) Five anchors per jamb from 90 to 96 inches in frame height.
        iv) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in frame height.
        v) Two anchors per head for frames more than 42 inches wide and mounted in stud partitions.
    b. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches on center, to match coursing, and as follows:
        i) Two anchors per jamb up to 60 inches in frame height.
        ii) Three anchors per jamb from 60 to 90 inches in frame height.
        iii) Four anchors per jamb from 90 to 120 inches in frame height.

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iv) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof more than 120 inches in frame height.

c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches on center.

5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

D. Hardware Preparation: Factory-prepare hollow-metal doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to SDI A250.6, the Door Hardware Schedule and templates furnished as specified in Section 08 71 00 "Door Hardware."

1. Reinforce frames to receive nontemplated mortised and surface-mounted door hardware.

2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal frames for hardware.

E. Glazed Lites: At existing hollow-metal frames to receive new glazing, provide removable stops around glazed lites. Form corners of stops and moldings with mitered hairline joints.

1. Coordinate rabbet width between fixed and removable stops with type of glazing and installation types indicated.

2. Provide removable stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches on center, and not more than 2 inches on center from each corner.

2.6 STEEL FINISHES

A. Uncoated Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

B. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for

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substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal frames plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed work.
    a. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch up finishes.
    b. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    c. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

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2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.
    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors in dimpled openings, and fill and make smooth, flush, and invisible on exposed faces after painting.
4. Solidly pack mineral-fiber insulation inside frames where indicated.
5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Glazing: Comply with installation requirements in Section 08 81 00 "Glass Glazing" and with hollow-metal door and frame manufacturer's written instructions.
    1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches on center, and not more than 2 inches from each corner.

3.4 ADJUSTING AND CLEANING

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying rust-inhibitive primer.

END OF SECTION 08 11 13

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SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Solid-core wood doors.
      a. MDO face (opaque finish).
   2. Louvers for flush wood doors.

B. Related Sections include:
   1. Section 08 11 13 "Hollow-Metal Frames" for hollow-metal steel door frames to receive wood doors.
   2. Section 08 71 00 "Door Hardware" for finish hardware installed on wood doors.
   3. Section 08 81 00 "Glass Glazing" for glass installed in wood doors.
   4. Section 09 91 00 "Painting" for field-painting of wood doors with MDO faces.

1.3 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A208.1: Particleboard.

B. American National Standards Institute (ANSI)/Builders Hardware Manufacturers Association (BHMA):
   1. ANSI/BHMA A156.115-W: Hardware Preparation in Wood Doors with Wood or Steel Frames.

C. Door Hardware Institute (DHI):
   1. Recommended Locations for Architectural Hardware for Wood Flush Doors.

D. Window & Door Manufacturers Association (WDMA):
   1. WDMA I.S.1A: Industry Standard for Architectural Wood Flush Doors.
   2. WDMA T.M. 6: Adhesive Durability.

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1.4 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site to review pertinent issues related to wood doors.

1.5 ACTION SUBMITTALS

A. Product data: For each type of door. Include details of core and edge construction, louvers, and trim for openings.

B. Shop Drawings: Indicate location using same Door Schedule reference numbers used on Drawings, size, and hand of each door, elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data, including the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.

C. Samples for Verification:

1. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. CALGreen Submittals:

1. Manufacturer's product data for primers, stains, and transparent finishes, indicating compliance with product requirements specified in "CALGreen Requirements" Article.
2. Manufacturer's product data for wood doors which incorporate particleboard core, indicating compliance with product requirements specified in "CALGreen Requirements" Article.

1.6 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings, using temporary, removable, or concealed markings.

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1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1. Comply with requirements of referenced standard and manufacturer's written instructions.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty group.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-inch by 84-inch section.

b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Obtain flush wood doors from single manufacturer.

2.2 CALGREEN REQUIREMENTS

A. General: Conform with all applicable requirements of the California Green Building Standards Code (CALGreen).

B. Paint Primers and Transparent Finishes: Provide paint primers and transparent finishes that comply with VOC limits in Table 1 of the California Air Resources Board (ARB) Architectural Coatings Suggested Control Measure, unless more stringent local limits apply.

C. Composite Wood Products: Provide wood doors manufactured with wood composite products which meet requirements of California Air Resources Board "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions From Composite Wood Products" for formaldehyde resin emission limits (in ppm) for composite wood products and as specified below:

1. Particleboard: 0.09.

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2.3 FLUSH WOOD DOORS, GENERAL

A. Flush Wood Doors: Solid-core wood doors complying with WDMA I.S.1-A, "Architectural Wood Flush Doors."

1. Manufacturers: Subject to compliance with requirements, provide wood doors by one of the following:
    a. Eggers Industries.
    b. Marshfield-Algoma; by Masonite Architectural.
    c. VT Industries, Inc.
    d. Manufacturer of equal products in accordance with Division 1 requirements for product substitutions.
2. Contract Documents may contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. WDMA I.S.1-A Performance Grade: Heavy Duty.

C. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2.

2.4 DOORS FOR OPAQUE FINISH

A. Interior Solid-Core Doors:

1. WDMA I.S.1-A Grade: Premium.
2. Faces: MDO.
3. Exposed Vertical and Top Edges: Any closed-grain hardwood.
4. Core: Particleboard.
    a. Provide manufacturer's mineral-core construction where needed to provide fire-protection rating indicated.
5. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.
6. Adhesives: Type I per WDMA T.M. 6.

2.5 LIGHT FRAMES AND LOUVERS

A. Glazing Beads for Light Openings in Non-Fire-Rated Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species:
    a. Doors for Opaque Finish: Any closed-grain hardwood.
2. Profile: Recessed rectangular bead.

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B. Metal Door Louvers: Fixed metal louvers.

1. Manufacturers: Subject to compliance with requirements, provide door louvers by one of the following:
   a. Air Louvers, Inc.; a Division of the Activar Construction Products Group.
   b. Anemostat; a Mestek Company.
   c. National Guard Products.
   d. Manufacturer of equal products in accordance with Division 1 requirement for product substitutions.
2. Blade Type: Vision-proof, inverted V.
3. Metal and Finish: Hot-dip galvanized steel, 0.040-inch thick (20 gage), factory primed for field painting.

2.6 FABRICATION

A. Factory-fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory-machine doors for hardware that is not surface applied. Locate hardware to comply with DHI's "Recommended Locations for Architectural Hardware for Flush Wood Doors." Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Factory-cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory-finished. Comply with applicable requirements in Section 08 81 00 "Glass Glazing."
3. Louvers: Factory-install louvers in prepared openings.

2.7 SHOP PRIMING

A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer as specified in Section 09 91 00 "Painting."

1. VOC Content of Primer: Complies with requirements specified in "CALGreen Requirements" Article.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation refer to Section 08 71 00 "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Field-Painted Doors: Refer to Section 09 91 00 "Painting" for painting requirements.

3.3 ADJUSTING AND PROTECTION

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 08 14 16

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SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Wall access doors and frames.
   2. Ceiling access doors and frames.

B. B. Related Sections:
   1. Section 09 91 00 "Painting" for field painting of galvanized and shop-primed access doors.

1.3 SUBMITTALS

A. Product Data: For each type of door and frame indicated. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.

B. Schedule: Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:
   1. Method of attaching door frames to surrounding construction.
   2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain doors and frames through one source from a single manufacturer.

B. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

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1.5 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Cold-Rolled Steel Sheets: ASTM A 366, Commercial Steel (CS), or ASTM A 620, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A 568. Electrolytic zinc-coated steel sheet, complying with ASTM A 591, Class C coating, may be substituted at fabricator's option.

C. Metallic-Coated Steel Sheet: ASTM A 653, Commercial Steel (CS), Type B, with A60 (ZF180) zinc-iron-alloy (galvannealed) coating or G60 (Z180) mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924.

D. Stainless Steel Strip, Plate, and Flat Bars: ASTM A 666, Type 304; with minimum sheet thickness indicated representing specified thickness according to ASTM A 480.

E. Stainless Steel Bars and Shapes: ASTM A 276, Type 304.

F. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

G. Plaster Bead: Casing bead formed from 0.0299-inch zinc-coated steel sheet with flange formed out of expanded metal lath and in size to suit thickness of plaster.

2.2 PAINT

A. Shop Primers: Provide primers that comply with Section 09 91 00 "Painting."

B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Shop Primer for Metallic-Coated Steel: Organic zinc-rich primer complying with SSPC-Paint 20 and compatible with topcoat.

D. Galvanizing Repair Paint: High zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC Paint 20.

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2.3 ACCESS DOORS AND FRAMES

A. Available Manufacturers: Subject to compliance with requirments, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Acudor Products, Inc.
2. Babcock-Davis.
3. J.L. Industries, Inc.
4. Karp Associates, Inc.
5. Larsen's Manufacturing Company.
6. Milcor, Inc.
7. Nystrom Building Products Co.
8. Williams Brothers Corporation.

B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel, metallic-coated steel, or stainless steel sheet, as indicated in Part 3, and as follows:

1. Door: Set flush with surrounding finish surfaces.
   a. Steel Sheet and Metallic-Coated Steel Sheet: Minimum 0.075-inch (14 gage) thick sheet metal.
   b. Stainless-Steel Sheet: Minimum 0.060-inch (16 gage) thick sheet metal.
2. Frame:
   a. Steel Sheet and Metallic-Coated Steel Sheet: Minimum 0.060-inch (16 gage) thick sheet metal.
   b. Stainless-Steel Sheet: Minimum 0.060-inch (16 gage) thick sheet metal.
3. Hinges: Concealed pin type.
4. Lock: Key-operated cylinder lock with interior release.

2.4 FABRICATION

A. General: Provide access door assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Steel Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. Exposed Flanges: Nominal 1-inch wide around perimeter of frame.
2. Provide mounting holes in frames to attach frames to metal or wood framing in plaster or drywall construction and to attach masonry anchors in masonry construction.

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D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder lock, furnish two keys per lock and key all locks alike.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.6 METALLIC-COATED STEEL FINISHES

A. Galvanizing of Steel Shapes and Plates: Hot-dip galvanize items indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.
2. ASTM A 153, for galvanizing steel and iron hardware.

B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. For galvanized surfaces, apply, after cleaning, a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Factory Priming for Field-Painted Finish: Apply shop primer immediately after cleaning and pretreating.

2.7 STEEL FINISHES

A. Surface Preparation: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Interiors: (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

B. Apply shop primer to uncoated surfaces of metal fabrications. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

2.8 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

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C. Bright, Directional Finish: No. 4 finish.

1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 PREPARATION

A. Advise installers of other work about specific requirements relating to access door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install access door and frame types as follows:

1. Interior Locations (Except Where Occurring Within Ceramic Tile Areas): Steel sheet.
2. Within Ceramic Tile Locations: Stainless-steel sheet.
3. Exterior Locations: Metallic-coated steel sheet.

3.3 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13

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SECTION 08 41 13

GLAZED ALUMINUM STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Interior glazed storefront.

B. Related Sections include:
   1. Section 07 92 00 "Joint Sealants" for sealant around perimeter of aluminum storefront systems.
   2. Section 08 81 00 "Glass Glazing" for glass installed in aluminum entrance and storefront systems.

1.3 REFERENCES

A. Aluminum Association (AA).

B. American Architectural Manufacturers Association (AAMA):
   1. AAMA 611: Voluntary Specification for Anodized Architectural Aluminum.
   2. AAMA 2605: Superior Performing High Performance Organic Coatings on Aluminum Extrusions and Panels.

C. ASTM International:
   1. ASTM A 36: Standard Specification for Carbon Structural Steel.
   2. ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   3. ASTM A 153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   4. ASTM A 1008: Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy With Improved Formability, Solution-Hardened, and Bake Hardenable.
   5. ASTM A 1011: Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

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6. ASTM B 209: Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.
7. ASTM B 221: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
8. ASTM B 308: Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
9. ASTM B 429: Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
10. ASTM D 256: Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
11. ASTM D 1187: Standard Specification for Asphatl-Base Emulsions for Use as Protective Coatings for Metal.
12. ASTM D 2244: Standard Practice for Calculation of Color Tolerances and Color Differences From Instrumentally Measured Color Coordinates.
13. ASTM D 2583: Standard Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor.
14. ASTM D 4214: Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

D. California Building Code (CBC) – California Code of Regulations, Title 24, Part 2.

E. National Association of Architectural Metal Manufacturers (NAAMM):
1. Metal Finishes Manual for Architectural and Metal Products.

F. Society for Protective Coatings (SSPC):
1. SSPC-PS Guide No. 12.00: Guide to Zinc-Rich Coating Systems.
2. SSPC-SPCOM: Surface Preparation Commentary for Steel and Concrete Substrate.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Confererence: Conduct conference at Project site to review methods and procedures related to glazed aluminum entrances and storefronts.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For glazed aluminum storefront. Include plans, elevations, sections, full-size details, and attachments to other work.
1. Include details of joinery, including concealed welds.

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2. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.

C. Samples for Verification: For each type and color of exposed finish required, in manufacturer's standard sizes.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum entrances and storefronts to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum entrance and storefront systems that meet or exceed performance requirements indicated and of documenting this performance by test reports, and structural calculations.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical storefront area as directed by Architect.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion

1.8 FIELD CONDITIONS

A. Field Measurements: Where glazed aluminum storefront system is indicated to fit other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of glazed aluminum storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration caused by wind and thermal and structural movements.
   c. Deterioration of metals and other materials beyond normal weathering.

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d. Water penetration through fixed glazing and framing areas.

e. Failure of operating components to function properly.

2. Warranty Period: 2 years from date of Substantial Completion.

B. Special Finish Warranty – Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Aluminum Entrance and Storefront Systems: Obtain all components from single source from single manufacturer.

2.2 ALUMINUM STOREFRONT, GENERAL

A. Aluminum Storefront System: Manufacturer's aluminum storefront system meeting specified performance requirements, fabricated from extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads. Spacing and layout of framing members is indicated on Drawings.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.3 ALUMINUM STOREFRONT SYSTEM

A. Storefront System:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Oldcastle BuildingEnvelope; FG-3000.

b. Equal product in accordance with Division 1 requirements for product substitutions.

2. Typical Framing Member Dimensions (Except Where Indicated Otherwise on Drawings, or as Needed to Meet Specified Performance Requirements):

a. Face Dimension: 2 inches.

b. Depth: 4-1/2 inches.

3. Construction: Non-thermally broken.

4. Glazing System: Retained mechanically with gaskets on four sides.

5. Glazing Plane: Center-set.

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2.4 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Sheet and Plate: ASTM B 209.
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   3. Extruded Structural Pipe and Tubes: ASTM B 429.
   4. Structural Profiles: ASTM B 308.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SPCOM, and prepare surfaces according to applicable SSPC standard.
   1. Structural Shapes, Plates, and Bars: ASTM A 36.
   2. Cold-Rolled Sheet and Strip: ASTM A 1008.
   3. Hot-Rolled Sheet and Strip: ASTM A 1011.

2.5 ACCESSORIES

A. Brake Shape Closures: Minimum 0.090-inch thick aluminum sheet matching finish of aluminum framing members.

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.
   3. Where exposed, use fasteners with countersunk Phillips screw heads, finished, to match framing system.
   4. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended by manufacturer.

C. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
   1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, non-bleeding flashing compatible with adjacent materials.

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E. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection or deformation

F. Bituminous Paint: Cold-applied asphalt-mastic paint complying with ASTM D 1187 requirements, and containing no asbestos, formulated for 30-mil thickness per coat.

2.6 GLAZING

A. Glazing: Comply with Section 08 81 00 "Glass Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints with ends coped or mitered.
   3. Physical and thermal isolation of glazing from framing members.
   4. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
   5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   6. Provisions for field replacement of glazing: From mezzanine floor level side of opening.
   7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using manufacturer's standard system.

F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

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2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
   1. Comply with manufacturer's written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration, and to prevent impeding movement of moving joints.
   6. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
   7. Seal perimeter and other joints watertight, unless otherwise indicated.

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B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose, or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components plumb and true in alignment with established lines and grades.

D. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

E. If required by manufacturer to achieve a weathertight installation, set continuous sill members and flashing in sealant as specified in Section 07 92 00 "Joint Sealants."

F. Install glazing as specified in Section 08 81 00 "Glass Glazing."

G. Install perimeter sealant according to Section 07 92 00 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install glazed aluminum entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
   b. Where surfaces are separated by reveal or protruding element from ½ to 1 inch wide, limit offset from true alignment to 1/8 inch.
   c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

END OF SECTION 08 41 13

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SECTION 08 42 10

GLAZED OPERABLE PANEL ENTRANCE SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Manually-operated glazed aluminum-framed folding-panel entrance systems.
   2. Glazing of operable panel entrance systems.

B. Related Sections include:
   1. Section 05 12 00 "Structural Steel" for overhead structural support framing for operable panel entrance systems.
   2. Section 05 55 00 "Metal Fabrications" for support and blocking for partition tracks and jamb conditions.
   3. Section 06 10 00 "Rough Carpentry" for overhead structural support framing for operable panel entrance systems.

1.3 REFERENCES

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans With Disabilities Act (ADA) Accessibility Guidelines for Building and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

B. American Architectural Manufacturers Association (AAMA):
   1. AAMA 611: Voluntary Specification for Anodized Architectural Aluminum.
   2. AAMA 1304: Voluntary Specification for Force-Entry Resistance of Side-Hinged Door Systems.

C. ASTM International (American Society for Testing and Materials):
   1. ASTM B 456: Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
   2. ASTM B 633: Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
   3. ASTM C 1172: Standard Specification for Laminated Architectural Flat Glass.
   4. ASTM E 2112: Standard Practice for Installation of Exterior Windows, Doors, and Skylights.

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D. California Building Code (CBC) – California Code of Regulations, Title 24, Part 2.

E. Code of Federal Regulations (CFR):
   1. 16 CFR 1201: Safety Standard for Architectural Glazing Materials.

F. Glass Association of North America (GANA):
   1. Glazing Manual.

G. National Association of Architectural Metal Manufacturers (NAAMM):
   1. Metal Finishes Manual for Architectural and Metal Products.

H. National Fenestration Rating Council (NFRC):
   1. NFRC 100: Procedure for Determining Fenestration Product U-Factors.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, hardware, and finishes for glazed operable panel entrance systems.

B. Shop Drawings: For glazed operable panel entrance systems. Include plans, elevations, sections, details, clearances required for operation, door swings, and stacking, attachments to other work, and the following:
   1. Hardware schedule with operating hardware types, functions, quantities, and locations indicated.
   2. Expansion provisions.
   3. Weight of system.
   4. Flashing and drainage details.
   5. Weatherstripping details.
   6. Thermal-break details.
   7. Glazing details.
   8. Anchorage.
      a. Anchorage of glazed operable panel entrance systems as may be indicated Drawings is only for purposes of obtaining preliminary approval of Drawings from the Division of the State Architect's office, and is not intended to as the final design. Actual anchorages are to fully engineered (with supporting calculations) and indicated on Shop Drawings, for DSA review and approval.
   9. Isometric views showing vertical-to-horizontal intersection of aluminum-framed units.
   10. Accessories.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

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1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance with specified performance requirements.

C. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes, weatherstripping, operable panels, and operating hardware to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating glazed operable panel entrance systems that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

B. Installer Qualifications: An installer acceptable to operable panel entrance system manufacturer for installation of units required for this Project.

C. Source Limitations: Obtain glazed operable panel entrance systems from a single source from single manufacturer.

D. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and California Building Code Chapter 11B.

E. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201.

F. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section for project meetings. Review methods and procedures and other issues related to glazed operable panel entrance systems.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Follow manufacturer's written instructions for delivery, storage, and handling of glazed operable panel entrance systems.

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of operable panel entrance systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair to replace components of glazed operable panel entrance systems that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including excessive deflection.
      b. Faulty operation of operable panels and hardware.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   2. Warranty Period:
      a. Operable panel entrance system roller hardware: 10 years from date of Substantial Completion.
      b. Metal Finish: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
   1. Warranty Period: 5 years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by operable panel entrance system manufacturer for strength, corrosion resistance, and application of required finish, and not less than 0.078-inch thickness at any location for the main panel frame, head track, and jamb members.

B. Fasteners: Provide fasteners of aluminum, nonmagnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive for SC 3 severe service conditions and compatible with framing members, trim, hardware, anchors, and other components of glazed operable panel entrance system.

1. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Accessories: Provide anchors, clips, and accessories of aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron for glazed operable panel entrance system, complying with ASTM B 456 or ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

D. Weatherstripping: Designed for permanently resilient sealing when operable panel entrance system is closed.

1. Compression-Type Weatherstripping: Compressible weatherstripping designed for permanently resilient sealing under bumper or wiper action, and for complete concealment when operable panels are in closed position.
2. Sliding-Type Weatherstripping: Woven-pile weatherstripping of polypropylene, or nylon pile and resin-impregnated backing fabric.

2.2 FOLDING PANEL ENTRANCE SYSTEM

A. General: Floor-supported, glazed aluminum-framed hinged folding panel system, including head track and jamb frame, sill track, operable panels, seals, and accessories, designed to provide an opening glass wall, in sizes and configurations as shown on Drawings. Panels are manually-operated, and joined by hinge connectors.

1. Product: Subject to compliance with requirements, provide the following:
   a. NanaWall Systems, Inc.; SL45.
2. Dimensions of framing members:
   a. Perimeter Frame (Head Track and Jambs):
      i) Depth: 1-3/4 inches.
      ii) Face Dimension: 2-1/2 inches.

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b. Glazed Panel Stiles and Rails:

i) Depth: 1-3/4 inches.

ii) Face Dimension, Stiles and Top Rail: 2-1/16 inches.

iii) Face Dimension, Bottom Rail: 2-1/16 inches.

3. Operating Direction of Folding Panels: As indicated on Drawings.

4. Panel Frame Configuration: One lite.

5. Panel Weight (including glass): 5.5 lbs per square foot maximum.

B. Hardware: Provide manufacturer's standard hardware, fabricated from a corrosion-resistant material compatible with aluminum and designed to smoothly operate, tightly close, and securely lock glazed aluminum-framed operable panels.

1. Carriers: Provide each operable panel with adjustable roller assemblies.

a. Upper Running Carriage: Self-lubricating four-wheel ball-bearing carrier assembly.

b. Lower Running Carriage: Ball bearing guide wheel.

2. Sill: Provide extruded-aluminum low-profile sill threshold and track; designed to comply with performance requirements indicated.

a. Low-Profile Sill: ADA-ABA compliant.

b. Finish: Mill finish.

3. Hinges: Die-cast zinc, with powder-coat finish to match color and finish of panel frame.

4. Latching Mechanism:

a. Non-Locking Folding Panels: Two-point latching hardware consisting of top and bottom concealed latching rods with fiberglass-reinforced polymer end caps operated by 180 degree turn of lever handle on inside face of panel. Provide one latching mechanism for each pair of non-locking folding panels at hinged edge of panel, with lever handle at interior side, only.

i) Lever Handle Finish: Brushed stainless-steel.

b. Locking Folding Panels: Three-point latching hardware consisting of top and bottom concealed latching rods with fiberglass-reinforced polymer end caps and jamb latch operated by 180 degree turn of lever handles on inside and outside face of panel.

i) Lock: Install manufacturer's keyed cylinder lock with thumbturn at interior side.

ii) Lever Handle Finish: Brushed stainless-steel.

c. Swing Panels (For Single Swing Panel, or Active Leaf of Double-Swing Panel): Exit device (panic hardware) as specified in Section 08 71 00 "Door Hardware."

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C. Glazing: Comply with Section 08 88 00 "Glass Glazing" for glazing requirements applicable to glazed operable panel entrance systems.

1. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
   a. Construction:
      i) Outer Ply: Clear heat-strengthened float glass.
         a) Thickness: 6.00 mm (±1/4 inch)
      ii) Interlayer: 0.060 inch clear PVB.
      iii) Inner Ply: Clear heat-strengthened float glass.
         a) Thickness: 6.00 mm (±1/4 inch).
   b. Provide safety glazing labeling.
2. Glazing System: Provide operable panel entrance system manufacturer's standard glazing system that produces weathertight seal.
   a. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded, or extruded, of profile and hardness required to maintain watertight seal.
   b. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.3 FABRICATION

A. Fabricate aluminum-framed glazed operable panel entrance system in sizes and configurations indicated. Include a complete system for assembling components and anchoring system.

B. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing without dismantling sliding panel stile and rail framing.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

C. Form or extrude aluminum shapes before finishing.

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D. Weatherstripping: Provide operable panels with a double row of compression-type or sliding weatherstripping, as suited to adjacent condition, at perimeter of all panel frames and head and jamb perimeter frames receiving panels. Weatherstripping to be locked into extruded grooves in panel stile and rail frames and surrounding head and jamb perimeter frame.

E. Weepholes: Provide weepholes and internal drainage passages to conduct infiltrating water to exterior.

F. Factory-Glazed Fabrication: Glaze operable panel entrance system panels in the factory where practical and possible for applications indicated. Comply with requirements in Section 08 81 00 " Glass Glazing."

G. Glazing Stops: Provide snap-on glazing stops coordinated with manufacturer's glazing system. Finish and color of glazing stops to match panel frames.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of opening.
2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

B. Verify rough opening dimensions, levelness of threshold substrate, and operational clearances.

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C. Verify that rough openings are plumb and square.

D. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight glazed operable panel entrance system installation.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing all components of glazed operable panel entrance systems.

B. Install glazed operable panel entrance systems level, plumb, square, true to line, without distortion, warp or rack of frames and panels, or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing, vapor retarders, air barriers, water/weather barriers, and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, and in compliance with manufacturer's written instructions, to provide weathertight construction.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials according to ASTM E 2112, Section 5.12 "Dissimilar Materials."

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Lubricate hardware and moving parts.

B. Adjust operating panels to provide a tight fit at contact points and weatherstripping for smooth operation, without binding, and a weathertight closure.

C. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.

D. Clean aluminum surfaces immediately after installing glazed operable panel entrance systems. Comply with manufacturer's written recommendations for final cleaning and maintenance. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, and clean surfaces.

E. Clean glass immediately after installing glazed operable panel entrance systems. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.

F. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

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G. Protect glazed operable panel entrance systems from contact with contaminating substances resulting from construction operations. During construction, monitor sliding door surfaces adjacent to and below exterior concrete and masonry surfaces for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating surfaces do contact glazed operable panel entrance system surfaces, remove contaminants immediately according to manufacturer's written instructions.

H. Refinish or replace glazed operable panels with damaged finishes.

I. Replace damaged components.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain glazed operable panel entrance system. Refer to Division 1 Section for demonstration and training requirements.

END OF SECTION 08 42 10

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SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Mechanical door hardware for the following:
      a. Swinging doors.
      b. Other doors, including sliding doors and folding doors, to extent indicated.
   2. Cylinders for door hardware specified in other Sections.
   3. Door silencers installed on hollow-metal steel frames.

B. Related Sections include:
   1. Section 06 10 53 "Miscellaneous Carpentry" for concealed blocking and framing for support of doorstops and other wall-mounted hardware items.
   2. Section 06 41 00 "Architectural Wood Casework" for cabinet locks and hardware.
   3. Section 08 11 13 "Hollow-Metal Frames" for hollow-metal steel frames to receive door hardware.
   4. Section 08 14 16 "Flush Wood Doors" for wood doors to receive door hardware.
   5. Section 08 31 13 "Access Doors and Frames" for access door hardware.
   6. Section 32 31 19 "Decorative Metal Fences and Gates" for metal site gate to receive door hardware.

1.3 REFERENCES

A. ASTM International (American Society for Testing and Materials):
   1. ASTM E 283: Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Wall, and Doors Under Specified Pressure Differences Across the Specimen.

B. Builders Hardware Manufacturers Association (BHMA):
   1. BHMA A156.1: Butts and Hinges.
   2. BHMA A156.2: Bored and Preassembled Locks & Latches.

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3. BHMA A156.3: Exit Devices.
4. BHMA A156.4: Door Controls – Closers.
5. BHMA A156.5: Auxiliary Locks and Associated Products.
6. BHMA A156.6: Architectural Door Trim.
7. BHMA A156.8: Door Controls – Overhead Stops and Holders.
8. BHMA A156.16: Auxiliary Hardware.
9. BHMA A156.18: Materials and Finishes.
10. BHMA A156.28: Recommended Practices for Keying Systems.

C. Door and Hardware Institute (DHI):
1. DHI Handbook: Sequence and Format for the Hardware Schedule.
2. DHI Handbook: Recommended Locations for Architectural Hardware for Flush Wood Doors.

D. Hollow Metal Manufacturers Association (HMMA):
1. HMMA 831: Recommended Hardware Locations for Custom Hollow Metal Doors and Frames.

E. Steel Door Institute (SDI):
1. ANSI/SDI A250.6: Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
2. ANSI/SDI A250.8 (Formerly SDI-100): Recommended Specifications for Standard Steel Doors and Frames.

F. United States Department of Justice:
1. 2010 ADA Standards for Accessible Design.

1.4 COORDINATION

A. Installation Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Coordinate sizes and locations of concealed framing and blocking to ensure that doorstops and other wall-mounted items have sufficient backing as required for proper performance.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

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B. Samples for Verification: Submit minimum 2-inch by 4-inch plate Samples of each type of finish required, except primed finish.

1. Submit full size Sample of exposed door hardware of each type as directed by Architect in specified finish. Tag with full description for coordination with door hardware sets. Submit Samples before, or concurrent with, submission of final door hardware sets.

   a. Full size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

C. Door Hardware Sets: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Submittal Sequence: Submit final door hardware sets at earliest possible date, particularly where approval of door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.

2. Format: Comply with scheduling sequence and vertical format in DHI Handbook "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page. Use same door numbers as in Contract Documents.

3. Content: Include the following information:

   a. Identification number, location, hand, fire rating, size, and material of each door and frame.

   b. Location of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.

   c. Type, style, function, size, quantity, and finish of each door hardware item.

   d. Complete designations, including name and manufacturer, type, style, function, size, quantity, and finish of each door hardware product.

   e. Fastenings and other pertinent information.

   f. Explanation of abbreviations, symbols, and codes contained in schedule.

   g. Mounting locations for door hardware.

   h. List of related door devices specified in other Sections for each door and frame.

D. Keying Schedule: Prepared by or under supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with Contract Documents.

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1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

C. Warranty: Special warranty specified in this Section.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Installer shall have warehousing facilities in Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer.

D. Keying Conference: Conduct conference at Project site to comply with Division 1 requirements for project meetings. In addition to Owner, Construction Manager, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

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E. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials. Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Inspect and discuss preparatory work performed by other trades.
3. Review required testing, inspecting, and certifying procedures.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including excessive deflection, cracking, or breakage.
   b. Faulty operation of doors and door hardware.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
2. Warranty Periods:
   a. Locksets (non-electrified): 3 years from date of Substantial Completion.
   b. Surface Closers: 10 years from date of Substantial Completion.
   c. Exit Devices: 3 years from date of Substantial Completion.

1.11 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Means of Egress Doors: Comply with California Building Code. Locks do not require use of a key, tool, or special knowledge for operation. Latches do not require more than 15 lbf to release the latch.

B. Accessibility Requirements:

1. Comply with applicable provisions of the following:
   a. California Building Code (Title 24, Part 2), Chapters 11A and 11B.
   b. United States Department of Justice's 2010 ADA Standards for Accessible Design.
2. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
3. Comply with the following maximum opening-force requirements:
   a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
   b. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
   c. Exterior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
   d. Fire Doors: Minimum opening force allowable by authorities having jurisdiction, but not to exceed 15 lbf.
4. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
5. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position 12 degrees from the latch.

2.2 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturer's products.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Manufacturer and product designation are listed for each door hardware type required. Manufacturer's names are abbreviated in Part 3 "Door Hardware Sets" Article.

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2.3 HINGES

A. Hinges: BHMA A156.1, Grade 1.

B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

C. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head; machine screws (drilled and tapped holes) for metal doors; wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.4 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As scheduled in Part 3 "Door Hardware Sets" Article.

B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Bored Locks: Minimum 1/2-inch latchbolt throw.
2. Deadbolts: Minimum 1-inch latchbolt throw.

C. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

D. Bored Locks: BHMA A156.2.

2.5 AUXILIARY LOCKS

A. Bored Auxiliary Locks: BHMA A156.5; with strike that suits frame.

B. Mortise Auxiliary Locks: BHMA A156.5; with strike that suits frame.

2.6 EXIT DEVICES

A. Exit Devices: BHMA A156.3, Grade 1.

B. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

C. Outside Trim: As scheduled in Part 3 "Door Hardware Sets" Article.

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2.7 LOCK CYLINDERS

A. Standard Lock Cylinders: BHMA A156.5, Grade 1.

B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:

1. Number of Pins: Six.
2. Bored-Lock Type: Cylinders with tailpieces to suit locks.

C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturer's cylinders.

D. Construction Keying: Comply with the following:

1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
   a. Replace construction cores with permanent cores as directed by Owner.

E. Manufacturer: Same manufacturer as for locks and latches.

2.8 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.

1. Comply with all keying requirements of Owner.

B. Keys: Nickel silver.

1. Stamping: Permanently inscribe each key with a visual key control number and include the notation "DO NOT DUPLICATE."
2. Quantity: In addition to one extra key blank for each lock, provide the following (as applicable):
   a. Cylinder Change Keys: Three.

2.9 OPERATING TRIM

A. Operating Trim: BHMA A156.6.

2.10 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4, Grade 1; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

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1. Install surface closer on non-public side of door unless indicated otherwise.
    a. Provide parallel arm closers when located on push-side of door.

2.11 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16.

2.12 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

B. Door Sweeps: Gasket material held in place by flat metal housing or flange; surface mounted to face of door with screws.

C. Door Shoes: Gasket material held in place by metal housing; mounted to bottom edge of door with screws.

2.13 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

2.14 METAL PROTECTIVE TRIM UNITS

A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch thick metal as scheduled in Hardware Sets; with manufacturer's standard machine or self-tapping screw fasteners.

B. Kickplates: Height as scheduled in Part 3 "Door Hardware Sets" Article, by door width with allowance for frame stops.

2.15 AUXILIARY DOOR HARDWARE

A. Auxiliary Hardware: BHMA A156.16; Grade 1.

B. Silencers for Metal Door Frames: Neoprene or rubber; minimum diameter 1/2 inch; fabricated for drilled-in application to frame.

2.16 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
    1. Manufacturer's identification is permitted on rim of lock cylinders only.

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B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Wood or Machine Screws: For the following:
   a. Hinges mortised to doors or frames.
   b. Strike plates to frames.
   c. Closers to doors and frames.
3. Steel Through Bolts: For the following unless door blocking is provided:
   a. Surface hinges to doors.
   b. Closers to doors and frames.
   c. Surface-mounted exit devices.
4. Spacers or Sex Bolts: for through bolting of hollow-metal doors.
5. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
6. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.17 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware sets.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before stripping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Verify concealed blocking and backing has been installed for all doorstops and other wall-mounted items occurring on framed walls.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with DHI Handbook "Recommended Locations for Architectural Hardware for Flush Wood Doors."

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI Handbook "Recommended Locations for Architectural Hardware for Flush Wood Doors."
4. Operating Hardware: Between 34 inches and 44 inches above finish floor, per 2016 California Building Code Section 11B-404.2.7.

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

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C. Hinges: Install types and in quantities indicated in Part 3 "Door Hardware Sets" Article, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.

E. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as indicated in keying schedule.

F. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Section 07 92 00 "Joint Sealants." Per 11B-404.2.5, ½" maximum with 1:2 slope maximum.

G. Stops: Provide door stops as scheduled in Part 3 "Door Hardware Sets" Article.

1. Do not mount floor stops where stop will impede traffic, 4" maximum from the wall.

H. Perimeter Gasketing: Apply to head and jambs, forming seal between door and frame.

I. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

J. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position 12 degrees from the latch.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

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B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 1 Section for demonstration and training.

3.7 DOOR HARDWARE SETS

A. Items listed in the following Schedule of Door Hardware Sets conform to requirements specified in Part 2 of this Section.

B. Manufacturer's Abbreviations:

GLY	Glynn-Johnson
HAG	Hager
IVE	Ives
LCN	LCN
PEM	Pemko
SCH	Schlage
STN	Stanley
TRI	Trimco/Builder's Brass Works
VON	Von Duprin

C. Hardware Sets:

(Note: See Drawings for exit device hardware occurring at exterior site gates)

HW Set 01

Doors 200A, 207A

Qty.	Item	Product	Mfr.	Finish
3	Hinges	FBB199, 4-1/2x4-1/2 x NRP	STN	630
1	Exit device	98L06	VON	626
1	Cylinder	20-022	SCH	626
1	Kickplate	KOO50, 10" x 1-1/2" LDW	TRI	630
1	Closer	4041	LCN	689
1	Doorstop	1270CX	TRI	626
3	Door frame silencers	1229A	TRI	Gray

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HW Set 02

Door 203A

Qty.	Item	Product	Mfr.	Finish
3	Hinges	FBB199, 4-1/2x4-1/2 x NRP	STN	630
1	Lockset	ND40S RHO	SCH	626
1	Kickplate	KOO50, 10" x 1-1/2" LDW	TRI	630
1	Closer	4041	LCN	689
1	Doorstop	1270CX	TRI	626
3	Door frame silencers	1229A	TRI	Gray

HW Set 03

Doors 202A

Qty.	Item	Product	Mfr.	Finish
3	Hinges	FBB199, 4-1/2x4-1/2 x NRP	STN	630
1	Exit device	98L06	VON	626
1	Cylinder	20-022	SCH	626
1	Closer	4041	LCN	689
1	Doorstop	1270CX	TRI	626

HW Set 04

Doors 205A, 212A

Qty.	Item	Product	Mfr.	Finish
3	Hinges	FBB199, 4-1/2x4-1/2 x NRP	STN	630
1	Lockset	ND70RD RHO	SCH	626
1	Kickplate	KOO50, 10" x 1-1/2" LDW	TRI	630
1	Closer	4041	LCN	689
1	Doorstop	1270CX	TRI	626
3	Door frame silencers	1229A	TRI	Gray

END OF SECTION 08 71 00

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SECTION 08 81 00

GLASS GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Glass for the following glazed systems:
      a. Aluminum storefront system.
      b. Hollow-metal frames.
      c. Wood doors.
   2. Glazing sealants and accessories.

B. Related Sections include:
   1. Section 08 14 16 "Flush Wood Doors" for wood doors to receive glazing.
   2. Section 08 41 13 "Glazed Aluminum Storefronts" for aluminum storefront system to receive glazing.
   3. Section 08 42 10 "Glazed Operable Panel Entrance Systems" for glazing in glazed folding panel entrance system.
   4. Section 08 87 00 "Glazing Surface Films" for surface-applied glazing films.

1.3 REFERENCES

A. American Architectural Manufacturer's Association (AAMA):
   1. AAMA 800: Voluntary Specifications and Test Methods for Sealants.

B. ASTM International:
   1. ASTM C 920: Standard Specification for Elastomeric Joint Sealants.
   2. ASTM C 1021: Standard Practice for Laboratories Engaged in the Testing of Building Systems.
   3. ASTM C 1036: Standard Specification for Flat Glass.
   4. ASTM C 1048: Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT, Coated, and Uncoated Glass.
   5. ASTM C 1087: Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.

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6. ASTM C 1281: Standard Specification for Preformed Tape Sealants for Glazing Applications.
7. ASTM E 1300: Standard Practice for Determining Load Resistance of Glass in Buildings.
8. ASTM C 1330: Standard Specification for Cylindrical Sealant Backing For Use With Cold Liquid-Applied Sealants.

C. California Building Code (CBC) – California Code of Regulations, Title 24, Part 2.

D. Code of Federal Regulations (CFR):
1. 16 CFR 1201: Safety Standard for Architectural Glazing Materials.
2. 40 CFR, Part 59, Subpart D: National Volatile Organic Compound Emission Standards.

E. Glass Association of North America (GANA):
1. Glazing Manual.

F. Lawrence Berkeley National Laboratory (LBNL):
1. WINDOW 5.2 computer program.

G. National Fenestration Rating Council (NFRC):
1. NFRC 100: Procedure for Determining Fenestration Product Thermal Properties.
2. NFRC 200: Procedure for Determining Fenestration Product Solar Heat Gain Coefficients at Normal Incidence.
3. NFRC 300: Procedures for Determining Solar Optical Properties of Simple Fenestration Products.
4. NFRC CAP 1: Certification Agency Program.

H. Safety Glazing Certification Council (SGCC).

I. South Coast Air Quality Management District (SCAQMD):
1. Rule 1168 – Adhesive and Sealant Applications.

1.4 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. VOC: Volatile Organic Compound.

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1.5 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.6 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Glazing Accessory Samples: For each color of exposed gaskets and glazing sealants, in 12-inch lengths.

C. CALGreen Submittals:

1. Manufacturer's product data for glazing sealants and primers indicating compliance with product requirements specified in "CALGreen Requirements" Article.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.8 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installers.

B. Product Certificates: For glass and glazing products, from manufacturer.

C. Preconstruction adhesion and compatibility test report.

D. Sample Warranties: For special warranties.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance.

B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

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C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build glass mockups by installing scheduled glass in mockups specified in the following Sections to match glazing systems required for Project, including glazing methods.
   a. Section 08 11 13 "Hollow-Metal Frames."
   b. Section 08 41 13 "Glazed Aluminum Storefronts."
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
3. Test not fewer than two Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.12 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

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1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or are below 40 deg F.

1.13 WARRANTY

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 CALGREEN REQUIREMENTS

A. General: Conform with all applicable requirements of the California Green Building Standards Code (CALGreen).

B. Provide glazing sealants and primers which comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, except as noted otherwise below. Such products shall also comply with Rule 1168 prohibition of the use of certain toxic compounds (chloroform, ethylene, dichloride, methylene chloride, perchloroethylene, and trichloroethyelen).

2.3 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Safety Glazing: Where tempered or laminated glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glazing system framing members and glazing components.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

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D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
2. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq ft x deg F.
3. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
4. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.4 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Glazing Manual."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark safety glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction, or of the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Glass Thicknesses: Glass thicknesses indicated are minimums. Provide glass that complies with specified performance requirements.

D. Strength: Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

2.5 GLASS PRODUCTS

A. Fully Tempered Float Glass: ASTM C 1048.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. Kind: Kind FT (fully tempered).
3. Condition: Comply with requirements for uncoated and coated glass as follows:
   a. Uncoated Vision Glass: Condition A.
   b. Coated Vision Glass: Condition C.

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4. Type: Type I (transparent flat glass).
    a. Class:
        i) Where Clear Glazing is Indicated: Class 1 (clear).
5. Quality: Q3.

B. Heat-Strengthened Float Glass: ASTM C 1048.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. Kind: Kind HS (heat strengthened).
3. Condition: Comply with requirements for uncoated and coated glass as follows:
    a. Uncoated Vision Glass: Condition A.
    b. Coated Vision Glass: Condition C.
4. Type: Type I (transparent flat glass).
    a. Class:
        i) Where Clear Glazing is Indicated: Class 1 (clear).
5. Quality: Q3.

C. Monolithic Glass Types: Refer to "Monolithic Glass Schedule" at end of this Section.

2.6 GLAZING SEALANTS

A. General:
1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

B. Glazing Sealant: Single-component, nonsag, neutral-curing silicone glazing sealant; ASTM C 920, Type S, Grade NS, Class 50 minimum, Use NT (exposure), Use G, A, O (joint substrate)
1. Products: Subject to compliance with requirements, provide one of the following:
    a. Dow Corning Corporation; 795 Silicone Building Sealant.
    b. Momentive Performance Materials, Inc./GE; SCS2000 SilPruf.
    c. Pecora Corporation; 895.
    d. Tremco Incorporated; Spectrem 2.

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e. Equal product in accordance with Division 1 requirements for product substitutions.

2. Colors of Exposed Glazing Sealants: Translucent.

3. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below (AAMA standards referenced below are contained within AAMA 800):

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types (AAMA standards referenced below are contained within AAMA 800):

1. AAMA 810.1, Type I, for glazing applications in which tape acts as the primary sealant.

2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

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F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Framing System Glazing Stops and Gaskets:

1. Aluminum Storefront Systems: Refer to Section 08 41 13 "Glazed Aluminum Entrances and Storefronts" for pressure-glazing system with gaskets.

2.9 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

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B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

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B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, and then to jambs. Cover horizontal framing joints by applying tapes to jambs, and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant, where applicable.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work towards centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter-cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work towards centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

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3.6 SEALANT GLAZING (WET)

A. At frameless vertical joints between glass lites, install continuous sealant bead between adjacent glass lites.

B. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than 4 work days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.8 MONOLITHIC GLASS SCHEDULE

A. Glass Type CG-1: Clear heat-strengthened float glass.

1. Thickness: 6.0 mm (±1/4 inch).
2. Optical and Thermal Properties:
   a. Visible Light Transmittance: 89 percent.
   b. Solar Heat Gain Coefficient: 0.82 maximum.
   c. Shading Coefficient: 0.94.
   d. Winter Nighttime U-Factor: 1.02 maximum.
   e. Summer Daytime U-Factor: 0.93 maximum.

B. Glass Type CG-2: Clear heat-strengthened float glass.

1. Thickness: 12.0 mm (±1/2 inch).
2. Optical and Thermal Properties:
   a. Visible Light Transmittance: 89 percent.
   b. Solar Heat Gain Coefficient: 0.82 maximum.
   c. Shading Coefficient: 0.94.
   d. Winter Nighttime U-Factor: 1.02 maximum.

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e. Summer Daytime U-Factor: 0.93 maximum.

C. Glass Type TG: Clear fully tempered float glass.
   1. Thickness: 6.0 mm (±1/4 inch).
   2. Provide safety glazing labeling.
   3. Optical and Thermal Properties:
      a. Visible Light Transmittance: 89 percent.
      b. Solar Heat Gain Coefficient: 0.82 maximum.
      c. Shading Coefficient: 0.94.
      d. Winter Nighttime U-Factor: 1.02 maximum.
      e. Summer Daytime U-Factor: 0.93 maximum.

END OF SECTION 08 81 00

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SECTION 08 87 00

WINDOW FILM

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes:

1. Window film adhered to interior glazing.

1.2 RELATED SECTIONS

A. Section 08 42 10 "Glazed Operable Panel Entrance System" panel entrance to receive architectural window film.

B. Section 08 81 00 "Glass Glazing" general glazing applications to receive architectural window film.

1.3 REFERENCES

A. ASHRAE - American Society for Heating, Refrigeration, and Air Conditioning Engineers; Handbook of Fundamentals.

B. ASTM International (ASTM):
1. ASTM D 882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
2. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers -- Tension.
3. ASTM D 624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
4. ASTM D 1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
5. ASTM D 1044 - Standard Method of Test for Resistance of Transparent Plastics to Surface Abrasion (Taber Abrader Test).
6. ASTM D 2240 - Standard Method for Rubber Property - Durometer Hardness.
7. ASTM D 2582 - Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
8. ASTM D 5895 - Standard Test Methods for Evaluating Drying or Curing During Film Formation of Organic Coatings Using Mechanical Recorders.
9. ASTM E 84 - Standard Method of Test for Surface Burning Characteristics of Building Materials.
10. ASTM E 308 - Standard Recommended Practice for Spectophotometry and Description of Color in CIE 1931 System.

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11. ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

C. Window 5.2 - A Computer Tool for Analyzing Window Thermal Performance; Lawrence Berkeley Laboratory.

D. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

E. Consumer Products Safety Commission 16 CFR, Part 1201 - Safety Standard for Architectural Glazing Materials.

F. GSA-TS01 - Standard Test for Glazing and Glazing Systems Subject to Airblast Loadings.

G. ISO 16933, International Standard for Glass in Building: Explosion-resistant security glazing - Test and classification for arena air-blast testing.

H. Underwriters Laboratories Inc. (UL): UL 972 - Burglary Resisting Glazing Material.

1.4 PERFORMANCE REQUIREMENTS

A. Fire Performance: Surface burning characteristics when tested in accordance ASTM E 84:
   1. Flame Spread: 25, maximum.
   2. Smoke Developed: 450, maximum.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Selection Samples: For each film specified, submit two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each film specified, two samples representing actual film color and pattern.

1.6 QUALITY ASSURANCE

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A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.9 WARRANTY

A. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: 3M Window Film , which is located at: 3M Center Bldg. 0235-02-S-27 ; St. Paul, MN 55144-1000; Toll Free Tel: 800-480-1704; Tel: 651-733-2222; Fax: 651-737-3446; Web: www.3m.com/windowfilm

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

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C. Window Film: As specified in Section 09 06 00 "Colors and Finishes" for WF-1, WF-2, WF-3 as noted on the Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Film Examination:
   1. If preparation of glass surfaces is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
      a. Glass surfaces receiving new film should first be examined to verify that they are free from defects and imperfections, which will affect the final appearance.
   2. Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
   3. Commencement of installation constitutes acceptance of conditions.

B. Impact Protection Adhesive Examination:
   1. If application of window film is/was the responsibility of another installer, notification in writing shall be made of deviations from manufacturer's recommended installation tolerances and conditions.
   2. Filmed glass surfaces receiving new attachment should first be examined to verify that they are free from defects and imperfections, and that the film edges extend sufficiently to the frame edges.
   3. Do not proceed with installation until film and frame surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
   4. Upon the customer's request, an adhesion test to the frame surface may be conducted by applying a 4 - 6 inch long bead, approximately 0.5 - 1 inch in width, masking one side of the frame surface underneath the strip with tape. Allow the Impact Protection Adhesive to cure for 7 days and test adhesion by pulling up on the masked end and a 90 degree angle. If cohesive failure is observed (adhesive residue left behind on the frame surface), adhesion is acceptable; if adhesive failure is observed (clean peel from the frame), adhesion is unacceptable and product is not recommended.

C. Impact Protection Profile Examination:
   1. If application of window film is/was the responsibility of another installer, notification in writing shall be made of deviations from manufacturer's recommended installation tolerances and conditions.
   2. Windows and frames must be examined to ensure that they are fit to

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receive the Impact Protection Profile in a manner such that the two profile adhesive strips will be perpendicularly opposed to each other and that they will not contact glazing stops or frame gaskets without stretching the profile.

3. Filmed glass surfaces receiving new attachment should first be examined to verify that they are free from defects and imperfections, and that the film edges extend sufficiently to the frame edges.
4. Do not proceed with installation until film and frame surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
5. Upon the customer's request, an adhesion test to the frame surface may be conducted by applying a 4 - 6 inch long strip on the frame surface, using the sufficient pressure to achieve good adhesive wet-out. Allow the Impact Protection Profile to cure for 1-2 days and test adhesion by removing the test strip. If cohesive failure is observed (adhesive residue left behind on the frame surface), adhesion is acceptable; if adhesive failure is observed (clean peel from the frame), adhesion is unacceptable and product is either not recommended, or an adhesion promoter, such as 3M Primer 94, must be used.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Refer to Manufacturer's installation instructions for methods of preparation for Impact Protection Adhesive or Impact Protection Profile film attachment systems.

3.3 INSTALLATION

A. Film Installation:
   1. Install in accordance with manufacturer's instructions.
   2. Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.
   3. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
   4. Apply film to glass and lightly spray film with slip solution.
   5. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
   6. Bump film edge with lint-free towel wrapped around edge of a 5-way

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tool.

7. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

B. Impact Protection Adhesive Installation:
   1. The film attachment system shall be applied according to the specifications of the Manufacturer by an Authorized Dealer/Applicator. Refer to 3M publication, 70-0709-0322-7, 3M Impact Protection Adhesive Attachment System Installation Instructions.
      a. For blast mitigation: minimum 1/2 inch bead overlap on both frame and film (excluding glazing stops or compression gaskets).
      b. For windborne debris protection: minimum 3/8 inch bead overlap on both frame and film (excluding glazing stops or compression gaskets).
   2. To ensure a straight and consistent bead width is achieved, masking tape may be applied to film and frame surfaces prior to application.
   3. With prior approval of the building owner or property manager, existing compression gaskets may be partially removed or trimmed to allow for a thinner bead and stronger anchorage. If removing the gaskets, sections shall be trimmed approximately 3 inches in length and inserted with appropriate spacing along all sides of the window to help secure the glazing during application and curing of the Impact Protection Adhesive.
   4. The Impact Protection Adhesive shall be dispensed with a caulk gun with nozzle opening diameter sized to match the approximate size of the desired bead width.
   5. A plastic putty knife or other tool with a clean straight edge shall be used to trowel and smooth out the adhesive. The completed adhesive bead shall be relatively triangular in shape.
   6. Any masking tape used shall be carefully removed within 10 minutes after applying the wet glaze.

C. Impact Protection Profile Installation:
   1. The film attachment system shall be applied according to the specifications of the Manufacturer by an Authorized Dealer/Applicator trained to install 3M Impact Protection Profile. Refer to 3M publication, 70-0709-0323-5, 3M Impact Protection Profile Attachment System Installation Instructions.
   2. Each profile piece must span continuously to both sides of the window, within 1/8 inch to the frame edge. Splicing the profile between frame edges is prohibited.
   3. Profile must be aligned and applied by 3M recommended or approved methods and tools to ensure a quality installation.
   4. Corner joints must be fabricated by 3M recommended and approved methods. No part of the profile adhesive shall make contact with an adjacent profile.

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5. Sufficient pressure must be evenly applied along the entire length of the profile to ensure full adhesion from both adhesive strips. A roller tool is required to minimize entrapment of air in the adhesive.

3.4 CLEANING AND PROTECTION

A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION 08 87 00

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SECTION 09 01 60

REFINISHING OF EXISTING WOOD FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Refinishing of existing wood flooring.

1.3 REFERENCES

A. California Air Resources Board:
   1. Suggested Control Measure for Architectural Coatings.

B. California Department of Public Health (CDPH):
   1. Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers – Version 1.1, February 2010.

C. California Green Building Standards Code (CALGreen) – California Code of Regulations, Title 24, Part 11.

D. National Wood Flooring Association (NWFA):
   1. Sanding and Finishing Guidelines and Methods.

1.4 ACTION SUBMITTALS

A. Product Data: Include technical data and tested physical and performance properties for each type of product indicated, including the following:
   1. Wood patching compound.
   2. Wood strippers.
   3. Transparent finish materials.

B. Samples for Initial Selection: Submit manufacturer's full range of wood stain colors for selection by Architect.

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C. Samples for Verification: Submit Samples on wood substrates matching species and cut of existing wood flooring, 8 inches by 8 inches.

1. Wood veneer-faced panel matching species and cut as found on existing doors, with transparent finish.

D. CALGreen Submittals:

1. Manufacturer's product data for floor finish materials indicating compliance with product requirements specified in "CALGreen Requirements" Article.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wood flooring finish to include in maintenance manuals. Include manufacturer's written cleaning and maintenance instructions.

1.6 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation, and standard of workmanship.

1. Build mockup of at least 25 square feet for each type of finish indicated.
2. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved in writing by Architect.
3. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Comply with wood flooring finish manufacturer's written instructions for substrate temperature, ambient temperature, humidity, ventilation, and other conditions affecting system installation.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain stain, sealer, and finish coats through one source from a single manufacturer.

2.2 CALGREEN REQUIREMENTS

A. General: Conform with all applicable requirements of the California Green Building Standards Code (CALGreen).

B. Coatings: Provide coatings that comply with VOC limits in Table 1 of the California Air Resources Board (ARB) Architectural Coatings Suggested Control Measure, unless more stringent local limits apply.

2.3 WOOD FLOORING FINISH

A. Provide complete system of compatible components that is recommended by finish manufacturer for applications indicated.

1. Manufacturers: Subject to compliance with requirements, provide wood flooring finishing system products by one of the following:
   a. Bona US.
   b. DuraSeal.
   c. Hillyard, Inc.
   d. Manufacturer of equal products in accordance with Division 1 requirements for product substitutions.
2. Stain: Penetrating and nonfading type.
   a. Color: As selected by Architect from manufacturer's full range.
3. Floor Sealer: Pliable, penetrating type.
4. Finish Coats: Formulated for multicoat application on wood flooring.
   a. Sheen: Semi-gloss.

2.4 AUXILIARY MATERIALS

A. Wood Stripper: Non-flammable wood stripper capable of removing existing wood finish to return wood to its original appearance.

B. Wood Filler/Patching Compound: Compatible with finish system components and recommended by filler and finish manufacturers for use indicated. Suitable for sanding and staining. If required to match approved Samples, provide pigmented filler.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

1. Verify compatibility with and suitability of substrates.
2. Verify that thickness of existing wood flooring (or wear layer, if existing wood flooring is engineered wood) is within NWFA guidelines for resanding of existing wood floors.

B. Begin refinishing work only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ascertain whether existing wood floor finish contains lead. If it is determined that lead is present in existing wood floor finish, notify Owner before proceeding any further.

B. Remove perimeter baseboards and trim as required to access entire surface of wood flooring to be refinished.

C. Sweep and vacuum wood flooring surface immediately before beginning of refinishing work.

3.3 REMOVAL OF EXISTING FINISH

A. Remove existing finish down to bare wood on exposed surfaces of existing wood flooring indicated to be refinished, using wood stripper in compliance with written instructions of manufacturer.

3.4 SURFACE PREPARATION

A. Patch and fill all gouges, depressions, and cracks in surface of wood flooring, using wood patching compound in accordance with written instructions of patching compound manufacturer.

3.5 FINISHING OF EXISTING WOOD FLOORING

A. General: Comply with applicable recommendations of NWFA's "Sanding and Finishing Guidelines and Methods."

B. Machine-sand existing wood flooring to remove offsets, ridges, cups, and other imperfections that are noticeable after finishing. Vacuum and tack with a clean cloth immediately before applying finish.

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C. Apply floor finish materials in accordance with written instructions, at application rate and in number of coats recommended by finish manufacturer for application indicated, but not less than one coat of floor sealer and three finish coats.

1. Apply stain to achieve an even color distribution matching approved Samples.
2. For water-based finishes, use finishing methods recommended by finish manufacturer to minimize grain rise.

D. Cover wood flooring before finishing.

E. Do not cover wood flooring after finishing until finish reaches full cure, and not before 7 days after applying last finish coat.

3.6 PROTECTION

A. Protect refinished wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.

1. Do not use heavy and sharp objects directly over kraft-paper covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 09 01 60

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SECTION 09 05 65

CONCRETE MOISTURE-CONTROL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Concrete moisture-control system consisting of the following components, for interior concrete slabs to receive finish flooring materials:
      a. Epoxy-resin-based moisture-control coating.
      b. Cementitious overlay.
   2. Preinstallation concrete moisture and alkalinity testing.

B. Related Sections include:
   1. Division 1 Section for allowances, for procedural and administrative requirements for allowances for concrete moisture-vapor control system.
   2. Division 1 Section for unit prices, for procedural and administrative requirements for unit prices for concrete moisture-vapor control system.

C. Unit Prices: Owner may elect to add to Contract Sum by way of Change order, based on needed scope of concrete moisture-control system as determined by concrete moisture testing. Refer to Division 1 Section "Unit Prices" for additive costs for concrete moisture-control system.

D. Allowances: Portions of specified Allowance designated for concrete moisture-control system in Division 1 Section "Allowances" will be allocated based on needed scope determined by concrete moisture testing.

1.3 REFERENCES

A. ASTM International:
   1. ASTM C 109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
   2. ASTM C 150: Standard Specification for Portland Cement.
   3. ASTM C 219: Standard Terminology Relating to Hydraulic Cement.
   4. ASTM D 1308: Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.

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5. ASTM E 96: Standard Test Methods for Water Vapor Transmission of Materials.
6. ASTM F 710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
7. ASTM F 2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
8. ASTM F 3010: Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings.

B. Code of Federal Regulations (CFR):
1. 40 CFR, Part 59, Subpart D: National Volatile Organic Compound Emission Standards.

1.4 DEFINITIONS

A. VOC: Volatile organic compounds.

1.5 COORDINATION

A. Coordinate sequencing of installation of concrete moisture-control system such that the length of time that system is left exposed prior to subsequent installation of finish flooring material is minimized. Protect system as specified in Part 3 "Protection" Article.

1.6 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site to review pertinent issues related to installation of concrete moisture-control system.
1. Attendees: Installer and representatives of concrete moisture-control system manufacturer, and other manufacturers and installers affected by installation of concrete moisture-control system.
2. Agenda: Review methods and procedures, and outstanding issues related to concrete moisture-control system including, but not limited to, the following:
a. Condition of substrate and preparatory work.
b. Project conditions.
c. Requirements for protecting work, including restriction of traffic during installation period.
d. Manufacturer's installation instructions and warranty requirements.
e. Coordination with other work.
f. Protection of adjacent work.
3. Document proceedings including corrective measures and actions required, and furnish copy of record to each participant.

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1.7 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical data for concrete moisture-control system:
   1. Concrete moisture-control coating.
   2. Cementitious overlay.

B. Concrete Moisture and Alkalinity Testing: Submit procedure and reporting format for moisture and alkalinity tests.

1.8 INFORMATIONAL SUBMITTALS

A. Installer's Qualification Data: Manufacturer's certification of Installer as approved installer of concrete moisture-control system.
   1. Provide five project references.

B. Product Test Reports: From a qualified independent testing agency indicating concrete moisture-control coating compliance with specified performance requirements.

C. Concrete Moisture and Alkalinity Test Reports: Submit test reports with results of preinstallation testing for concrete moisture and alkalinity levels in concrete slabs, as specified in Part 3 "Concrete Moisture and Alkalinity Testing" Article.

D. Qualification Data: For testing agency.

E. Sample Warranties: For special warranties.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company with minimum of 10 years experience in manufacturing non-silicate epoxy-based concrete moisture- and alkalinity-control products, with a record of successful in-service performance, and capable of providing field service representation during construction.

B. Installer Qualifications: Authorized representative trained and approved in writing by manufacturer of concrete moisture-control system components.

C. Testing Agency: Independent third-party agency with minimum of 5 years of demonstrated experience and capability to perform specified concrete moisture and alkalinity tests.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store materials in a dry, secure area protected from exposure to harmful weather conditions and at temperature levels as recommended by manufacturer.

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1.11 FIELD CONDITIONS

A. Moisture Testing: Conduct preinstallation concrete moisture and alkalinity testing within temperature and relative humidity conditions as specified in Part 3 "Concrete Moisture and Alkalinity Testing" Article.

B. At new concrete slabs, do not install concrete moisture-vapor control system until preinstallation concrete moisture and alkalinity test results have been reviewed, and concrete slab has cured and is in acceptable condition as determined by manufacturer of concrete moisture-control coating.

1. Allow minimum curing time for concrete as recommended in writing by manufacturer of concrete moisture-control coating.

C. Environmental Limitations: Comply with concrete moisture-control system manufacturer's written instructions for substrate temperature, ambient temperature, humidity, ventilation, and other conditions affecting system installation.

D. Close spaces to traffic during application of concrete moisture-vapor control system during application, and for not less than 24 hours afterwards, unless manufacturer recommends longer period.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer of concrete moisture-control coating agrees to replace finish flooring which fails due to concrete moisture emissions or alkalinity. Warranty coverage to be non-prorated, and is to include replacement of failed finish flooring, concrete moisture-control system, and all associated labor costs.

1. Failures include, but are not limited to, moisture, loss of adhesion, and mold and mildew.
2. Warranty shall not exclude the following:
    a. Cracks and other issues related to installation of concrete substrate.
    b. Upper limits for concrete moisture levels as recorded by preinstallation testing.
    c. Condensation or dew point issues.
    d. Salts in concrete.
    e. Pinholes in moisture-vapor control system.
    f. Future removal and reinstallation of finish flooring.
3. Warranty Period: 10 years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain components and accessories of concrete moisture-control system through one source from same manufacturer, or as approved in writing by concrete moisture-control coating manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Permeability: Provide concrete moisture-control coating capable of forming a moisture-vapor barrier on surface of concrete slab with a maximum permeability of 0.10 perm, as tested per ASTM E 96.

2.3 CONCRETE MOISTURE-CONTROL COATING

A. Concrete Moisture-Control Coating: 100 percent-solids, two-component epoxy-resin-based, membrane-forming liquid coating designed for coating concrete substrates to restrict water-vapor emission passage and to provide protective barrier over alkaline surfaces; meeting requirements of ASTM F 3010; capable of meeting specified performance requirements and suitable for use over small hairline cracks and pinholes.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. Ardex; MC Rapid.
    b. Koster American Corporation; VAP I 2000.
    c. Mapei; Planiseal VS.
    d. Equal product in accordance with Division 1 requirements for product substitutions.
2. VOC Content: Provide concrete moisture-control coating that complies with local regulatory limits for VOC content when calculated according to 40 CFR, Part 59, Subpart D (EPA Method 24).
3. Resistance to Alkalinity: No effect when exposed to14 pH alkali solution when tested according to ASTM D 1308 for acids/alkali.
4. Acrylic, latex, sodium, lithium, potassium silicate formulations, and other single-component products are not acceptable.
5. Three-component products which include water as a component are not acceptable.

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2.4 CEMENTITIOUS OVERLAY

A. Cementitious Overlay and Patching Compound: Portland cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thicknesses of 1/8 inch and approved in writing by manufacturer of moisture-control coating.

1. Product: Subject to compliance with requirements, provide one of the following:
   a. Ardex; K-15 Self-Leveling Underlayment Concrete.
   b. Koster American Corporation; SL.
   c. Mapei; Ultraplan 1 Plus.
   d. Equal product in accordance with Division 1 requirements for product substitutions.
2. Cement Binder: ASTM C 150, Portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
3. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109.
4. Underlayment Additive: Resilient-emulsion product of cementitious overlay manufacturer formulated for use with overlay when applied to substrate and conditions indicated.
5. Primer: Manufacturer's recommended primer to facilitate adhesion of cementitious overlay to surface of concrete moisture-control coating.

PART 3 - EXECUTION

3.1 CONCRETE MOISTURE AND ALKALINITY TESTING

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform moisture and alkalinity testing as specified in this Article.

B. Testing Conditions: Do not conduct moisture and alkalinity testing until final building environmental conditions have been achieved. Maintain temperature between 65 and 85 deg F, and relative humidity between 40 percent and 60 percent for not less than 72 hours prior to, and throughout duration of testing.

C. Prepare concrete slab substrates prior to testing in accordance with referenced testing standards.

1. Verify that substrates are dry and free of curing compounds, sealers, coatings, and other substances that would preclude accurate test readings.

D. Moisture Testing: Moisture testing shall be performed using relative humidity in-situ probe test method, conforming with ASTM F 2170.

1. Level of moisture to be determined and reported as relative humidity (RH).
2. After completion of testing, fill test probe holes with cementitious patching material.

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E. Alkalinity Testing: Testing shall utilize a calibrated digital 1-14 wide range pH meter and conform with requirements of ASTM F 710 for test procedure. Paper and pencil type tests are not acceptable.

F. Quantity and locations of testing shall meet the following criteria.
   1. Minimum of three tests for first 1,000 square feet.
   2. Minimum of one test for each additional 1,000 square feet.
   3. At slabs on grade, include at least one test within 3 feet of each exterior wall.

G. Test reports shall include the following information:
   1. Name and address of structure.
   2. Description of testing instruments and methods. Include statement of justification for type of test instruments used; include copy of ASTM F 2170 and ASTM F 710 testing protocols.
   3. Date and time of measurements.
   4. Name, title, and affiliation of individual performing measurements.
   5. Floor plan with location of each test location clearly marked. Include the following information.
      a. Moisture Tests:
         i) Locations and depths of probe holes within the structure.
         ii) Relative humidity in each probe hole, to the nearest percent relative humidity.
         iii) Temperature in each probe hole to the nearest degree F.
         iv) Ambient air temperature, to the nearest degree F, and relative humidity to the nearest percent above each probe hole.
         v) Make, model, and last calibration date of instrument used to make measurements.
      b. Alkalinity Tests:
         i) Location of each test.
         ii) pH level of each test.
   6. Any observations that might affect the interpretation of individual measurements such as standing water on the slab, wet coring operations, weather, or ventilating system operations.

3.2 EXAMINATION

A. Preinstallation Concrete Moisture and Alkalinity Testing: Engage a qualified testing agency to conduct preinstallation concrete moisture and alkalinity testing of existing concrete slabs as specified in "Concrete Moisture and Alkalinity Testing" Article, on all interior concrete slab areas to receive finish flooring.
   1. Allow new concrete to cure for a minimum of 14 days.

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2. After reviewing results of preinstallation concrete moisture and alkalinity testing of concrete slab areas to receive finish flooring, meet with Architect and Construction Manager to determine areas to receive moisture-control system.

3. Those slab areas that show moisture levels of more than 75 percent relative humidity, and a pH level of less than 7 or greater than 9 require application of concrete moisture-control system. Contract Sum may be adjusted accordingly by using accepted unit cost as a basis, or by allocating a portion of designated allowance as directed by Architect and Construction Manager.

B. Examine concrete substrates, with Installer present, for compliance with requirements for installation of concrete moisture-control system. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Mask and protect adjacent surfaces from the effects of dust and splashing of materials associated with preparation and installation of concrete moisture-control system.

B. Surface Preparation: Scarify existing concrete slab surfaces to receive system treatment by shot blasting and as recommended in writing by manufacturer of moisture-vapor control coating. Acid etching is not allowed.

1. Comply with concrete moisture-vapor control coating manufacturer's written recommendations for surface profile roughness of concrete surface.

C. Crack and Joint Preparation: Mechanically open, vacuum, and seal all cracks and joints with moisture-control coating material, and then fill with 100 percent portland cement-based patching compound, as recommended in writing by manufacturer of concrete moisture-control coating.

D. Remove all residual dust and debris by vacuum and dry sweeping.

E. If necessary, place dehumidifiers in locations and for time period as required to achieve ambient humidity conditions in conformance with concrete moisture-control coating manufacturer's and cementitious overlay manufacturer's written recommendations.

3.4 CONCRETE MOISTURE-CONTROL COATING APPLICATION

A. Mixing: Mix separate components of concrete moisture-control coating in accordance with manufacturer's written instructions immediately prior to application.

1. Do not dilute with solvent or water.

B. Apply concrete moisture-control coating in accordance with manufacturer's written instructions. Achieve full coverage of all concrete surfaces, cracks, and joints.

1. Apply coating by squeegee and roller application to concrete surfaces, and in conformance with manufacturer's written instructions.

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2. Conform with manufacturer's requirements for coverage rates and number of applications as needed to meet specified performance requirements.

3.5 CEMENTITIOUS OVERLAY INSTALLATION

A. After application and curing of moisture-control coating in accordance with manufacturer's written instructions, install cementitious overlay. Install in accordance with manufacturer's written instructions, to minimum thickness of 1/8 inch and as otherwise required to provide a smooth and continuous substrate suitable to receive finish flooring materials without the use of special adhesives or patching compounds.

1. Install primer at manufacturer's recommended spreading rate to surface of concrete moisture-vapor control coating prior to installation of cementitious overlay, if recommended by manufacturers of concrete moisture-vapor control coating and cementitious overlay.

B. Cure cementitious overlay according to manufacturer's written instructions. Prevent contamination during application and curing processes.

3.6 PROTECTION

A. Protect concrete moisture-control system from damage and surface moisture during time prior to installation of finish flooring materials.

B. Do not install floor coverings over cementitious overlay until after time period recommended in writing by manufacturer of cementitious overlay has elapsed.

END OF SECTION 09 05 65

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SECTION 09 06 00

COLORS AND FINISHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:

1. Color, pattern, and finish selections for products and materials specified in other specification Sections of this Project Manual.

B. Related Sections: Refer to Color/Finish Schedule in Part 3 for other sections specifying materials and products for which color and finish is specified in this Section.

1.3 SUBMITTALS

A. Samples: Submit Samples in accordance with requirements of individual Specification Sections for review of kind, color, pattern, and texture for Architect's review of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance for construction associated with each set.
    a. Samples that may be incorporated into the Work are indicated in individual specification sections. Such Samples must be in undamaged condition at time of use.

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4. Samples for Initial Selection: Where color/finish is indicated as "selected by Architect," submit manufacturer's color charts or samples showing the full range of colors, textures, and patterns available.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected.

PART 2 - PRODUCTS

2.1 COLORS AND FINISHES

A. In addition to Color/Finish Schedule in Part 3 of this Section, refer to Drawings and individual Specification Sections for information indicating extent and location of each color and finish designation specified in this Section.

B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review. Refer to Division 1 requirements for product substitutions.

PART 3 - EXECUTION

3.1 COLOR/FINISH SCHEDULE

A. Refer to following Color/Finish Schedules, to be used in conjunction with referenced Specification Sections, for color/finish selections. Refer to referenced Specification Section for product/material descriptive and performance criteria.

1. Where color/finish is indicated "As selected by Architect," refer to Part 1 "Submittals" Article for requirements for Samples for initial selection.

Section 06 41 00 – Architectural Wood Cabinets		
Designation	Description	Color/Finish
PL-1	Plastic laminate	Wilsonart-#4783-60 White Tigris
PL-2	Plastic laminate	Wilsonart-#4919-60 Blue Agave
PL-3	Plastic laminate	Wilsonart-#4913-60 Eggplant
EB-1	PVC edge banding	Wilsonart-#4783-60 White Tigris
LPL	Low-pressure laminate (melamine)	White

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Color Schedule

Designation	Locations
PL-1	Cabinets at all locations & at Bench Countertop except as noted otherwise below (exposed surfaces as defined in Section 06 41 00)
PL-2	Countertop at F.I.S. 2
PL-3	Countertop at bench cabinet at F.I.S. 1 & 2
EB-1	Edge banding at PL-1
LPL	Semi-exposed surfaces of cabinets as defined in Section 06 41 00

Section 08 41 13 – Glazed Aluminum Entrances and Storefronts	
Description	Color/Finish
Aluminum storefront framing and entrance doors	Clear anodized

Section 08 42 10 – Glazed Operable Panel Entrance Systems	
Description	Color/Finish
Glazed operable panel framing	Fluoropolymer, custom color to match Clear anodized

Section 08 51 13 – Aluminum Windows	
Description	Color/Finish
Aluminum window frame	Clear anodized

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Section 08 87 00 – Window Film		
Designation	Description	Color/Finish
WF-1	Window Film 1	3M Fasara - As selected by Architect from manufacturer's full range
WF-2	Window Film 2	3M Fasara - As selected by Architect from manufacturer's full range
WF-3	Window Film 3	3M Fasara - As selected by Architect from manufacturer's full range

Color Schedule

Designation	Locations
WF-1	Refer to Interior Elevations
WF-2	Refer to Interior Elevations
WF-3	Refer to Interior Elevations

Section 08 91 00 – Louvers		
Designation	Description	Color/Finish
LVR-STL	Steel louver	Powder-coated, custom color to match Kelly Moore #KM4988 Passionate Blueberry

Color Schedule

Designation	Locations
LVR-STL	Refer to Drawings (Door Schedule)

Section 09 30 00 – Ceramic Tile		
Designation	Description	Color/Finish
CT-1	Ceramic floor tile	As selected by Architect from manufacturer's full range
CT-2	Ceramic base tile	As selected by Architect from manufacturer's full range
CT-3	Ceramic wall tile	Daltile Elevare – EL40 Lunar 6x18
CT-4	Ceramic wall tile accent	Daltile Elevare – EL44 Carbon 4x16
CT-5	Ceramic wall tile	As selected by Architect from manufacturer's full range

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CT-6	Ceramic wall tile accent	As selected by Architect from manufacturer's full range
GRT-1	Epoxy grout	As selected by Architect from manufacturer's full range
GRT-2	Epoxy grout	As selected by Architect from manufacturer's full range

Color Schedule

Designation	Locations
CT-1	Boys Toilet Room - floors
CT-2	Boys & Girls Toilet Room – coved base tile
CT-3	Boys Toilet Room – walls (field)
CT-4	Boys Toilet Room – walls (accent)
CT-5	Girls Toilet Room – walls (field)
CT-6	Girls Toilet Room – walls (accent)
GRT-1	Boys Toilet Room - walls and floor grout
GRT-2	Girls Toilet Room - walls and floor grout

Section 09 51 13 – Suspended Lay-In Panel Ceilings

Designation	Description	Color/Finish
LCP-1	Lay-in ceiling panel	Armstrong; #1729 Fine Fissured, White

Color Schedule

Designation	Locations
LCP-1	Refer to Drawings (Ceiling Plan)

Section 09 65 00 – Resilient Flooring

Designation	Description	Color/Finish
VCT-1	Vinyl composition tile	Armstrong – Standard Excelon #51911 Classic White
VCT-2	Vinyl composition tile	Armstrong – Standard Excelon #51804 Earthstone Greige
VCT-3	Vinyl composition tile	Armstrong – Standard Excelon #51882 Serene Blue

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VCT-4	Vinyl composition tile	Armstrong – Standard Excelon #51915 Charcoal
SV-1	Sheet vinyl flooring	Mohawk Group – Serenity Collection, Calmness C2023, #949 Harmony
SV-2	Sheet vinyl flooring	Mohawk Group – Serenity Collection, Therapeutic C2020, #838 Placid
SV-3	Sheet vinyl flooring	Mohawk Group – Serenity Collection, Ephemeral C2022, #878 Mood

Color Schedule

Designation	Locations
VCT-1	Refer to Drawings (Finish Schedule), field color
VCT-2	Refer to Drawings (Finish Schedule), accent color
VCT-3	Refer to Drawings (Finish Schedule), accent color
VCT-4	Refer to Drawings (Finish Schedule), accent color
SV-1	Refer to Drawings (Finish Schedule), field color in Rooms 202 & 204
SV-2	Refer to Drawings (Finish Schedule), accent color in Room 204
SV-3	Refer to Drawings (Finish Schedule), accent color in Rooms 202 & 204

Section 09 65 13 – Resilient Base and Accessories	
Description	Color/Finish
Resilient base	Burke – #523 Black Brown
Resilient transition molding	Burke – #523 Black Brown
Resilient stair nosing	Burke (profile # 575) – As selected by Architect from manufacturer's full range

Section 09 68 13 – Tile Carpeting		
Designation	Description	Color/Finish

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TC-1	Walk-off Carpet tile	Lees – Tuff Stuff II, Step Up II, #983 Iron Ore

Color Schedule

Designation	Locations
TC-1	Refer to Drawings (Finish Schedule)

Section 09 68 16 – Sheet Carpeting		
Designation	Description	Color/Finish
CP-1	Carpet	Mohawk Group – Faculty Remix/ GL154, #989 Greatest Charcoal
CP-2	Carpet	Mohawk Group – ColorBeat, #976 Brushed Metal

Color Schedule

Designation	Locations
CP-1	Refer to Drawings (Finish Schedule)
CP-2	Refer to Drawings (Finish Schedule), at stairs, step seating, boxed curb/seating block

Section 09 72 21 – Vinyl-Wrapped Panels		
Designation	Description	Color/Finish
VWC-1	Vinyl wall covering	Koroseal – Harborweave, Silver Fox #2118-93
VWC-2	Vinyl wall covering	Charles G. Hardy Inc. – Snowdrift #393349
VWC-3	Vinyl wall covering (Multipurpose/Stage)	As selected by Architect from manufacturer's full range

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Section 09 91 00 – Painting		
Designation	Description	Color/Finish
EP-1	Exterior paint color	Match Kelly Moore #159 Sequoia Redwood
EP-2	Exterior paint color	Match Kelly Moore #KM5793 Jasmine Hollow
EP-3	Exterior paint color	Match Kelly Moore #302 Mission Tan
IP-1	Interior paint color	Match Kelly Moore #KM4928 Lucky Dog
IP-2	Interior paint color	Match Kelly Moore #KM5793 Jasmine Hollow
IP-3	Interior paint color	Match Kelly Moore #KM4988 Passionate Blueberry
IP-4	Interior paint color	Match Kelly Moore #KM4958 Rushing River
IP-5	Interior paint color	Match Kelly Moore #23 Swiss Coffee
IP-6	Interior paint color	Match Kelly Moore #KMA25-5 Belly Flop
IP-7	Interior paint color	Match Kelly Moore #KM5540-5 Thor's Thunder
IP-8	Interior paint color	Match Kelly Moore #KM5148 Green Bananas

Color Schedule

Designation	Locations
EP-1	Exterior classroom doors/frames, typical
EP-2	Exterior siding, typical
EP-3	Exterior cement plaster, typical
IP-1	Interior gypsum board walls, paint over existing tackable wall, typical
IP-2	Interior gypsum board walls, wood trim, typical
IP-3	Interior doors/frames, typical
IP-4	Interior gypsum board walls, typical
IP-5	Interior gypsum board walls, typical
IP-6	Interior gypsum board walls accent, typical
IP-7	Interior gypsum board walls accent, typical
IP-8	Interior gypsum board walls accent, typical

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Section 10 11 00 – Visual Display Surfaces	
Description	Color/Finish
Tackboard vinyl fabric facing	Koroseal – Harborweave, Silver Fox #2118-93

Section 10 14 00 – Signage		
Designation	Description	Color/Finish
SGN-1	Polymer sign	As selected by Architect from manufacturer's full range
SGN-2	Polymer sign	As selected by Architect from manufacturer's full range
SGN-3	Polymer sign	White

Color Schedule

Designation	Locations
SGN-1	Lower portion of polymer-based panel signs
SGN-2	Upper portion of polymer-based panel signs
SGN-3	Sign text of polymer-based panel signs

Section 11 61 43 – Stage Curtains	
Description	Color/Finish
Stage curtains	KM Fabrics – Memorable, #1118 Navy

Section 12 52 19 – Upholsetered Seat Cushion	
Description	Color/Finish
Fabric Seat Cushion FAB-1	Carnegie – Xorel Meteor #6427 747

END OF SECTION 09 06 00

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SECTION 09 28 13

CEMENTITIOUS BACKING BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Cementitious backing board.

B. Related Sections include:
   1. Section 09 29 00 "Gypsum Board" for moisture- and mold-resistant gypsum board.
   2. Section 09 30 00 "Ceramic Tile" for ceramic tile and setting materials installed over cementitious backing board.

1.3 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A108 Series: Specifications for Installation of Ceramic Tile.
      a. A108.11: Interior Installation of Cementitious Backer Units.
      b. A118.9: Test Methods and Specification for Cementitious Backer Units.

B. ASTM International:
   1. ASTM C 1325: Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.
   2. ASTM D 3273: Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
   3. ASTM E 119: Standard Test Methods for Fire Tests of Building Construction and Materials.

C. UL Environment:
   1. GREENGUARD Gold certification program.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

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1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, surface contamination, corrosion, construction traffic, and other potential causes of damage. Stack cementitious backing board panels flat and supported on risers on a flat platform to prevent sagging.

C. Handle cementitious backing boards to prevent damage to edges, ends, and surfaces.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with cementitious backing board manufacturer's written instructions for allowable ambient temperature ranges. Do not install backing board until installation areas are enclosed and weatherproof.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 CEMENTITIOUS BACKING BOARD

A. Cementitious Backing Board: Formed from Portland cement-based slurry with polymer-coated, glass-fiber mesh fully encompassing front and back faces, and edges; conforming with ANSI A118.9 and ASTM C 1325, in maximum lengths available to minimize end-to-end butt joints.

1. Product: Subject to compliance with requirements, provide one of the following:
   a. National Gypsum Company; PermaBase Cement Board.
   b. USG Corporation; DUROCK Brand Cement Board.
   c. Equal product in accordance with Division 1 requirements for product substitutions.
2. Thickness: 5/8 inch.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
4. VOC Emissions: Complying with the testing and product requirements of the California Department of Public Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using

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Environmental Chambers – Version 1.1, February 2010," using the applicable exposure scenario.

a. Certification: UL Environment; GREENGUARD Gold.

2.3 ACCESSORIES

A. Fasteners: Corrosion-resistant fasteners of type and size as recommended by cementitious backing board manufacturer for intended substrate and framing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine cementitious backing board panels before installation. Reject panels that are wet or damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install cementitious backing board, and treat joints according to ANSI A108.11 and in accordance with manufacturer's written instructions for type of application indicated.

B. Locate panel edges and end joints over continuous supports.

C. Fit panels around ducts, pipes, and conduits.

D. Space fasteners in cementitious backing board panels according to referenced installation standard and manufacturer's written instructions.

E. Refer to Section 09 30 00 "Ceramic Tile" for treatment of joints between cementitious backing board panels.

END OF SECTION 09 28 13

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SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Gypsum board.
      a. Regular.
      b. Moisture- and mold-resistant.
   2. Cutting and patching of existing gypsum board.

B. Related Sections include:
   1. Section 06 10 00 "Rough Carpentry" for wood framing and furring that supports gypsum board.
   2. Section 07 21 00 "Building Insulation" for sound attenuation insulation.
   3. Section 09 28 13 "Cementitious Backing Board" for cementitious backer units installed as substrate for ceramic tile.
   4. Section 09 91 00 "Painting" for primers and finish coats applied to gypsum board surfaces.

1.3 REFERENCES

A. ASTM International:
   1. ASTM A 653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM B 221: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   3. ASTM C 475: Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
   4. ASTM C 645: Standard Specification for Nonstructural Steel Framing Members.
   5. ASTM C 834: Standard Specification for Latex Sealants.
   6. ASTM C 840: Standard Specification for Application and Finishing of Gypsum Board.
   7. ASTM C 919: Standard Practice for Use of Sealants in Acoustical Applications.

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8. ASTM C 954: Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 inch to 0.112 inch in Thickness.
9. ASTM C 1002: Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
10. ASTM C 1047: Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
11. ASTM C 1396: Standard Specification for Gypsum Board.
12. ASTM D 3273: Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
13. ASTM D 3274: Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation.
14. ASTM E 90: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
15. ASTM E 413: Classification for Rating Sound Insulation.

B. California Green Building Standards Code (CALGreen) – California Code of Regulations, Title 24, Part 11.

C. Gypsum Association (GA):
1. GA-214: Recommended Levels of Gypsum Board Finish.

D. South Coast Air Quality Management District (SCAQMD):
1. Rule 1168 – Adhesive and Sealant Applications.

E. UL Environment:
1. GREENGUARD Gold certification program.

1.4 DEFINITIONS

A. STC: Sound Transmission Class.

B. VOC: Volatile Organic Compound.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. CALGreen Submittals:
1. Manufacturer's product data for sealants and laminating adhesives, indicating compliance with product requirements specified in "CALGreen Requirements" Article.

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1.6 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 50 square feet in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
   1. Build mockups for the following:
      a. Each level of gypsum board finish indicated for use in exposed locations.
   2. Apply or install final decoration indicated, including painting and wall-coverings, on exposed surfaces for review of mockups.
   3. Simulate finished lighting conditions for review of mockups.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed and integrated into adjacent surfaces at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, surface contamination, corrosion, construction traffic, and other potential causes of damage. Stack gypsum panels flat and supported on risers on a flat platform to prevent sagging.

C. Handle gypsum boards to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads or trim.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 CALGREEN REQUIREMENTS

A. General: Conform with all applicable requirements of the California Green Building Standards Code (CALGreen).

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B. Provide acoustical sealant and primer, and gypsum board laminating adhesive which complies with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, except as noted otherwise below. Such products shall also comply with Rule 1168 prohibition of the use of certain toxic compounds (chloroform, ethylene, dichloride, methylene chloride, perchloroethylene, and trichloroethyelen).

2.2 GYPSUM BOARD

A. Gypsum Panel Sizes: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

B. Gypsum Board: Type X, ASTM C 1396.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Georgia-Pacific Gypsum LLC; ToughRock Fireguard X.
   b. National Gypsum Company; Gold Bond Fire-Shield Gypsum Board.
   c. USG Corporation; SHEETROCK Brand Firecode X Gypsum Panel.
   d. Equal product in accordance with Division 1 requirements for product substitutions.
2. Thickness: 5/8 inch.
3. Long Edges: Tapered.
4. VOC Emissions: Complying with the testing and product requirements of the California Department of Public Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers – Version 1.1, February 2010," using the applicable exposure scenario.
   a. Certification: UL Environment; GREENGUARD Gold.

C. Moisture- and Mold-Resistant Gypsum Board: Type X, ASTM C 1396.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Georgia-Pacific Gypsum LLC; ToughRock Fireguard X Mold-Guard.
   b. National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board.
   c. USG Corporation; SHEETROCK Brand Mold Tough Firecode X Panel.
   d. Equal product in accordance with Division 1 requirements for product substitutions.
2. Thickness: 5/8 inch.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

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5. VOC Emissions: Complying with the testing and product requirements of the California Department of Public Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers – Version 1.1, February 2010," using the applicable exposure scenario.
    a. Certification: UL Environment; GREENGUARD Gold.

2.3 TRIM ACCESSORIES

A. Trim: ASTM C 1047.
    1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
    2. Shapes:
        a. Cornerbead: Type with face flange to receive joint compound.
        b. LC-bead: J-shaped; exposed long flange receives joint compound.

2.4 JOINT TREATMENT MATERIALS

A. General: Provide materials complying with ASTM C 475 and the recommendations of manufacturer of both gypsum board and joint treatment materials for the application indicated.

B. Joint Tape:
    1. Paper-Faced Gypsum Board: Paper.
    2. Glass-Mat-Faced Gypsum Board: 10-by-10 threads per inch glass-fiber mesh of type recommended by glass-mat-faced gypsum board manufacturer.

C. Joint Compound for Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
    1. Prefilling: At open joints or beveled panel edges, and damaged surface areas, use setting-type taping compound.
    2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
        a. Use setting-type compound for installing paper-faced metal trim accessories.
    3. Fill Coat: For second coat, use drying-type, all-purpose compound.
    4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
    1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 inch (22 gage) to 0.112 inch (12 gage) thick.

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C. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0346 inch (20 gage), unless indicated otherwise.
2. Protective Coating: ASTM A 653, G60 (Z180).
3. Depth: 7/8 inch, unless indicated otherwise.

D. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
   b. USG Corporation; SHEETROCK Brand Acoustical Sealant.
   c. Equal product in accordance with Division 1 requirements for product substitutions.
2. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.

E. Sound Attenuation Blankets: As specified in Section 07 21 00 "Building Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine gypsum board panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CUTTING AND PATCHING

A. Cut, patch, replace, and repair existing gypsum board surfaces as necessary to accommodate other work, including installation of concealed conduits and backing in existing wall cavities, and to remove dents and other imperfections, and restore surface to specified finish levels.

B. When cutting out sections of existing gypsum board areas, cut gypsum board along supporting framing members.

C. When patching and infilling existing gypsum board areas, produce invisible joint between existing and new surfaces. Match existing gypsum board finish.

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3.3 APPLYING AND FINISHING GYPSUM BOARD PANELS

A. Comply with ASTM C 840.

B. Where indicated, install sound attenuation blankets in accordance with requirements of Section 07 21 00 "Building Insulation," before installing gypsum board panels, unless blankets are readily installed after panels have been installed on one side.

1. Place insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions and tight to items passing through ceilings.

C. Install Type X gypsum board panels at all locations, except as follows:

1. Moisture- and Mold-Resistant Gypsum Board: Install where indicated on Drawings.

D. Install ceiling gypsum board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

E. Install gypsum board panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16-inch of open space between panels. Do not force into place.

F. Locate panel edges and end joints over continuous supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

1. Attach gypsum board panel edges to framing provided at perimeter of openings and cutouts.

G. Form control and expansion joints with space between edges of adjoining gypsum board panels.

H. Cover both faces of stud partition framing with gypsum board panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 square feet in area.

I. Attachment to Cold-Formed Metal Framing: Attach gypsum board panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges, first.

J. Wood Framing: Install gypsum board panels over wood framing, with floating internal corner construction. Do not attach gypsum board panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float panels over these members, or provide control joints to counteract wood shrinkage.

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K. Fit gypsum board panels around ducts, pipes, and conduits.

L. Where partitions intersect open concrete coffers, concrete joists and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum board panels to fit profile formed by coffers, joists, and other structural members; allow 1/4 to 3/8-inch wide joints to install sealant.

M. Isolate perimeter of gypsum board panels applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch wide spaces at these locations, and trim edges with edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

N. Space fasteners in gypsum board panels according to referenced gypsum board application and finishing standard and manufacturer's written instructions.

O. Single-Layer Application:
   1. On ceilings, apply gypsum board panels before wall/partition gypsum board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
   2. On partitions/walls, apply gypsum board panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of gypsum board panels.
   3. On Z-furring members, apply gypsum board panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
   4. Fastening Methods: Apply gypsum board panels to supports with steel drill screws.

P. Multi-Layer Application:
   1. On ceilings, apply gypsum board panels indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
   2. On partitions/walls, apply gypsum board panels indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistive-rated assembly. Stagger joints on opposite sides of partitions.
   3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one framing member. Locate edge joints of base layer over furring members.

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4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

Q. Curved Partitions:

1. Install gypsum board panels horizontally (perpendicular to framing) and unbroken, to extent possible, across curved surface plus 12-inch long straight sections at ends of curves and tangent to them.
2. On convex sides of partitions, begin installation at one end of curved surface and fasten gypsum board panels to studs as they are wrapped around curve. On concave side, start fastening panels to stud at center of curve and work outward to panel ends. Fasten panels to framing with screws spaced 12 inches on center.
3. For double-layer construction, fasten base layer to studs with screws 16 inches on center. Center gypsum board face layer panels over joints in base layer, and fasten to framing with screws spaced 12 inches on center.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings, or if not indicated, according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Install trim as follows:

1. Cornerbead: Use at outside corners.
2. LC-Bead (J-Bead): Use at exposed panel edges.
3. Curved-Edge Cornerbead: Use at curved openings.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended to receive tape.

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D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to GA-214 "Recommended Levels of Gypsum Board Finish."

1. Gypsum board to receive paint finish, and as indicated otherwise: Level 4.
    a. Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges.
    b.
2. Gypsum board occurring behind tackable panels, acoustical panels, and impact-resistant wall covering: Level 3.
    a. Embed tape and apply separate first and fill coats of joint compound to tape, fasteners, and trim flanges.
3. Gypsum board in concealed locations: Level 1 (except as required otherwise by listed designs for fire and sound construction).
    a. Embed tape at joints.

3.6 PROTECTION

A. Protect adjacent surfaces from joint compound and promptly remove from floors and other non-gypsum board surfaces. Repair surfaces stained, marred, or otherwise damaged during gypsum board installation.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet or moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

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SECTION 09 30 00

CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Ceramic tile.
      a. Floor tile (Slip resistant).
      b. Wall tile.
   2. Mortar beds for ceramic tile.
   3. Waterproof/crack isolation membrane for tile installations.
   4. Sealants for ceramic tile expansion joints.
   5. Grout for ceramic tile.

B. Related Sections include:
   1. Section 09 28 13 "Cementitious Backing Board" for cementitious backing board substrate for ceramic tile thinset installations.

1.3 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A108 Series: Specifications for Installation of Ceramic Tile.
      a. A108.01: General Requirements: Subsurfaces and Preparations by Other Trades.
      b. A108.02: General Requirements: Materials, Environmental, and Workmanship.
      c. A108.1A: Ceramic Tile Installed in the Wet-Set Method with Portland Cement Mortar.
      d. A108.1B: Ceramic Tile Installed on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar.
      e. A108.6: Ceramic Tile Installed With Chemical Resistant, Water Cleanable Tile-Setting and –Grouting Epoxy.
      f. A108.10: Installation of Grout in Tilework.
      g. A108.11: Interior Installation of Cementitious Backer Units.

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h. A108.13: Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.

i. A108.17: Installation of Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone.

2. ANSI A118.3: Specifications for Chemical-Resistant Water Cleanable Tile-Setting and Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive.
3. ANSI A118.4: Specifications for Modified Dry-Set Mortar.
4. ANSI A118.6: Specifications for Standard Cement Grouts for Tile Installation.
5. ANSI A118.10: Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installations.
6. ANSI A118.12: Specifications for Crack Isolation Membranes for Thin-set Ceramic Tile and Dimension Stone Installation.
7. ANSI A137.1: Specifications for Ceramic Tile.

B. ASTM International:

1. ASTM A 666: Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
2. ASTM A 1064: Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
3. ASTM C 373: Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products.
4. ASTM C 648: Standard Test Method for Breaking Strength of Ceramic Tile.
5. ASTM C 650: Standard Test Method for Resistance of Ceramic Tile to Chemical Substances.
6. ASTM C 920: Standard Specification for Elastomeric Joint Sealants.
7. ASTM D 226: Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
8. ASTM D 4397: Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.

C. California Green Building Standards Code (CALGreen) – California Code of Regulations, Title 24, Part 11.

D. South Coast Air Quality Management District (SCAQMD):

1. Rule 1168 – Adhesive and Sealant Applications.

E. Tile Council of North America (TCNA).

1. TCNA Handbook for Ceramic, Glass, and Stone Tile Installation.

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1.4 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. Module Size: Actual tile size plus joint width indicated.

C. Face Size: Actual tile size, excluding spacer lugs.

1.5 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site to review pertinent issues related to ceramic tiling.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Initial Selection: Manufacturer's full range of colors and patterns for each type of tile and grout indicated, for selection by Architect. Include Samples of accessories involving color selection.

1. Minimum Number of Colors for Selection:

a. Grouting Epoxy: 36.

b. Sealant:

i) Urethane Sealant: 40.

ii) Mildew-Resistant Silicone Sealant: 3.

D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.

a. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.

2. Assembled samples mounted on a rigid panel, with grouted joints and one sealant-filled expansion joint, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.

3. Full-size units of each type of trim and accessory.

4. Metal edge strips in 6-inch lengths.

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E. CALGreen Submittals:

1. Manufacturer's product data for sealants and sealant primers, and tile-setting adhesives and grouts indicating compliance with product requirements specified in "CALGreen Requirements" Article.

1.7 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of product, signed by product manufacturer.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.9 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Build mockup of each type of wall tile installation.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

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1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type from single source or producer.
   1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
   1. Obtain setting and grouting materials, except for unmodified portland cement and aggregate, from single manufacturer.
   2. Obtain combination waterproofing/crack isolation membrane from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
   1. Joint sealants.
   2. Metal edge strips.

2.2 CALGREEN REQUIREMENTS

A. General: Conform with all applicable requirements of the California Green Building Standards Code (CALGreen).

B. Provide sealant and sealant primers, and tile-setting adhesives and grout which comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, except as noted otherwise below. Such products shall also comply with Rule 1168 prohibition of the use of certain toxic compounds (chloroform, ethylene, dichloride, methylene chloride, perchloroethylene, and trichloroethyelen).

2.3 PERFORMANCE REQUIREMENTS

A. Slip-Resistance: Ceramic floor tile shall provide a wet dynamic coefficient of friction of not less than 0.42 when tested per ANSI A137.1 AcuTest, using BOT-3000E digital tribometer.

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2.4 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 Articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in swimming pools, on exteriors, or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.5 TILE PRODUCTS

A. General: Tested requirements indicated for each tile type are in accordance with the following standards:

1. Dynamic Coefficient of Friction: As tested per ANSI A137.1 AcuTest, using BOT-3000E digital tribometer.
2. Water Absorption: ASTM C 373.
3. Breaking Strength: ASTM C 648.
4. Scratch Hardness: MOHS Scale.
5. Chemical Resistance: ASTM C 650.

B. Unglazed Mosaic Tile – Floor Tile and Cove Base Tile:

1. Product: Subject to compliance with requirements, provide one of the following:
   a. Daltile; Keystones to match existing.
   b. Equal product in accordance with Division 1 requirements for product substitutions.
2. Composition: Porcelain.
3. Module Size: 2 inches by 2 inches.
4. Thickness: 1/4 inch.
5. Face: Plain with cushion edges.

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6. Finish: Unglazed.
7. Dynamic Coefficient of Friction: As indicated in "Performance Requirements" Article.
8. Water Absorption: < 0.5 percent.
9. Breaking Strength: > 300 lbs.
10. Scratch Hardness: 6.0 – 7.5 MOH.
11. Chemical Resistance: Resistant.
12. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes selected from manufacturer's standard shapes, including the following:
    a. Base Cove: Cove profile; module size 2 inches.
        i) Outer Corner at Base: Base cove with continuous outer corner cove profile and surface bullnose at vertical corner edge.
        ii) Inner Corner at Base: Base cove with continuous inner corner cove profile.
    b. Outer Corners: Surface bullnose at one edge, module size 2 inches.
    c. Edge/Wainscot Trim for Thinset Installations: Surface bullnose at one edge, module size 2 inches.
        i) Outer Corner at Top of Wainscot: Surface bullnose top and side edge; module size 2 inches.
    d. Edge Trim/Wainscot Cap for Thickset Mortar Installations: Quarter-round bead cap bullnose, module size 2 inches.
        i) Outer Corner at Top of Wainscot: Bead cap bullnose for outer corner.
        ii) Inner Corner at Top of Wainscot: Bead cap bullnose for inner corner.
13. Color: As specified in Section 09 06 00 "Colors and Finishes."

C. Glazed Interior Wall Tile:
1. Product: Subject to compliance with requirements, provide one of the following:
    a. Daltile; Semi-Gloss to match existing.
    b. Equal product in accordance with Division 1 requirements for product substitutions.
2. Module Size: 4-1/4 inches by 4-1/4 inches or 6 inches by 6 inches.
3. Thickness: 5/16 inch.
4. Face: Plain, with modified square edges.
5. Finish: Bright, opaque.
6. Water Absorption: < 20 percent.
7. Breaking Strength: 100 - 230 lbs.

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8. Scratch Hardness: 4.0 -6.5 MOH.
9. Chemical Resistance: Resistant.
10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes selected from manufacturer's standard shapes, including the following:
    a. Base Cove: Cove profile; module size 4-1/4 inches by 4-1/4 inches.
        i) At Wainscot: Square edge at top edge.
        ii) At Single-Course Tile Base: Surface bullnose at top edge.
        iii) Outer Corner at Base: Base cove profile with continuous outer corner profile at one corner and surface bullnose at vertical edge.
    b. Outer Corners: Surface bullnose at one edge; module size 4-1/4 inches by 4-1/4 inches.
    c. Wainscot Cap/Edge Trim:
        i) Thinset Installation: Surface bullnose at one edge; module size 4-1/4 inches by 4-1/4 inches.
        ii) Thickset Installation: Bead bullnose at one edge; module size 4-1/4 inches by 4-1/4 inches.
    d. Edge Trim for Thickset Installation: Quarter-round bead bullnose.
11. Colors: As specified in Section 09 06 00 "Colors and Finishes."

D. Glazed Interior Wall Tile:
1. Product:
    a. Daltile; Elevare Glazed Ceramic.
    b. Equal product in accordance with Division 1 requirements for product substitutions.
2. Module Size: 6 inches by 18 inches.
3. Thickness: 5/16 inch.
4. Face: Plain, with modified square edges.
5. Finish: Bright, opaque.
6. Water Absorption: < 20 percent.
7. Breaking Strength: 100 - 230 lbs.
8. Scratch Hardness: 4.0 -6.0 MOH.
9. Chemical Resistance: Resistant
10. Trim: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile.
    a. Outer Corners: Schluter Trim; Jolly.
        i) L-shaped profile with 1/8" wide top section and vertical wall section that together form the visible surface, integrated trapezoid-perforated anchoring leg, and integrated gout joint spacer.

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ii) Provide with straight anchoring leg.

iii) Brushed Nickel Anodized Aluminum.

iv) Height as required.

v) Wainscot Cap/Edge/Outside Corner Trim

vi) Thinset Installation: 12" Jolly; ½" x 11 15/16".

11. Color[s]: As specified in Section 09 06 00 09050"Colors and Finishes."

2.6 TILE BACKING PANELS

A. Tile Backing Panels: As specified in Section 09 28 13 "Cementitious Backing Board."

2.7 COMBINATION WATERPROOF/CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.10 and ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.

1. Product: Subject to compliance with requirements, provide the following:
   a. Ardex Americas; 8+9.
   b. Laticrete International, Inc.; Hydroban.
   c. Mapei Corporation: Mapelastic Aqua Defense.
   d. Equal product in accordance with Division 1 requirements for product substitutions.

2.8 SETTING MATERIALS

A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.1B and as specified below:

1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
2. Reinforcing Wire Fabric: Galvanized, welded wire reinforcement, 2 inches by 2 inches by 0.062-inch diameter; comply with ASTM A 1064 except for minimum wire size.
3. Bond Coat: Latex portland cement mortar as specified in following paragraph.

B. Latex Portland Cement Mortar (Thinset): ANSI A118.4, consisting of the following:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Ardex Americas; X 5.
   b. Laticrete International, Inc.; 254 Platinum.
   c. Mapei Corporation; Kerabond Dryset Mortar with Keralastic additive.

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d. Equal product in accordance with Division 1 requirements for product substitutions.

2. Prepackaged dry-mortar mix, polymer-modified.
   a. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to other requirements in ANSI A118.4.
3. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.

2.9 GROUT MATERIALS

A. Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy: ANSI A118.3.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Ardex Americas; WA.
      b. Laticrete International, Inc.; SpectraLOCK PRO Grout.
      c. Mapei Corporation; Kerapoxy.
   2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 deg F and 212 deg F respectively, and certified by manufacturer for intended use.
   3. Colors: As specified in Section 09 06 00 "Colors and Finishes."
   4. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.

2.10 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 07 92 00 "Joint Sealants."
   1. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.
   2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT or T.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Degussa Building Systems; Sonneborn Sonolastic NP 2.
      b. Pecora Corporation; DynaTrol II.
      c. Sika Corporation; Sikaflex-2c NS EZ Mix.

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d. Equal product in accordance with Division 1 requirements for product substitutions.

D. Mildew-Resistant, Single-Component, Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 786 Mildew Resistant.

b. GE Advanced Materials – Silicones; Sanitary SCS1700.

c. Equal product in accordance with Division 1 requirements for product substitutions.

2.11 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Reinforcing Mesh: Alkali-resistant woven glass-fiber mesh as recommended by manufacturer of tile backing panels.

C. Metal Edge Strips: [L-shape]; perforated anchoring leg with ability to form radiused curves along length of edge strip, height to match tile and setting-bed thickness, designed specifically as a termination edge at flooring applications; stainless-steel, ASTM A 666 Type 304 exposed-edge material.

1. Products: Subject to compliance with requirements, provide the following:

a. Schluter Systems; [Schiene].

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Grout Sealer: Manufacturer's standard no-sheen product for sealing grout joints and that does not change color or appearance of grout.

1. Products: Subject to compliance with requirements, provide the following:

a. Aquamix; Sealer's Choice Gold.

b. Equal product in accordance with Division 1 requirements for product substitutions.

2. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.

3. VOC Emissions: Complies with requirements specified in "LEED v4 Requirements" Article.

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2.12 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare floor substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1B and is sloped 1/4 inch per foot toward drains.

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C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE BACKING PANEL INSTALLATION

A. Install cementitious backer units as specified in Section 09 28 13 "Cementitious Backing Board," and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

1. Install reinforcing mesh at joints by embedding in tile setting material in accordance with manufacturer's written instructions.

3.4 COMBINATION WATERPROOF/CRACK ISOLATION MEMBRANE INSTALLATION

A. Install combination waterproof/crack isolation membrane to comply with ANSI A108.13 and ANSI A108.17 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

B. Do not install tile or setting materials over waterproof/crack isolation membrane until membrane has been installed and cured in accordance with manufacturer's written instructions and tested to determine that it is watertight.

3.5 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that face of tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out

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tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles of floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Mosaic Tile: 1/16 inch.
2. Glazed Interior Wall Tile: 1/16 inch.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Grout tile to comply with TCNA installation methods specified in tile installation schedules.

1. For grouting epoxy, comply with ANSI A108.6.

J. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, at all locations where tile surface abuts intersecting plane (e.g. inner corners, floor/wall junctions, etc.), and where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
2. Use urethane sealant, except at interior wet locations, use mildew-resistant silicone sealant at wall joints.
3. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

K. Metal Edge Strips: Install at locations indicated.

3.6 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.

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2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.8 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations:

1. Tile Installation F112: Cement mortar bed (thickset) over concrete slab; TCNA F112 (include combination waterproof/crack isolation membrane between mortar bed and thinset bond coat) and ANSI A108.1B.
   a. Tile Type: Unglazed mosaic tile.
   b. Thinset Mortar for Cured-Bed Method: Latex-portland cement mortar.
   c. Grout: Grouting epoxy.
2. Tile Installation F141: Cement mortar bed (thickset) over wood subfloor; TCNA F141 (include combination waterproof/crack isolation membrane between mortar bed and thinset bond coat) and ANSI A108.1B.
   a. Tile Type: Unglazed mosaic tile.
   b. Thinset Mortar: Latex-portland cement mortar.
   c. Grout: Grouting epoxy.

B. Interior Wall Installations:

1. Tile Installation W244C: Thinset mortar on cementitious backer units; TCNA W244C.
   a. Tile Type: Glazed interior wall tile.
   b. Thinset Mortar: Latex-portland cement mortar.
   c. Grout: Grouting epoxy.

END OF SECTION 09 30 00

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SECTION 09 51 13

SUSPENDED LAY-IN PANEL CEILINGS

PART 1 - GENERAL

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes suspended ceiling system consisting of exposed suspension system and lay-in panels.

B. Related Sections include:
   1. Division 23 Section for air terminals in suspended lay-in panel ceiling system.
   2. Division 26 Section for light fixtures in suspended lay-in panel ceiling system.

C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.3 DEFINITIONS

A. CAC: Ceiling Attenuation Class.

B. DSA: Division of the State Architect.

C. LR: Light Reflectance coefficient.

D. NRC: Noise Reduction Coefficient.

1.4 REFERENCES

A. ASME International (American Society of Mechanical Engineers):
   1. ASME B18.6.1: Wood Screws.
   2. ASME B18.6.4: Thread Forming and Thread Cutting Screws.

B. ASTM International:
   1. ASTM A 580: Standard Specification for Stainless Steel Wire.
   2. ASTM A 641: Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
   3. ASTM A 653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   4. ASTM B 633: Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

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5. ASTM C 635: Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
6. ASTM C 636: Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
7. ASTM C 645: Standard Specification for Nonstructural Steel Framing Members.
8. ASTM C 834: Standard Specification for Latex Sealants.
9. ASTM D 3273: Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
10. ASTM D 3274: Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation.
11. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
12. ASTM E 90: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
13. ASTM E 119: Standard Test Methods for Fire Tests of Building Construction and Materials.
14. ASTM E 488: Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
15. ASTM E 580: Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
16. ASTM E 795: Standard Practices for Mounting Test Specimens During Sound Absorption Tests.
17. ASTM E 1190: Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members.
18. ASTM E 1264: Standard Classification for Acoustical Ceiling Products.
19. ASTM E 1512: Standard Test Methods for Testing Bond Performance of Bonded Anchors.
20. ASTM F 593: Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
21. ASTM F 594: Standard Specification for Stainless Steel Nuts.
22. ASTM G 21: Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

C. California Building Code (CBC) – California Code of Regulations, Title 24, Part 2.

D. California Department of Health Services:
1. Standard Practice for the Testing of Volatile Organic Emissions from Various Sources using Small-Scale Environmental Chambers (including 2004 Addenda).

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E. Ceilings & Interior Systems Construction Association (CISCA):
   1. Ceiling Systems Handbook.

F. Code of Federal Regulations (CFR):
   1. 40 CFR, Part 59, Subpart D (EPA Method 24): National Volatile Organic Compound Emission Standards.

G. Division of the State Architect (DSA):
   1. Interpretation of Regulations Document IR 25-2.13: Metal Suspension Systems for Lay-In Panel Ceilings: 2013 CBC.

H. International Code Council Evaluation Service, Inc. (ICC-ES):

I. National Association of Architectural Metal Manufacturers (NAAMM):
   1. Metal Finishes Manual for Architectural and Metal Products.

J. National Voluntary Laboratory Accreditation Program (NVLAP).

K. South Coast Air Quality Management District (SCAQMD):
   1. Rule 1168 – Adhesive and Sealant Applications.

L. Underwriters Laboratories (UL).
   1. Fire Resistance Directory.

1.5 COORDINATION

A. Coordinate layout and installation of lay-in ceiling panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.6 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site to review methods and procedures related to installation of suspended lay-in panel ceilings.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For components with factory-applied color finishes, submit manufacturer's full range of available colors for selection by Architect.)
   1. Minimum Number of Colors for Selection:
      a. Exposed Suspended Ceiling Runners: 10.

C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

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1. Lay-In Panel: Set of 6-inch square Samples of each type, color, pattern, and texture.
2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch long Samples of each type, finish, and color.

1.8 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Suspended ceiling components, including suspension system members and seismic compression strut and bracing assemblies.
   2. Structural members to which suspension systems will be attached.
      a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
   3. Items penetrating finished ceiling including the following:
      a. Light fixtures.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Access panels.
      f. Audio-visual equipment mounting hardware.
   4. Perimeter moldings.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each suspended lay-in panel ceiling, for tests performed by a qualified testing agency.

D. Evaluation Reports: For each suspended lay-in panel ceiling suspension system and anchor and fastener type, from ICC-ES.
   1. Include valid ICC-ES Evaluation Report for seismic clip used to attach ends of ceiling grid runners to wall at free end while allowing 3/4-inch movement in either direction.

E. Field quality-control reports.

1.9 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

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1.10 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lay-In Ceiling Panels: Full-size panels equal to ***[2]*** percent of quantity installed.
2. Suspension System Components: Quantity of each exposed component equal to ***[2]*** percent of quantity installed.

1.11 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical ceiling area as directed by Architect.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Deliver lay-in panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing lay-in panels, permit them to reach room temperature and stabilized moisture content.

C. Handle lay-in panels carefully to avoid chipping edges or damaging units in any way.

1.13 FIELD CONDITIONS

A. Environmental Limitations: Do not install suspended lay-in panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning suspended lay-in panel ceiling installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of lay-in ceiling panel and supporting suspension system through one source from a single manufacturer.

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2.2 SUSTAINABILITY CHARACTERISTICS

A. Recycled Content of Lay-In Ceiling Panels: Provide lay-in ceiling panels that contain minimum levels of recycled content as indicated for each lay-in panel type.

B. Recycled Content of Metal Suspension System: Provide metal ceiling suspension components that contain the following minimum levels of recycled content:

1. Preconsumer: 6 percent minimum.
2. Postconsumer: 23 percent minimum.

C. VOC Content of Interior Sealants: Provide sealants and sealant primers used inside the weatherproofing system that comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule #1168.

2.3 PERFORMANCE REQUIREMENTS

A. Design Requirements: Provide ceiling suspension system that complies with requirements of the 2016 California Building Code (Title 24, Part 2), including ability to withstand effects of all design loads and earthquake motions calculated according to requirements of the California Building Code, using factors defined therein and applicable to local site conditions, without showing permanent deformation of ceiling system components including panels and suspension system, or permanent damage to fasteners and anchors.

1. Comply with requirements of California Division of the State Architect Interpretation of Regulations IR 25-2.13, "Metal Suspension Systems for Lay-in Panel Ceilings: 2016 CBC."

B. Fire-Test-Response: Provide suspended lay-in panel ceilings that comply with the following requirements:

1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
   b. Smoke-Developed Index: 50 or less.
2. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency

2.4 LAY-IN CEILING PANELS, GENERAL

A. Lay-In Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, forms, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

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1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4-inches away from test surface according to ASTM E 795.

B. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Where ceiling panels are indicated to receive mold/mildew protection, provide panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.5 LAY-IN CEILING PANELS

A. Lay-in Acoustical Panel – Type LCP-1:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Armstrong World Industries, Inc.; #1729, Fine Fissured.
   b. USG Interiors, Inc.; #2410, Radar ClimaPlus.
   c. Equal product in accordance with Division 1 requirements for product substitutions.
2. ASTM E 1264 Classifications:
   a. Type: Type III, mineral base with painted finish.
   b. Form: Form 2, water felted.
   c. Pattern: CE (perforated, small holes, and lightly textured) or CDE (perforated, small holes, fissured, and lightly textured).
3. Dimensions: 24 inches by 48 inches by 5/8 inch thick.
4. Edges: Square.
5. Color: White.
6. NRC: 0.55 minimum.
7. CAC: 35 minimum.
8. LR: 0.84 minimum.
9. Mold/Mildew Protection: Manufacturer's antimicrobial treatment.
10. Recycled Content:
    a. Preconsumer: 11 percent minimum.
    b. Postconsumer: 6 percent minimum.
11. Warranty: 30-year warranty against visible sagging, mold/mildew, and bacterial growth.

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2.6 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635 and ASTM E 580.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, except that, in no case shall the load be less than 450 lbs. Load-carrying capability to be as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
    a. Type: Post-installed expansion.
    b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn (0.005 mm) for Class SC 1 service condition.
2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to ten times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
3. Mechanical Fasteners: ASME B18.6.4, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
4. Wood Screws: ASME B18.6.1.

D. Wire Hangers, Braces, Safety Wires, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch diameter (12 gage) wire or as otherwise indicated on Drawings.

E. Anchor Clips: Angles with legs of width as indicated on Drawings, or if not indicated, 1 inch wide at concrete decks and three inches wide at steel decks (e.g. without concrete fill); provide hole for attaching hanger and bracing wires; unless otherwise

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indicated, formed of 0.1084-inch thick (12 gage) galvanized steel sheet complying with ASTM A 653, G90 (Z275) coating designation; with attachment devices as indicated on Drawings.

F. Compression Strut for Seismic Uplift: ASTM C 645; manufacturer's standard C-shaped steel stud section; with stiffened flanges; unpunched.
   1. Stud Flange Width: 1-5/8 inches.
   2. Stud Depth: 2-1/2 inches, unless indicated otherwise.
   3. Base-Metal Thickness: 0.0346 inch (20 gage).
   4. Grade: 33 ksi minimum yield strength.
   5. Protective Coating: ASTM A 653, G60 (Z180) hot-dip galvanized zinc coating.

G. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces and maintain alignment of grid.

H. Clean-Room Gasket System: Where indicated, provide manufacturer's standard system, including manufacturer's standard gasket and related adhesives, tapes, seals, and retention clips, designed to seal out foreign material from and maintain positive pressure in clean-room.

2.7 METAL SUSPENSION SYSTEM

A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653, not less than G30 (Z90) coating designation, with prefinished 15/16-inch wide metal caps on flanges.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Armstrong World Industries, Inc.; Prelude XL Exposed Tee System.
         i) Edge Molding Clip at Free End of Runners and Tees: Armstrong BERC-2 clip.
         ii) Seismic Joint Clips:
            -Main Runners: Armstrong #SJMR15 with #ES4 sliding face cap.
            -Cross Runners: Armstrong #SJCG.
         iii) Product Report: ICC-ES Evaluation Report #ESR-1308, with Supplement to address compliance with 2010 California Building Code.
      b. USG Interiors, Inc.; Donn DX/DXL Suspension System.
         i) Edge Molding Clip at Free End of Runners and Tees: USG ACM7 Ceiling Attachment Clip.
         ii) Seismic Joint Clips:
            -Main Runners: USG Interiors, Inc.; Donn #DH2 with sliding face cap to match profile of runner.

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-Cross Runners: USG Interiors, Inc.; Donn #DH4.

iii) Product Report: ICC-ES Evaluation Report #ESR-1222, with Supplement to address compliance with 2010 California Building Code.

c. Equal product in accordance with Division 1 requirements for product substitutions.

2. Structural Classification: Heavy-duty system, as defined in ASTM C 635.
3. End Condition of Cross Runners: Override (stepped) or butt-edge type.
4. Face Design: Flat, flush.
5. Cap Material: Steel cold-rolled sheet.
6. Cap Finish: Painted white.

B. Seismic Separation Joints: Manufacturer's seismic joint clip for connecting ends of adjacent in-line runners while allowing 3/4-inch horizontal movement in either direction, in conformance with seismic design requirements. Provide sliding cover face cap to match profile and finish of adjacent runners.

2.8 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. Provide manufacturer's standard edge moldings that fit lay-in panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
   a. Width of Exposed Flange of Wall Moulding: 7/8 inch.
2. Provide manufacturer's standard retaining clip fabricated from cold-rolled hot-dip galvanized steel, which joins web of main runner or cross tee at ends to wall moulding, while allowing 3/4-inch horizontal movement in either direction at free ends, in conformance with seismic design requirements.
3. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of lay-in panel and flange at exposed suspension member.
4. For circular penetrations of ceiling, provide edge moldings fabricated to a diameter required to fit penetration exactly.

2.9 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

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1. Products: Subject to compliance with requirements, provide one of the following:
    a. Pecora Corporation; AC-20 FTR.
    b. USG Corporation; SHEETROCK Acoustical Sealant.
    c. Equal product in accordance with Division 1 requirements for product substitutions.
2. VOC Content: Provide sealant and sealant primer that complies with local regulatory limits for VOC content when calculated according to 40 CFR, Part 59, Subpart D (EPA Method 24).
    a. In addition to local regulatory limits, provide sealants used inside the weatherproofing system that comply with requirements of "Sustainability Characteristics" Article.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which suspended lay-in panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of suspended lay-in panel ceilings.

B. Examine lay-in panels before installation. Reject panels that are wet, moisture-damaged, or mold-damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of lay-in panels to balance border widths at opposite edges of each ceiling, unless indicated otherwise on Drawings. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install suspended lay-in panel ceilings to comply with manufacturer's written instructions and the following, as applicable to Seismic Design Categories D, E, and F:
    1. 2016 California Building Code.
    2. ASTM C 636.
    3. ASTM E 580.
    4. California Division of the State Architect Interpretation of Regulations IR 25-2.13, "Metal Suspension Systems for Lay-in Panel Ceilings: 2013 CBC."

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5. CISCA's "Ceiling Systems Handbook."
6. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Space hangers not more than 48 inches on center along each member supported directly from hangers, unless otherwise indicated. Provide hangers not more than 8 inches from ends of each member, or within 1/4th of the length of the end runner, whichever is least, around the entire perimeter of the ceiling area.
3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
   a. Hanger wires more than 1 in 6 out of plumb are to have counter-sloping wires.
      i) Counter-sloping is optional for perimeter hanger wires at main runners that are positively attached to perimeter closure angle.
4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices, so hanger wires do not attach to or bend around interfering construction.
5. Secure wire hangers to ceiling suspension members and to supports above by looping and wire tying with a minimum of three tight turns in 3 inches. Hanger wire loops to be tightly wrapped and sharply bent to prevent vertical movement or rotation of the member within the loops. Connect hangers directly either to structures or to anchor clips, eye bolts, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   a. Direction of anchor clip leg, eye bolt, or other anchoring device to align as closely as possible with the direction of the hanger wire.
   b. At concrete, secure anchoring device for hanger wires with post-installed expansion anchors or power-actuated fasteners.
6. When framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
7. Do not support ceilings directly from metal floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extends through metal deck and into concrete.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to ducts, pipe, or conduit.

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10. Separate all hanger wires at least 6 inches from unbraced ducts, pipes, conduits, and other construction above ceiling.
11. Splicing of hanger wires is not permitted.
12. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Provide bracing assemblies consisting of a compression strut and four splayed bracing wires oriented 90 degrees from each other. Place bracing assemblies at a spacing of not more than 12 feet by 12 feet on center.
   1. Provide bracing assemblies at locations at no more than 1/2 of the spacings indicated above, from each perimeter wall and at the edge of vertical ceiling offsets. Minimum spacing from perimeter wall and vertical offset is as follows:
      a. School Buildings: 6 feet.
      b. Essential Services Buildings: 4 feet.
   2. Secure bracing wires to ceiling suspension members and to supports by looping and wire tying with a minimum of four tight turns in 1-1/2 inches. Connect bracing wires directly either to structures or to anchor clips, eye bolts, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures. Do not attach to steel deck tabs. Fasten anchor clips for bracing wires into concrete with postinstalled anchors (power-actuated fasteners are not acceptable).
      a. Direction of anchor clip leg, eye bolt, or other anchoring device to align as closely as possible with the direction of the bracing wire.
      b. At concrete, secure anchoring device for bracing wires with post-installed expansion anchors (power-actuated fasteners not allowed).
   3. Slope of bracing wires is not to exceed 45 degrees from the plane of the ceiling.
   4. Bracing wires shall be taut.
   5. Splicing of bracing wires is not permitted.
   6. Separate all bracing wires at least 6 inches from unbraced ducts, pipes, conduits, and other construction above ceiling.
   7. Compression struts to be adequate to resist vertical component of loads induced by bracing wires, and are not to be more than 1 (horizontal) in 6 (vertical) out of plumb.

D. Do not attach ends of suspended ceiling runners to more than two adjacent walls. Where end of runner is not attached to wall, provide 3/4 inch clear between end of runner and wall. If walls run diagonally to suspended ceiling runners, one end of main and cross runners shall be free, with a minimum 3/4 inch clearance between end of runner and wall.

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1. At those portions of ceiling perimeter in which main or cross runners are not attached to wall, provide a seismic stabilizer bar for interconnection between adjacent runners at free end to prevent lateral spreading.
    a. If perpendicular distance from wall to first parallel runner is 8 inches or less, interconnection of free ends of perpendicular runners is not required.
    b. Where manufacturer's retaining clip designed to join main runner or cross tee to wall molding while allowing 3/4-inch horizontal movement in either direction is used, seismic stabilizer bar for interconnection of adjacent runners is not needed.

E. Install edge moldings and trim of type indicated at perimeter of suspended ceiling area and where necessary to conceal edges of lay-in panels.
    1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
    2. Screw attach moldings to substrate at intervals not more than 16 inches on center and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
    3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

F. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

G. Mount all light fixtures, air terminals, and other devices and services in ceiling as follows:
    1. Ceiling panels shall not support any light fixtures, air terminals, or devices.
    2. Attach all light fixtures, air terminals, and other devices to ceiling grid main runners (Heavy-Duty classification) to resist a horizontal force equal to the weight of the fixture, terminal, or device, using screws or approved fasteners. Minimum of two attachments are required at each fixture, terminal, or device.
    3. Flush or recessed light fixtures, air terminals, flexible sprinkler hose fittings, and other services in ceiling weighing less than 56 lbs. may be supported directly on main runners of a Heavy-Duty classification suspended ceiling system, but must be provided with a minimum of two 12-gage slack safety wires at diagonally opposite corners, each anchored to structure above.
    4. Flush or recessed light fixtures, air terminals, flexible sprinkler hose fittings, and other services in ceiling weighing 56 lbs. or more must be independently supported by not less than four 12-gage taut safety wires, each attached to the housing and anchored to the structure above. The four taut safety wires shall be capable of supporting four times the weight of the unit.
    5. 4-foot by 4-foot light fixtures must be provided with 12-gage slack safety wires at each corner, each anchored to structure above.
    6. Support surface-mounted light fixtures by at least two positive metal clamping devices of 14-gage minimum thickness which surround the ceiling runner and which are each supported from the structure above by a 12-gage safety wire.

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Spring clips or clamps and rotational spring catches that connect only to the runner are not acceptable. Provide additional supports when light fixtures are 8 feet long or longer. Maximum spacing between supports shall not exceed 8 feet.

7. Support pendant-mounted light fixtures directly from structure above with hanger wires or cables passing through each pendant hanger and capable of supporting two times the weight of the fixture. Provide bracing assembly, as specified above, where pendants penetrate ceiling. Bracing assembly to be positively connected to pendant as required to transmit horizontal forces, so that pendant does not impose any lateral force on suspended ceiling system.
8. Attach all lightweight miscellaneous devices, including fire alarm strobes, smoke detectors, speakers, exit signs, etc. to ceiling grid main runners (Heavy-Duty classification) to resist a horizontal force equal to the weight of the device, using screws or approved fasteners. Minimum of two attachments are required at each device. Devices weighing more than 10 lbs. shall have a 12-gage slack safety wire anchored to structure above. Devices weighing more than 20 lbs. must be independently supported by not less than four 12-gage taut safety wires, each attached to the housing and anchored to the structure above. The four taut safety wires shall be capable of supporting four times the weight of the unit.
9. Rigid conduit shall not be used for attachment of light fixtures.

H. Additional Requirements for Hospitals: Lay-in ceiling assemblies in exitways shall be installed with a main runner or cross runner surrounding all sides of each lay-in tile, board, panel, light fixture, or air terminal. Splices or intersections of such runners shall be attached with through connectors such as pop rivets, screws, pins, plates with end tabs, or other approved connectors.

I. Provide seismic separation/expansion joints in ceiling areas as follows:
   1. As required to divide overall ceiling area into individual areas not exceeding 2500 square feet.
   2. In ceiling areas at intersections of corridors, and at junctions of corridors and lobbies or other similar areas.
   3. At penetrations through ceiling for sprinkler heads and other similar devices that are not integrally tied to ceiling system in the lateral direction, provide one of the following methods to accommodate movement:
      a. 2-inch oversized ring, sleeve, or adapter through ceiling tile to allow free movement of 1 inch in all horizontal directions.
      b. Flexible sprinkler hose fitting that can accommodate 1 inch of ceiling movement in any lateral direction.

J. Install lay-in panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
   1. Arrange directionally patterned lay-in panels as follows:

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a. As indicated on reflected ceiling plans.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
5. Install hold-down clips in areas indicated. Space as recommended by lay-in panel manufacturer's written instructions unless otherwise indicated.
6. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
7. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform tests and inspections and prepare test reports.

1. Notify Owner's testing agency, and Project Inspector at least 2 working days in advance of the time when Work that requires testing or inspecting is to be performed.
2. Provide access to the Work as needed to perform testing and inspecting.

B. Testing and Inspection: Testing and inspecting of completed installations of suspended lay-in panel ceiling hangers and anchors and fasteners shall take place in successive stages. Do not proceed with installations of suspended lay-in panel ceiling hangers for the next area until test results for previously completed installations of suspended lay-in panel ceiling hangers show compliance with requirements.

1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
   a. Within each test area, testing agency will select 1 of every 10 power-actuated fasteners and post-installed anchors used to attach hangers to concrete and will test them for 200 lbf of tension. It will also select one of every two post-installed anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
   b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

C. Remove and replace acoustical panel ceiling hangers and anchors and fasteners that do not pass tests and inspections and retest as specified above.

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1. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 CLEANING

A. Clean exposed surfaces of suspended lay-in panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

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SECTION 09 65 00

RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Vinyl composition floor tile.
   2. Vinyl sheet flooring, non-homogeneous (with backing).
   3. Vinyl sheet flooring, homogeneous (unbacked).

B. Related Sections include:
   1. Section 09 65 13 "Resilient Base and Accessories" for resilient base, stair treads, and transition moldings.

1.3 REFERENCES

A. ASTM International:
   1. ASTM D 2047: Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
   2. ASTM D 2240: Standard Test Method for Rubber Property-Durometer Hardness.
   3. ASTM D 6866: Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis.
   4. ASTM E 648: Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
   5. ASTM E 662: Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
   6. ASTM F 710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
   7. ASTM F 970: Standard Test Method for Static Load Limit.
   8. ASTM F 1066: Standard Specification for Vinyl Composition Floor Tile.
   9. ASTM F 1303: Standard Specification for Sheet Vinyl Floor Covering With Backing.
   10. ASTM F 1344: Standard Specification for Rubber Floor Tile.

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11. ASTM F 1516: Standard Practice for Sealing Seams of Resilient Flooring Products by the Heat Weld Method (when Recommended).
12. ASTM F 1913: Standard Specification for Vinyl Sheet Floor Covering Without Backing.
13. ASTM F 2034: Standard Specification for Sheet Linoleum Floor Covering.
14. ASTM F 2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
15. ASTM F 2195: Standard Specification for Linoleum Floor Tile.

B. California Air Resources Board:
1. Suggested Control Measure for Architectural Coatings.

C. California Collaborative for High Performance Schools (CA-CHPS).

D. California Department of Public Health (CDPH):
1. Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers – Version 1.1, February 2010.

E. California Green Building Standards Code (CALGreen) – California Code of Regulations, Title 24, Part 11.

F. Chemical Abstract Service (CAS):
1. Chemical Abstract Registration Number (CASRN).

G. Cradle to Cradle Products Innovation Institute:
1. Cradle to Cradle Certified Product Standard.

H. European Standards (EN):
1. EN 15804: Sustainability of Construction Works – Environmental Product Declarations – Core Rules for the Product Category of Construction Products.

I. GreenScreen for Safer Chemicals:
1. GreenScreen Chemical Hazard Assessment Procedure V1.2.

J. Health Product Declaration Collaborative:
1. Health Product Declaration Open Standard.

K. International Organization for Standardization (ISO):
1. ISO 14021: Environmental Labels and Declarations – Self-Declared Environmental Claims (Type II Environmental Labeling).
2. ISO 14025: Environmental Labels and Declarations – Type III Environmental Declarations – Principals and Procedures.
3. ISO 14040: Environmental Management – Life Cycle Assessment – Principals and Framework.

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4. ISO 14044: Environmental Management – Life Cycle Assessment – Requirements and Guidelines.
5. ISO 21930: Sustainability in Building Construction – Environmental Declaration of Building Products.

L. Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

M. Resilient Floor Covering Institute (RFCI):
1. FloorScore certification program.

N. South Coast Air Quality Management District (SCAQMD):
1. Rule 1113 – Architectural Coatings.
2. Rule 1168 – Adhesive and Sealant Applications.

O. Sustainable Agriculture Network:
1. Sustainable Agriculture Standard.

P. UL GREENGUARD.

1.4 DEFINITIONS

A. VOC: Volatile Organic Compounds.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
1. Include documentation of test results for slip resistance.

B. Shop Drawings:
1. Tile: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
a. Show details of special patterns.
2. Sheet: For each type of sheet flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
a. Show details of special patterns.

C. Samples for Initial Selection: Submit manufacturer's full range of colors for each type of resilient flooring product and accessory indicated, for selection by Architect.
1. Minimum Number of Colors for Selection:
a. Vinyl composition floor tile: 90.
b. Vinyl sheet flooring: 64.

D. Samples for Verification:
1. Floor Tile: Full-size units of each color and pattern of resilient floor tile.

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2. Sheet Flooring: In manufacturer's standard size Samples, but not less than 6-inch by 9-inch sections of each color and pattern of resilient sheet flooring.
3. Welded-Seam Samples: For seamless installation technique indicated and for each resilient sheet flooring product, color, and pattern required; with seam running lengthwise and in center of 6-inch by 9-inch Sample applied to a rigid backing and prepared by Installer for this Project.

E. CALGreen Submittals:
1. Manufacturer's product data for resilient flooring products indicating compliance with product requirements specified in "CALGreen Requirements" Article.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of resilient flooring product and accessory to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, pattern, and size of floor tile installed.
2. Sheet Flooring: Furnish ten linear feet for every 500 linear feet, or fraction thereof, in roll form and in full roll width for each type, color, and pattern of sheet flooring installed.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for installation of resilient flooring.
1. Engage an Installer who employs workers for this Project that are trained or certified by resilient flooring manufacturer for installation techniques required, including seaming method indicated.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockups for each type of resilient flooring, including base and accessories specified in Section 09 65 13 "Resilient Base and Accessories."
a. Size: Minimum 25 square feet for each type, color, and pattern, in locations directed by Architect.

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2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Store resilient flooring products, and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F, except not less than 65 deg F for linoleum.
   1. Store tiles on flat surfaces.
   2. Store rolls upright.

1.11 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive resilient flooring during the following time periods:
   1. 48 hours before installation, except as noted below:
      a. 72 hours before installation for linoleum tile and sheet flooring.
   2. During installation.
   3. 48 hours after installation, except as noted below:
      a. 72 hours after installation for linoleum tile and sheet flooring.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Moisture content of concrete slabs and environmental conditions must be within limits recommended by manufacturer of products being installed.

D. Close spaces to traffic during resilient flooring installation.

E. Close spaces to traffic for 48 hours after resilient flooring installation, except as noted below:
   a. 72 hours after installation for linoleum tile and sheet flooring.

F. Install resilient flooring after other finishing operations, including painting, have been completed.

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PART 2 - PRODUCTS

2.1 CALGREEN REQUIREMENTS

A. General: Conform with all applicable requirements of the California Green Building Standards Code (CALGreen).

B. Provide adhesives and adhesive primers which comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, except as noted otherwise below. Such products shall also comply with Rule 1168 prohibition of the use of certain toxic compounds (chloroform, ethylene, dichloride, methylene chloride, perchloroethylene, and trichloroethyelen).

C. Resilient Flooring: Provide resilient flooring products which meet at least one of the following:

1. Certified under the Resilient Floor Covering Institute (RFCI) FloorScore program.
2. Compliant with the VOC-emission limits specified in the California Department of Public Health Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1, February 2010.
3. Compliant with 2014 California Collaborative for High Performance Schools California (CA-CHPS) Criteria Interpretation for EQ 7.0 and EQ 7.1 (formerly EQ 2.2) and listed in the CHPS High Performance Database.
4. Certified under UL GREENGUARD Gold (formerly Greenguard Children's & Schools Program).

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics for Resilient Flooring:

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm, as determined by testing identical products according to ASTM E 648.
2. Smoke Density: 450 or less, determined by testing identical products according to ASTM E 662.

B. Slip-Resistance:

1. Except where indicated otherwise, provide resilient flooring products with a minimum Coefficient of Friction of 0.6 as tested under dry conditions in accordance with ASTM D 2047.
    a. Application of floor polish is not to reduce Indicated Coefficient of Friction values below indicated minimums.

2.3 VINYL COMPOSITION FLOOR TILE

A. Vinyl Composition Tile: Complying with ASTM F1066, Class 2 - through pattern tile.

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1. Product: Armstrong World Industries, Inc.; Standard Excelon Imperial Texture/Multicolor.
    a. Colors/Patterns: As specified in Section 09 06 00 "Colors and Finishes."
2. Size: 12 inches by 12 inches.
3. Thickness: 1/8 inch (3.2 mm).
4. Wearing Surface: Smooth.
5. Static Load Limit: 125 lbs. /sq. in per ASTM F 970.
6. VOC Emissions:
    a. Complies with requirements specified in "CALGreen Requirements" Article.

2.4 VINYL SHEET FLOORING – NON-HOMOGENEOUS (WITH BACKING)

A. Complying with ASTM F 1303, Type I (minimum binder content of 90 percent), Grade 1, Class A backing.
1. Product: Mohawk Group; Serenity Collection.
    a. Colors/Patterns: As specified in Section 09 06 00 "Colors and Finishes."
2. Sheet Width: 6 feet.
3. Thickness: 0.080 inch (2.0 mm) overall, 0.022 inch (0.55 mm) wear layer.
4. Wearing Surface: Smooth.
5. Static load limit: 175 psi per ASTM F 970.
6. VOC Emissions:
    a. Complies with requirements specified in "CALGreen Requirements" Article.
    b.
7. Seaming Method: Standard.

2.5 VINYL SHEET FLOORING – HOMOGENEOUS (UNBACKED)

A. Complying with ASTM F 1913.
1. Product: ***[Armstrong World Industries, Inc.; Medintone]***.
    a. Color***[s]***/Pattern***[s]***: As selected by Architect from manufacturer's full range of colors.
        i) For bidding purposes, assume ***[two]*** separate colors, in equal quantities for each color.

    [or]

    b. Color***[s]***/Pattern***[s]***:
        i) SV-UB-1: ***[#H8322 Amber Light]***.
        ii) SV-UB-2: ***[#H8334 Gold Dust Light]***.

    [or]

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c. Color***[s]***/Pattern***[s]***: As specified in Section 09 06 00 "Colors and Finishes."

2. Sheet Width: 6 feet.
3. Thickness: 0.080 inch (2.0 mm).
4. Wearing Surface: Smooth.
5. Static load limit: 750 psi per ASTM F 970.
6. VOC Emissions:
   a. Complies with requirements specified in "CALGreen Requirements" Article.
   b. Complies with requirements specified in ***["LEED 2009 Requirements"] ["LEED v4 Requirements"]*** Article.
7. Seaming Method: Standard, except as noted otherwise below:
   a. Food Preparation Areas: ***[Heat-welded] [Chemically-bonded]***.

2.6 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement-based or blended hydraulic-cement-based formulation provided or approved by floor covering manufacturer for applications indicated.

B. Primer/Sealer: Resilient flooring manufacturer's standard sealer material designed to seal gypsum-based underlayment surfaces.

C. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit products and substrate conditions indicated.
   1. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.

D. Integral-Flash-Cove-Base Accessories:
   1. Cove Strip: 1-inch radius provided or approved by flooring manufacturer.
   2. Cap Strip: Square metal, vinyl, or rubber cap provided or approved by flooring manufacturer.

E. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer of resilient flooring and accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, maximum moisture content, and other conditions affecting performance of the Work.

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1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might show through surface of or interfere with adhesion of resilient flooring and accessories.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to resilient flooring and accessory manufacturer's written recommendations to ensure adhesion of resilient products.

B. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient flooring and accessory manufacturer. Do not use solvents.

C. Concrete substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Moisture and Alkalinity Testing: Perform tests recommended by resilient flooring manufacturer and as follows. Proceed with installation only after substrates pass testing.
    a. Perform concrete moisture testing, using the relative humidity in-situ probe test method, in accordance with ASTM F 2170.
        i) Proceed with installation only after substrates show a moisture level of 75 percent relative humidity or less, or as recommended in writing by manufacturer of resilient flooring to be installed.
    b. Perform alkalinity testing in accordance with ASTM F 710.
        i) Proceed with installation only after substrates show a pH level of not less than 7 and not greater than 9, or as recommended in writing by manufacturer of resilient flooring to be installed.
3. Adhesion Testing: Perform tests recommended by resilient flooring manufacturer. Proceed with installation only after substrates pass testing.

D. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

E. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

F. Apply primer/sealer over gypsum-based cementitious underlayment in accordance with resilient flooring manufacturer's written instructions and as required to ensure proper adhesion of resilient flooring to underlayment surface.

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G. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation, except as noted below:

a. 72 hours in advance of installation for linoleum tile and floor covering.

H. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in pattern of colors and sizes indicated.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, door frames, thresholds, and nosings.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 RESILIENT SHEET FLOORING INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient sheet flooring.

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B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.

C. Lay out resilient flooring as follows:
   1. Maintain uniformity of flooring direction.
   2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
   3. Match edges of flooring for color shading at seams.
   4. Avoid cross seams.
   5. For linoleum, eliminate deformations that result from hanging method used during drying process (stove bar marks).

D. Scribe, cut, and fit resilient sheet flooring to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install resilient sheet flooring on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining floor covering. Tightly adhere sheet flooring edges to substrates that abut covers and to cover perimeters.

H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

I. Integral-Flash-Cove Base: Cove resilient sheet flooring ***[6]*** inches up vertical surfaces. Support flooring at horizontal and vertical junction by cove strip. Butt at top against cap strip.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient flooring.

B. Perform the following operations immediately after completing resilient flooring installation:
   1. Remove adhesive and other blemishes from exposed surfaces using cleaner recommended by resilient product manufacturers.
   2. Sweep and vacuum surfaces thoroughly.

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3. Damp-mop surfaces to remove marks and soil.
    a. Do not wash floor until after time period recommended by manufacturer.

C. Protect resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer of resilient flooring.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient flooring and accessory surfaces before applying liquid floor polish.
    1. Apply protective floor polish to resilient flooring surfaces as recommended in writing by manufacturer of resilient flooring.
        a. Use commercially available product acceptable to manufacturer.
        b. Use floor polish that allows indicated minimum slip-resistance levels to be maintained.
        c. Coordinate selection of floor polish with Owner's maintenance personnel.

E. Cover resilient flooring surfaces until Substantial Completion.
    1. Allow drying room film (yellow film caused by linseed oil oxidation) to disappear, before covering linoleum surfaces.

F. Do not move heavy and sharp objects directly over surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels

END OF SECTION 09 65 00

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SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Resilient base.
   2. Resilient stair accessories.
   3. Resilient molding accessories.

B. Related Sections include:
   1. Section 09 65 00 "Resilient Flooring" for resilient flooring installed with resilient base.
   2. Section 09 68 13 "Tile Carpeting" for carpet tile flooring installed with resilient base and stair accessories.
   3. Section 09 68 16 "Sheet Carpeting" for sheet carpet flooring installed with resilient base and stair accessories.

1.3 REFERENCES

A. ASTM International:
   1. ASTM F 710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
   2. ASTM F 1861: Standard Specification for Resilient Wall Base.
   3. ASTM F 2169: Standard Specification for Resilient Stair Treads.
   4. ASTM F 2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

B. California Code of Regulations – Title 17, Public Health.

C. California Collaborative for High Performance Schools (CA-CHPS).

D. California Department of Public Health (CDPH):
   1. Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers – Version 1.1, February 2010.

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E. California Green Building Standards Code (CALGreen) – California Code of Regulations, Title 24, Part 11.

F. Resilient Floor Covering Institute (RFCI):
   1. FloorScore certification program.

G. South Coast Air Quality Management District (SCAQMD):
   1. Rule 1168 – Adhesive and Sealant Applications.

H. UL GREENGUARD.

I. United States Department of Justice:
   1. 2010 ADA Standards for Accessible Design.

1.4 DEFINITIONS

A. VOC: Volatile Organic Compounds.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: Submit manufacturer's full range of colors for each type of resilient base and accessory product indicated, for selection by Architect.
   1. Minimum Number of Colors for Selection:
      a. Resilient base: 76.
      b. Resilient stair accessories: 76.
      c. Resilient transition moldings: 20.

C. Samples for Verification:
   1. Resilient Base: Manufacturer's standard size Samples, but not less than 12 inches long, of each resilient base color, texture, and pattern.
   2. Stair Treads: 12-inch long Sample of each stair tread color and texture.
   3. Accessories: Manufacturer's standard size Samples not less than 6 inches long, of each type and color of edge strip, nosing, transition strip, and other resilient flooring accessory.

D. CALGreen Submittals:
   1. Manufacturer's product data for resilient flooring products indicating compliance with product requirements specified in "CALGreen Requirements" Article.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

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1. Resilient Base: Not less than 10 linear feet for every 500 linear feet, or fraction thereof, of each type, color, pattern, and size of resilient base installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for installation of resilient base and accessories.
   1. Engage an Installer who employs workers for this Project that are trained or certified by resilient flooring and accessory manufacturer for installation techniques required.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups for each type of resilient base and accessory.
      a. Size: Minimum 10 lineal feet for each type, in locations directed by Architect.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store resilient base and accessories, and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F, except not less than 65 deg F for linoleum.

1.9 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive resilient flooring during the following time periods:
   1. 48 hours before installation, except as noted below:
      a. 72 hours before installation for linoleum tile and sheet flooring.
   2. During installation.
   3. 48 hours after installation, except as noted below:
      a. 72 hours after installation for linoleum tile and sheet flooring.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

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C. Install resilient base and accessories after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 CALGREEN REQUIREMENTS

A. General: Conform with all applicable requirements of the California Green Building Standards Code (CALGreen).

B. Provide adhesives and adhesive primers which comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, except as noted otherwise below. Such products shall also comply with Rule 1168 prohibition of the use of certain toxic compounds (chloroform, ethylene, dichloride, methylene chloride, perchloroethylene, and trichloroethyelen).

1. Aerosol adhesives and similar unit sizes of adhesives, and sealants (in units of product, less packaging, which do not weigh more than one pound and do not consist of more than 16 fluid ounces) shall comply with statewide VOC standards and other requirements, including prohibitions of use of certain toxic compounds, of the California Code of Regulations, Title 17, commencing with Section 94507.

C. Resilient Base and Accessories: Provide resilient products which meet at least one of the following:

1. Certified under the Resilient Floor Covering Institute (RFCI) FloorScore program.
2. Compliant with the VOC-emission limits specified in the California Department of Public Health Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1, February 2010.
3. Compliant with 2014 California Collaborative for High Performance Schools California (CA-CHPS) Criteria Interpretation for EQ 7.0 and EQ 7.1 (formerly EQ 2.2) and listed in the CHPS High Performance Database.
4. Certified under UL GREENGUARD Gold (formerly Greenguard Children's & Schools Program).

2.2 RESILIENT BASE

A. Resilient Base Standard: ASTM F 1861.

1. Manufacturer: Subject to compliance with requirements, provide resilient base by one of the following:
   a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
   b. Roppe Corporation, USA.

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c. Manufacturer of equal products, in accordance with Division 1 requirements for product substitutions.

2. Color: As specified in Section 09 06 00 "Colors and Finishes."

B. Material Requirement: TS (rubber, vulcanized thermoset).

C. Manufacturing Method: Group I (solid, homogeneous).

D. Style: Cove (base with toe).

E. Minimum Thickness: 0.125 inch.

F. Height: 4 inches.

G. Lengths: Coils in manufacturer's standard length.

H. Outside Corners: Job formed, except use preformed where indicated in Part 3.

I. Inside Corners: Job formed.

J. Finish: Matte.

K. Surface: Smooth.

L. VOC Emissions:

1. Complies with requirements specified in "CALGreen Requirements" Article.
2. Certification: RFCI FloorScore.

2.3 RESILIENT STAIR TREADS AND ACCESSORIES

A. Carpet Nosings: Manufacturer's double-flange carpet stair nosings, designed for use with carpeting on tread and riser surfaces of stairs.

1. Manufacturers: Subject to compliance with requirements, provide resilient stair treads by one of the following:
   a. Burke Mercer Flooring Products, Division of Burke Industries, Inc.
   b. Roppe Corporation, USA.
   c. Manufacturer of equal products in accordance with Division 1 requirements for product substitutions.
2. Color: As specified in Section 09 06 00 "Colors and Finishes."
3. Surface: Ribbed.
4. VOC Emissions:
   a. Complies with requirements specified in "CALGreen Requirements" Article.
   b. Certification: RFCI FloorScore .

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2.4 RESILIENT MOLDING ACCESSORIES

A. General: Manufacturer's standard transition/reducer strips of rubber or vinyl, designed for terminating edge of finish flooring materials or providing flush transition joint between different finish flooring materials.

1. Manufacturer: Subject to compliance with requirements, provide resilient molding accessories by one of the following:
   a. Burke Mercer Flooring Products, Division of Burke Industries, Inc.
   b. Roppe Corporation, USA.
   c. Manufacturer of equal products in accordance with Division 1 requirements for product substitutions.
2. Color: As specified in Section 09 06 00 "Colors and Finishes."
3. Profile and Dimensions: Burke Stair Nosing #575.
4. Provide two-piece construction consisting of track base for anchorage to substrate, and snap-in top cap.
5. Accessibility Requirements: Bevel transition strips with a slope of not more than 1:2, and comply with requirements per the following:
   a. California Building Code (Title 24, Part 2), Chapter 11B.
   b. United States Department of Justice's 2010 ADA Standards for Accessible Design.
6. VOC Emissions:
   a. Complies with requirements specified in "CALGreen Requirements" Article.
   b. Certification: RFCI FloorScore.

2.5 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement-based or blended hydraulic-cement-based formulation provided or approved by floor covering manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit products and substrate conditions indicated.

1. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.

C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, maximum moisture content, and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might show through surface of or interfere with adhesion of resilient flooring and accessories.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to resilient base and accessory manufacturer's written recommendations to ensure adhesion of resilient products.

B. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient flooring and accessory manufacturer. Do not use solvents.

C. Concrete Substrates for Resilient Stair Accessories: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Moisture and Alkalinity Testing: Perform tests recommended by resilient flooring manufacturer and as follows. Proceed with installation only after substrates pass testing.
    a. Perform concrete moisture testing, using the relative humidity in-situ probe test method, in accordance with ASTM F 2170.
        i) Proceed with installation only after substrates show a moisture level of 75 percent relative humidity or less, or as recommended in writing by manufacturer of resilient flooring to be installed.
    b. Perform alkalinity testing in accordance with ASTM F 710.
        i) Proceed with installation only after substrates show a pH level of not less than 7 and not greater than 9, or as recommended in writing by manufacturer of resilient flooring to be installed.
3. Adhesion Testing: Perform tests recommended by resilient flooring manufacturer. Proceed with installation only after substrates pass testing.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

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E. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners: Except as noted otherwise below, install job-formed corners.

1. Outside Corners: Use straight pieces of maximum lengths possible, and form with returns not less than 3 inches in length. Form without producing discoloration (whitening) at bends.

a. Where project conditions are such that length of base on either side of corner is less than 3 inches, notch back of toe of resilient wall base to facilitate bending around corner, and ensure full coverage is achieved with adhesive at backside of base. Entire length of base shall be tightly adhered.

2. Inside Corners: Use straight pieces of maximum lengths possible, and form with returns not less than 3 inches in length. Form by cutting an inverted V-shaped notch in toe of wall base at point where corner is formed.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.

2. Tightly adhere to substrates throughout length of each piece.

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C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient flooring that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient base and accessories.

B. Perform the following operations immediately after completing resilient base and accessory installation:

1. Remove adhesive and other blemishes from exposed surfaces using cleaner recommended by resilient product manufacturers.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.
    a. Do not wash surfaces until after time period recommended by manufacturer.

C. Protect resilient base and accessories from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION 09 65 13

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SECTION 09 68 13

TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes modular wall-off carpet tile.

B. Related Sections include:

1. Section 02 41 19 "Selective Demolition" for removal of existing floor coverings.
2. Section 09 05 65 "Concrete Moisture-Control System" for moisture-vapor-emission control system applied to concrete slab substrates prior to installation of finish flooring.
3. Section 09 65 13 "Resilient Base and Accessories" for the following resilient products used with carpet tile:
   a. Resilient base.
   b. Resilient transition moldings between carpet tile and adjacent finish flooring materials.
4. Section 09 68 16 "Sheet Carpeting" for carpet roll goods.

1.3 REFERENCES

A. American Association of Textile Chemists and Colorists (AATCC):

1. AATCC 134: Test Method for Electrostatic Propensity of Carpets.

B. ASTM International:

1. ASTM E 648: Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
2. ASTM E 662: Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
3. ASTM E 2471: Standard Test Method for Using Seeded-Agar for the Screening Assessment of Antimicrobrial Activity in Carpets.
4. ASTM F 710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

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C. California Department of Public Health (CDPH):
   1. Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers – Version 1.1, February 2010.

D. CALGreen: California Green Building Standards Code - California Code of Regulations, Title 24, Part 11.

E. Carpet and Rug Institute (CRI):
   1. CRI Carpet Installation Standard.
   2. CRI Green Label Plus testing program.

F. Collaborative for High Performance Schools (CHPS).
   1. Criteria Interpretation Library.
      a. EQ 7.0 – Low Emitting Materials.
      b. EQ 7.1 – Additional Low Emitting Materials.

G. International Certified Floorcovering Installers Association.
   1. Commercial II certification level.

H. NSF International/American National Standards Institute (ANSI):
   1. NSF/ANSI 140: Sustainability Assessment for Carpet.

I. SCS Global Services:
   1. Sustainable Carpet Certification.

J. South Coast Air Quality Management District (SCAQMD):
   1. Rule 1168 – Adhesive and Sealant Applications.

1.4 DEFINITIONS

A. VOC: Volatile Organic Compounds.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
      a. Delivery, storage, and handling procedures.
      b. Ambient conditions and ventilation procedures.
      c. Subfloor preparation procedures.

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1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
   2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, plans showing the following:
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
   2. Existing flooring materials to be removed.
   3. Existing flooring materials to remain.
   4. Carpet tile type, color, and dye lot.
   5. Type of subfloor.
   6. Type of installation.
   7. Pattern of installation.
   8. Pattern type, location, and direction.
   9. Pile direction patterns.
   10. Types, color, and locations of insets and borders.
   11. Type, color, and location of edge, transition, and other accessory strips.
   12. Transition details to other flooring materials.

C. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. Carpet Tile: Full-size Sample.
   2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

E. CALGreen Submittals:
   1. Manufacturer's product data for adhesives and adhesive primers indicating compliance with product requirements specified in "CALGreen Requirements" Article.
   2. Manufacturer's product data for carpet tile indicating compliance with product requirements specified in "CALGreen Requirements" Article.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

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B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq yds.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: An experienced Installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups at locations and in sizes as shown on Drawings or if not shown, as directed by Architect.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

1.12 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

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B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.13 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:
   a. More than 10 percent loss of face fiber, edge raveling, snags, and runs.
   b. Dimensional instability.
   c. Loss of tuft-bind strength.
   d. Excess static discharge.
   e. Loss of face fiber.
   f. Delamination
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CALGREEN REQUIREMENTS

A. General: Conform with all applicable requirements of the California Green Building Standards Code (CALGreen).

B. Provide adhesives and adhesive primers which comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, except as noted otherwise below. Such products shall also comply with Rule 1168 prohibition of the use of certain toxic compounds (chloroform, ethylene, dichloride, methylene chloride, perchloroethylene, and trichloroethyelen).

1. Aerosol adhesives and similar unit sizes of adhesives, and sealants (in units of product, less packaging, which do not weigh more than one pound and do not consist of more than 16 fluid ounces) shall comply with statewide VOC standards and other requirements, including prohibitions of use of certain toxic compounds, of the California Code of Regulations, Title 17, commencing with Section 94507.

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C. Carpet Tile: Provide carpet tile products which meet at least one of the following:

1. Certified as complying with the testing and product requirements of the Carpet and Rug Institute's Green Label Plus program.
2. Compliant with the VOC-emission limits specified in the California Department of Public Health Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1, February 2010.
3. Meets requirements of NSF/ANSI 140 for certification at the Gold level or higher.
4. Meets requirements of SCS Global Services Sustainable Carpet Certification program at the Gold level or higher.
5. Compliant with 2014 California Collaborative for High Performance Schools California (CA-CHPS) Criteria Interpretation for EQ 7.0 and EQ 7.1 (formerly EQ 2.2) and listed in the CHPS High Performance Database.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics for Tile Carpeting:

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq cm, as determined by testing identical products according to ASTM E 648.
2. Smoke Density: 450 or less, determined by testing identical products according to ASTM E 662.

2.3 CARPET TILE

A. Modular Carpet Tile: Modular carpet tile system designed for random installation, such that individual tiles may be installed without regard to pile direction, pattern, or orientation while maintaining a visually continuous and finished overall appearance without any tile appearing improperly positioned.

1. Product: Mohawk Group; Tuff Stuff II Collection, Step Up II Tile.
   a. Color: As specified in Section 09 06 00 "Colors and Finishes."
2. Construction: Tufted.
3. Fiber Type: Duracolor Premium Nylon.
4. Dye Method: 100 percent solution dyed.
5. Pile Characteristic: Tip-sheared.
6. Pile Height: .144 inch.
7. Gage: 5/32 inch.
8. Face Yarn Weight: 38 oz per sq yd.
9. Density: 9,500 oz per cu yd.
10. Backing: Manufacturer's fiberglass-reinforced vinyl backing system.
11. Size: 24 inches by 24 inches.

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12. Applied Soil-Resistance Treatment: Manufacturer's standard material; 8.0 on the Red 40 Stain Scale, per AATCC 175.
13. Performance Characteristics: As follows:
    a. Electrostatic Propensity: Less than 3.5 kV per AATCC 134.
14. Minimum Recycled Content:
    a. Preconsumer: 44 percent.
    b. Postconsumer: 1 percent.
15. VOC Emissions:
    a. Complies with requirements specified in "CALGreen Requirements" Article.
    b. Certification: CRI Green Label Plus.

2.4 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Primer/Sealer: Carpet manufacturer's standard sealer material designed to seal gypsum-based underlayment surfaces.

C. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
    1. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.

D. Resilient Transition Moldings: As specified in Section 09 65 13 "Resilient Base and Accessories."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Verify that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might show through surface or interfere with adhesion of carpet tile and accessories

D. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Concrete substrates: Prepare according to ASTM F 710.

1. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturer.
2. Refer to Section 09 05 65 "Concrete Moisture-Control System" for moisture and alkalinity testing and treatment. Proceed with installation only after substrates pass testing.
3. Adhesion Testing: Perform tests recommended by carpet tile manufacturer. Proceed with installation only after substrates pass testing.

C. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes, and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

D. Apply primer/sealer over gypsum-based cementitious underlayment in accordance with carpet manufacturer's written instructions and as required to ensure proper adhesion of carpet to underlayment surface.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 CARPET TILE INSTALLATION

A. General: Comply with with CRI's "Carpet Installation Standard," Section 18, "Modular Carpet," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer, and as follows:

1. Glue-down; install every tile with full-spread, releasable pressure-sensitive adhesive.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Maintain carpet tile patterns indicated on Drawings.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

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F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

I. Do not bridge building expansion joints with carpet tiles.

J. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet tiles that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile.
   1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
   2. Remove yarns that protrude from carpet tile surface.
   3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "CRI Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

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SECTION 09 68 16

SHEET CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Sheet carpet.

B. Related Sections include:
   1. Section 02 41 19 "Selective Demolition" for removal of existing floor coverings.
   2. Section 09 05 65 "Concrete Moisture-Control System" for moisture-vapor-emission control system applied to concrete slab substrates prior to installation of finish flooring.
   3. Section 09 65 13 "Resilient Base and Accessories" for the following resilient products used with sheet carpeting:
      a. Resilient base.
      b. Resilient transition moldings between carpet and adjacent finish flooring materials.
      c. Resilient stair nosings.
   4. Section 09 68 13 "Tile Carpeting" for modular carpet tile.

1.3 REFERENCES

A. American Association of Textile Chemists and Colorists (AATCC):
   1. AATCC 16: Colorfastness to Light.
   2. AATCC 134: Electrostatic Propensity of Carpets.
   3. AATCC 165: Colorfastness to Crocking: Carpets – AATCC Crockmeter Method.

B. ASTM International:
   1. ASTM D 1335: Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings.
   2. ASTM D 3676: Standard Specification for Rubber Cellular Cushion Used for Carpet or Rug Overlay.

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3. ASTM D 7330: Standard Test Method for Assessment of Surface Appearance Change in Pile Floor Coverings Using Standard Reference Scales.
4. ASTM E 648: Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
5. ASTM F 710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
6. ASTM F 2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

C. California Department of Public Health (CDPH):
1. Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers – Version 1.1, February 2010.

D. CALGreen: California Green Building Standards Code - California Code of Regulations, Title 24, Part 11.

E. Carpet and Rug Institute (CRI):
1. CRI Carpet Installation Standard.
2. CRI Green Label testing program.
3. CRI Green Label Plus testing program.

F. Carpet Cushion Council (CCC).

G. Collaborative for High Performance Schools (CHPS).
1. Criteria Interpretation Library.
a. EQ 7.0 – Low Emitting Materials.
b. EQ 7.1 – Additional Low Emitting Materials.

H. International Certified Floorcovering Installers Association.
1. Commercial II certification level.

I. NSF International/American National Standards Institute (ANSI):
1. NSF/ANSI 140: Sustainability Assessment for Carpet.

J. SCS Global Services:
1. Sustainable Carpet Certification.

K. South Coast Air Quality Management District (SCAQMD):
1. Rule 1168 – Adhesive and Sealant Applications.

1.4 DEFINITIONS

A. VOC: Volatile organic compound.

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1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet installation including, but not limited to, the following:
    a. Delivery, storage, and handling procedures.
    b. Ambient conditions and ventilation procedures.
    c. Subfloor preparation procedures.

1.6 ACTION SUBMITTALS

A. Product data: For the following, including installation recommendations for each type of substrate:

1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
    a. Include data indicating compliance with CALGreen requirements.
    b. Include data indicating compliance with CALGreen requirements.

B. Shop Drawings: For carpet installation, showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
2. Existing flooring materials to be removed.
3. Existing flooring materials to remain.
4. Carpet, type, color, and dye lot.
5. Locations where dye lot changes occur.
6. Seam locations, types, and methods.
7. Type of subfloor.
8. Type of installation.
9. Pattern type, repeat size, location, direction, and starting point.
10. Types, colors, and locations of inserts and borders.
11. Types, colors, and locations of edge, transition, and other accessory strips.
12. Transition details to other flooring materials.

C. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet: 12-inch square Samples.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.
3. Carpet Cushion: 6-inch square Sample.
4. Carpet Seam: 6-inch Sample.

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5. Mitered Carpet Border Seam: 12-inch square Sample. Show carpet pattern alignment.

D. Product Schedule: For carpet. Use same designations indicated on Drawings.

E. CALGreen Submittals:

1. Manufacturer's product data for adhesives and adhesive primers indicating compliance with product requirements specified in "CALGreen Requirements" Article.
2. Manufacturer's product data for sheet carpeting indicating compliance with product requirements specified in "CALGreen Requirements" Article.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet for tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.9 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq yds.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: An experienced Installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups in location and size indicated, or if not indicated, as directed by Architect.

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2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

B. Deliver carpet in original mill protective covering with mill register numbers and tags attached.

1.12 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.

1. Refer to Section 09 05 65 "Concrete Moisture-Control System" for moisture testing and treatment requirements for concrete slabs.

1.13 WARRANTY

A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:
   a. More than 10 percent loss of face fiber, edge raveling, snags, and runs.
   b. Loss of tuft bind strength.
   c. Excess static discharge.
   d. Delamination
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CALGREEN REQUIREMENTS

A. General: Conform with all applicable requirements of the California Green Building Standards Code (CALGreen).

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B. Provide adhesives and adhesive primers which comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, except as noted otherwise below. Such products shall also comply with Rule 1168 prohibition of the use of certain toxic compounds (chloroform, ethylene, dichloride, methylene chloride, perchloroethylene, and trichloroethyelen).

1. Aerosol adhesives and similar unit sizes of adhesives, and sealants (in units of product, less packaging, which do not weigh more than one pound and do not consist of more than 16 fluid ounces) shall comply with statewide VOC standards and other requirements, including prohibitions of use of certain toxic compounds, of the California Code of Regulations, Title 17, commencing with Section 94507.

C. Sheet Carpeting: Provide sheet carpeting products which meet at least one of the following:

1. Certified as complying with the testing and product requirements of the Carpet and Rug Institute's Green Label Plus program.
2. Compliant with the VOC-emission limits specified in the California Department of Public Health Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1, February 2010.
3. Meets requirements of NSF/ANSI 140 for certification at the Gold level or higher.
4. Meets requirements of SCS Global Services Sustainable Carpet Certification program at the Gold level or higher.
5. Compliant with 2014 California Collaborative for High Performance Schools California (CA-CHPS) Criteria Interpretation for EQ 7.0 and EQ 7.1 (formerly EQ 2.2) and listed in the CHPS High Performance Database.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics for Sheet Carpeting:

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq cm, as determined by testing identical products according to ASTM E 648.
2. Smoke Density: 450 or less, determined by testing identical products according to ASTM E 662.

2.3 SHEET CARPETING

A. Sheet Carpet (Designated on Drawings as CP-1):

1. Product: Mohawk Group; GL154 Faculty Remix.
   a. Color: As specified in Section 09 06 00 "Colors and Finishes."
2. Construction: Tufted.
3. Fiber Content: 100 percent nylon Type 6, 6.
4. Fiber Type: Duracolor Premium Nylon.

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5. Dye Method: Solution dyed/yarn dyed.
6. Pile Characteristic: Textured multi-colored loop.
7. Pile Thickness: 0.166 inch average.
8. Stitches: 8.3 per inch.
9. Gage: 8 per inch.
10. Face Yarn Weight: 26 oz/sq yd.
11. Density: 5,639 oz per cu yd.
12. Primary Backing: Woven polypropylene.
13. Secondary Backing: Woven polypropylene.
14. Backcoating: Thermoplastic copolymer.
15. Roll Width: 12 feet.
16. Soil-Resistance Treatment: Manufacturer's material which occurs homogeneously throughout carpet fiber.
17. Performance Characteristics: As follows:
    a. Electrostatic Propensity: Less than 3.5 kV per AATCC 134.
18. Minimum Recycled Content:
    a. Postconsumer: 33 percent.
19. VOC Emissions:
    a. Complies with requirements specified in "CALGreen Requirements" Article.
    b. Certification: CRI Green Label Plus.

B. Sheet Carpet (Designated on Drawings as CP-2).
1. Mohawk Group; BC309 In The Loop.
    a. Color: As specified in Section 09 06 00 "Colors and Finishes."
2. Construction: Tufted.
3. Fiber Content: 100 percent nylon Type 6, 6.
4. Fiber Type: Colorstrand SD Nylon.
5. Dye Method: 100 percent solution dyed.
6. Pile Characteristic: Textured patterned loop.
7. Pile Thickness: 0.110 inch average.
8. Stitches: 10.2 per inch.
9. Gage: 8 per inch.
10. Face Yarn Weight: 20 oz/sq yd.
11. Density: 6,545 oz per cu yd.
12. Primary Backing: Woven polypropylene.
13. Secondary Backing: Woven polypropylene.
14. Backcoating: Thermoplastic copolymer.

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15. Width: 12 feet.
16. Soil-Resistance Treatment: Manufacturer's standard material.
17. Performance Characteristics: As follows:
    a. Electrostatic Propensity: Less than 3.5 kV per AATCC 134. (verify with Steve A.)
18. Minimum Recycled Content:
    a. Preconsumer: 52 percent.
19. VOC Emissions:
    a. Complies with requirements specified in "CALGreen Requirements" Article.
    b. Certification: CRI Green Label Plus.

2.4 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed sheet carpeting and is recommended or provided by carpet manufacturer.
    1. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.

C. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

D. Primer/Sealer: Carpet manufacturer's standard sealer material designed to seal gypsum-based underlayment surfaces.

E. Resilient Transition Moldings: As specified in Section 09 65 13 "Resilient Base and Accessories."

F. Resilient Stair Nosings for Carpet Stair Treads: As specified in Section 09 65 13 "Resilient Base and Accessories."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance.

B. Examine carpet for type, color, pattern, and potential defects.

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C. Verify that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might show through surface or interfere with adhesion of carpet and accessories

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," and with carpet manufacturer's written installation instructions for preparing substrates.

B. Concrete substrates: Prepare according to ASTM F 710.

1. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet manufacturer.
2. Refer to Section 07 26 15 "Concrete Moisture-Control System" for moisture and alkalinity testing and treatment. Proceed with installation only after substrates pass testing.
3. Adhesion Testing: Perform tests recommended by carpet manufacturer. Proceed with installation only after substrates pass testing.

C. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes, and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

D. Apply primer/sealer over gypsum-based cementitious underlayment in accordance with carpet manufacturer's written instructions and as required to ensure proper adhesion of carpet to underlayment surface.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 CARPET INSTALLATION

A. Comply with CRI's "Carpet Installation Standard" and carpet manufacturer's written instructions for the following:

1. Direct-Glue-Down Installation: Comply with Section 13, "Direct Glue-Down Installation."
2. Stair Installation: Comply with Section 17, "Carpet on Stairs."

B. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seam under the door in closed position.

C. Do not bridge building expansion joints with carpet.

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D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet tiles that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet:
   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
   2. Remove yarns that protrude from carpet surface.
   3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "CRI Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods recommended in writing by carpet manufacturer.

END OF SECTION 09 68 16

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SECTION 09 77 21

VINYL-WRAPPED PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes shop-fabricated vinyl-wrapped tackable panels.

B. Related Sections include:

1. Section 09 29 00 "Gypsum Board" for gypsum board substrates to receive vinyl-wrapped panels.
2. Section 10 11 00 "Visual Display Surfaces" for wall-mounted factory-fabricated tackboards with vinyl facing.

1.3 REFERENCES

A. American Association of Textile Chemists and Colorists (AATCC):

1. AATCC Test Method 8: Colorfastness to Crocking: AATCC Crockmeter Method.
2. AATCC Test Method 16: Colorfastness to Light.

B. ASTM International:

1. ASTM C 209: Standard Test Methods for Cellulosic Fiber Insulating Board.
2. ASTM C 423: Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
3. ASTM C 612: Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
4. ASTM D 1037: Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.
5. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
6. ASTM E 603: Standard Guide for Room Fire Experiments.
7. ASTM E 795: Standard Practices for Mounting Test Specimens During Sound Absorption Tests.
8. ASTM F 793: Standard Classification of Wallcoverings by Use Characteristics.

C. California Code of Regulations – Title 17, Public Health.

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D. California Department of Public Health (CDPH):

1. Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers – Version 1.1, February 2010.

E. California Green Building Standards Code (CALGreen) – California Code of Regulations, Title 24, Part 11.

F. Chemical Fabrics & Film Association, Inc.:

1. CFFA-W-101D: Quality Standard for Vinyl Coated Fabric Wallcovering.

G. Federal Specifications:

1. FS CCC-W-408A: Wall Covering, Vinyl Coated.

H. National Fire Protection Association (NFPA):

1. NFPA 286: Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

I. South Coast Air Quality Management District (SCAQMD):

1. Rule 1168 – Adhesive and Sealant Applications.

J. Underwriters Laboratory (UL):

1. UL 723: Standard Test for Surface Burning Characteristics of Building Materials.

1.4 DEFINITIONS

A. VOC: Volatile organic compounds.

1.5 COORDINATION

A. Coordinate locations of electrical and signal wall boxes with corresponding openings in vinyl-wrapped panels.

1. Install electrical and signal wall boxes, and other items intended for flush wall installation, so that front face of box sits flush with face of vinyl-wrapped panel.

1.6 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site to review pertinent issues related to installation of vinyl-wrapped panels.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of vinyl facing, panel core material, and adhesive indicated. Include technical data and tested physical and performance properties.

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B. Shop Drawings: For vinyl-wrapped panels. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel facing and core materials.

1. Include elevations showing panel sizes, layout of panel joints, and direction of vinyl pattern matching, if any.
2. Show intersections with wall base, doors, windows, and other adjacent work. Indicate operating ranges of doors and casework doors and drawers adjacent to vinyl-wrapped panels. Include and coordinate the wall-mounted items with each other, using input from installers of the items involved, including the following:
    a. Electrical receptacles and switches.
    b. HVAC thermostats and temperature sensors.
    c. Light fixtures.
    d. HVAC air inlets and diffusers.
    e. Speakers.
    f. Fire alarm devices.
    g. Access panels

C. Samples for Verification:

1. Vinyl Wall-Covering Facing: 12-inch by 12-inch Samples of each vinyl facing type from dye lot to be used for the Work, and as follows:
    a. Show complete pattern repeats.
    b. Mark top and face of vinyl facing.
2. Assembled Panel: For each type of vinyl-wrapped panel facing material, approximately 24 inches by 24 inches. Show edge profile, corner, and typical joint.
    a. Include edge moldings for the following conditions:
        i) Exposed panel edge.
        ii) Outside corner joint at two adjacent panels.

D. CALGreen Submittals:

1. Manufacturer's product data for adhesives indicating compliance with product requirements specified in "CALGreen Requirements" Article.

1.8 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for vinyl-wrapped panels, indicating compliance with specified performance requirements.

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1.9 CLOSEOUT SUBMITTALS

A. Maintenance Data: For vinyl-wrapped panels to include in maintenance manuals. Include vinyl facing manufacturer's written cleaning and stain-removal recommendations.

1.10 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials from same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Vinyl Facing: For each color and pattern installed, provide length equal to 10 percent of amount installed, but no fewer than 10 yards.

1.11 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.

1. Install mockup of typical wall area in location and of size indicated, or if not indicated, as directed by Architect. Include the following conditions:
    a. Typical joint between panels.
    b. Panel installation around door opening.
    c. Panel installation around window opening.
    d. Panel edge condition at abutting wall.
    e. Panel top edge (at ceiling) and bottom edge (at base).
    f. Outside corner.
    g. Inside corner
    h. Include intersection at wall and ceiling, corner, cabinets, and door opening.
2. Approved mockup may be become part of the completed Work if undisturbed at time of Substantial Completion.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

B. Installer Qualifications: An installer acceptable to vinyl-wrapped panel manufacturer for installation of units required for this Project.

C. Vinyl-Wrapped Panel Fabricator Qualifications: Shop with demonstrated experience in custom-fabricating products similar to those required for this Project, with a record of successful in-service performance, and which employs skilled workers qualified to perform such work.

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1.12 DELIVERY, STORAGE, AND HANDLING

A. Comply with vinyl-wrapped panel manufacturer's written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Store materials and panels in a temperature-controlled dry place with adequate air circulation.

C. Stack panel materials flat to prevent sagging, and protect edges from crushing and impact.

1.13 FIELD CONDITIONS

A. Environmental Limitations: Do not install vinyl-wrapped panels until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Lighting: Do not install vinyl-wrapped panels until a permanent level of lighting is provided on surfaces to receive vinyl-wrapped panels.

C. Air-Quality Limitations: Protect vinyl-wrapped panels from exposure to airborne odors, such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify locations of vinyl-wrapped panels and actual dimensions of openings and penetrations by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 CALGREEN REQUIREMENTS

A. General: Conform with all applicable requirements of the California Green Building Standards Code (CALGreen).

B. Provide adhesives which comply with current VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168, except as noted otherwise below. Such products shall also comply with Rule 1168 prohibition of the use of certain toxic compounds (chloroform, ethylene, dichloride, methylene chloride, perchloroethylene, and trichloroethyelen).

1. Aerosol adhesives and similar unit sizes of adhesives, and sealants (in units of product, less packaging, which do not weigh more than one pound and do not consist of more than 16 fluid ounces) shall comply with statewide VOC standards and other requirements, including prohibitions of use of certain toxic compounds, of the California Code of Regulations, Title 17, commencing with Section 94507.

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2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Vinyl facings and panel core materials shall comply with the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    a. Vinyl Facing Material:
        i) Flame Spread Index: 25 or less.
        ii) Smoke Developed Index: 450 or less.
    b. Panel Core Material:
        i) Flame Spread Index: 200 or less.
        ii) Smoke Developed Index: 450 or less.
2. Fire Growth Contribution: Comply with the following criteria when tested in the manner intended for use in accordance with NFPA 286.
    a. During the 40 kW exposure, flames shall not spread to the ceiling.
    b. Flame shall not spread to the outer extremities of the samples on any wall or ceiling.
    c. Flashover, as described in NFPA 286, shall not occur.
    d. The peak heat release rate throughout the test shall not exceed 1,000 sq meters.
    e. The total smoke released throughout the NFPA 286 test shall not exceed 1,000 sq meters

2.3 VINYL-WRAPPED PANELS

A. Vinyl-Wrapped Panel: Manufacturer's standard panel construction consisting of vinyl facing material laminated to front face, edges, and back edge border of core.

1. Manufacturers/Products: Subject to compliance with requirements, provide products by one of the following:
    a. Chatfield-Clarke Company.
    b. Lamvin, Inc.;
    c. Manufacturer of equal products in accordance with Division 1 requirements for product substitutions.
2. Mounting: Adhesive.
3. Joints Between Panels: Flush.
4. Panel Corner Detail (As Viewed From Front): Square.
5. Panel Dimensions:
    a. Width: 24 inches.
    b. Height: As indicated on Drawings.

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B. Vinyl Facing Material: Vinyl wall-covering from same dye lot.
   1. Product: RJF International Corporation, Koroseal Wallcoverings; Harborweave.
      a. Color: As specified in Section 09 06 00 "Colors and Finishes."
   2. Provide mildew-resistant product complying with the following:
      a. FS CCC-W-408A and CFFA-W-101D for Type II Medium-Duty products.
   3. Total Weight Excluding Coatings: 21.0 oz per linear yard (14.0 oz per sq yard).
   4. Vinyl Gage: 8.5 mils.
   5. Width: 54 inches.
   6. Backing Material: Osnaburg.

C. Tackable Panel Core: Industrial fiberboard formed from recycled wood fibers, impregnated with water-repellent petroleum wax emulsion; clay-coated and calendared (pressed) on one side for smoot finish.
   1. Product: Subject to compliance with requirements, provide one of the following:
      a. Building Products of Canada Corporation; SmartCore.
      b. Equal product in accordance with Division 1 requirements for product substitutions.
   2. Thickness: 1/2 inch.
   3. Fire-Test Response Characteristics: As specified in "Performance Requirements" Article.
   4. Edge Profile: Square.
   5. Mounting: Adhesive.
   6. Physical Properties:
      a. Transverse Load at Rupture: 12.5 lbf minimum, per ASTM C 209.
      b. Tensile Strength – Parallel to Surface: 297.5 lbs/sq in, per ASTM C 209.
      c. Water Absorption: 7.7 percent at 2 hours, per ASTM D 1037.
      d. Linear Moisture Expansion: Less than 0.5 percent, per ASTM D 1037.
   7. Recycled Content: 93 percent minimum, preconsumer.

2.4 ACCESSORIES

A. Adhesives for Fabric Facing Material: Provide adhesive, primer and sealer, produced expressly for use with selected facing material on panel core material indicated, and as recommended in writing by manufacturer of facing material.
   1. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.

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B. Adhesive for Tackable Panels: Adhesive recommended in writing by manufacturer of tackable core material for directly adhering tackable panel core material to continuous substrate indicated.

1. VOC Content: Complies with requirements specified in "CALGreen Requirements" Article.

C. Moldings for Exposed Panel Edge Conditions: Extruded aluminum moldings designed to fit over edges of vinyl-wrapped panels. Provide profiles as required for the following conditions:

1. Exposed edge (cap mold).
2. Outside corner.
3. Divider (termination/transition to adjacent wall material).

2.5 FABRICATION

A. General: Manufacturer's standard panel construction consisting of vinyl facing material adhered to front face (smooth side), edges, and back border of panel core material. Fabricate vinyl-wrapped panels to sizes and configurations indicated; adhere facing materials to panel core material to produce installed panels with visible surfaces fully covered and stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.

1. Wrap vinyl facing material over smooth side of panel core material, minimum of 2 inches around back of panel at all butted panel edges, both at adjacent panels, and where abutting adjacent surfaces.
2. Tailor vinyl facing at square corners.
3. Where radius or other nonsquare corners are indicated, attach facing material so there are no seams or gathering of material.
4. Where vinyl facings with directional or repeating patterns are indicated, mark facing material top and attach facing in same direction so pattern matches in adjacent panels. Install facing material with pattern square to the panel, unless indicated otherwise.
5. Panel Width: As specified in "Vinyl-Wrapped Panels" Article, except where required to fit field conditions or as indicated otherwise on Drawings.
6. Panel Height: As indicated on Drawings. Horizontal joints between panels not allowed unless indicated otherwise.

B. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:

1. Thickness.
2. Edge straightness.
3. Overall length and width.
4. Squareness from corner to corner.
5. Chords, radii, and diameters.

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C. Edge Moldings: Tightly wrap and fully adhere vinyl wall-covering matching facing of panels to exposed surfaces of aluminum edge moldings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of work.

1. Flatness tolerance is not to vary more than 1/8 inch in 10 feet nor vary at a rate greater than 1/16 inch per foot.

B. Verify that substrate surfaces are clean, dry, smooth, and structurally sound.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair bond of wall-covering, including mold, mildew, oil, grease, incompatible primers, dirt, and dust.

C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.

1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
2. Gypsum Board: Prime with primer as specified in Section 09 91 00 "Painting;" fill cracks and surface blemishes with filler, and sand smooth.
3. Existing Painted Surfaces: Treat areas susceptible to bleeding with primer/sealer.

D. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

E. Acclimatize vinyl-wrapped panels by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION – VINYL-WRAPPED PANELS

A. General: Comply with vinyl-wrapped panel manufacturer's written installation instructions.

B. Install vinyl-wrapped panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and penetrations.

1. Use adhesive to mount panels securely to supporting substrate.

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2. Butt panels together tightly.
    a. Facing material to wrap around edges of both adjacent panels at butt joints for flush seam installation. Do not use plastic edge moldings at butt joints between panels.
    b. Variation of Joint Width: Not more than 1/16 inch wide from hairline in 48 inches, noncumulative.
3. Install vinyl-wrapped panels to maintain sequence that facing material was cut from roll during fabrication.
4. Where panels are required to be cut to accommodate field conditions, backcut core material without cutting wall-covering facing material. Trim excess wall-covering, tailor at corners, stretch tight over panel edge, and readhere to panel edge and back border using adhesive.
    a. Backcut openings for electrical receptacles, switches, and other items occurring in the wall. Cut "X" pattern in facing material over opening and wrap flaps around edges of opening, stretch tight, and readhere to edges and back of panel using adhesive. Wrapped openings to fit cleanly over device boxes.
5. Panel edges at door and window openings to align cleanly with edges of opening or frame.

C. At exposed outer corner and edge conditions, install continuous edge moldings, prewrapped with vinyl facing material to match vinyl-wrapped panels.
1. Moldings to be continuous for entire length of panel edge.
2. Miter edge moldings at bends and where continuous around panel corner.

3.4 INSTALLATION TOLERANCES

A. Variation From Plumb and Level: Plus or minus 1/16 inch.

B. Variation of Panel Joints From Hairline: Not more than 1/16 inch wide.

3.5 ADJUST AND CLEAN

A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended in writing by vinyl facing material manufacturer.

C. Install hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items. Verify that cut edges of facing material are completely concealed.

3.6 PROTECTION

A. Provide protection methods and materials needed to ensure that vinyl-wrapped panels will be without deterioration or damage at time of Substantial Completion.

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B. Replace panels that cannot be cleaned and repaired in a manner approved by Architect.

END OF SECTION 09 77 21

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SECTION 09 91 00

PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the field application of paint systems as specified in Paint Systems Schedules at the end of this Section.
   1. Backpriming of finish carpentry work is included in this Section.
   2. Priming of existing walls covered with vinyl wall covering.

B. Related Sections include:
   1. Section 05 50 00 "Metal Fabrications" for shop priming of metal fabrication items.
   2. Section 06 20 00 "Finish Carpentry" for exterior wood finish carpentry to receive backpriming.
   3. Section 08 11 13 "Hollow-Metal Doors and Frames" for shop priming of hollow-metal steel doors and frames to receive field painted finish.
   4. Section 08 14 16 "Flush Wood Doors" for shop finishing of wood doors with transparent finish, and shop priming of doors to receive field painted finish.

1.3 REFERENCES

A. ASTM International:
   1. ASTM C 920: Standard Specification for Elastomeric Joint Sealants.
   2. ASTM D 523: Standard Test Method for Specular Gloss.

B. California Air Resources Board:
   1. Suggested Control Measure for Architectural Coatings.

C. California Green Building Standards Code (CALGreen) – California Code of Regulations, Title 24, Part 11.

D. Master Painters Institute (MPI):
   1. MPI Architectural Painting Specification Manual.
   2. MPI Maintenance Repainting Manual.

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E. Society for Protective Coatings (SSPC):
   1. SSPC-PA 1: Shop, Field, and Maintenance Painting of Steel.
   2. SSPC-SP 2: Hand Tool Cleaning.
   3. SSPC-SP 3: Power Tool Cleaning.

F. South Coast Air Quality Management District (SCAQMD):
   1. Rule 1168 – Adhesive and Sealant Applications.

1.4 DEFINITIONS

A. VOC: Volatile Organic Compounds.

B. Gloss Levels: As follows, according to ASTM D 523:
   1. Flat: Gloss Level 1 (not more than 5 units at 60 degrees and 10 units at 85 degrees).
   2. Low-Sheen: Gloss Level 3 (10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees).
   3. Semi-Gloss: Gloss Level 5 (35 to 70 units at 60 degrees).
   4. Gloss: Gloss Level 6 (70 to 85 units at 60 degrees), unless indicated otherwise.

1.5 COORDINATION

A. Review other Sections of these Specifications in which prime paints are to be provided. Where requested by those trades performing Work in other Sections, provide information regarding paint products specified in this Section to ensure compatibility of overall painting system.
   1. Surface preparation, priming, and coats of paint specified in this Section are in addition to surface preparation and shop priming specified in other Sections of these Specifications.
   2. Where prime paints specified in other Sections of these Specifications are incompatible with prime or topcoats specified in this Section, provide barrier coats, or remove and reprime as required.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Indicate preparation requirements and application instructions.
   1. Indicate VOC content.

B. Samples for Verification: For each type of paint system and each color and sheen of topcoat indicated.
   1. Submit Samples on rigid backing, 8 inches square.

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2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

D. CALGreen Submittals:
1. Manufacturer's product data for paints and coatings indicating compliance with product requirements specified in "CALGreen Requirements" Article.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials from the same product run (batch mix) as materials applied and that are packaged with protective covering for storage and identified with labels describing contents.
1. Quantity: Furnish an additional 5 percent, but not less than 1 gallon of each material and color applied.

1.8 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq ft.
b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F or as otherwise recommended in paint manufacturer's written instructions.

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1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.10 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F or as otherwise stated in paint manufacturer's written instructions.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by manufacturers as indicated in Paint Systems Schedules at end of this Section.
1. Material Quality: Provide manufacturer's best quality (e.g. "Premium" quality) paint products for each paint system indicated.
2. Source Limitations: Unless indicated otherwise, provide primer and topcoat products as manufactured by a single manufacturer for each paint system as specified for a given substrate and sheen.

2.2 CALGREEN REQUIREMENTS

A. General: Conform with all applicable requirements of the California Green Building Standards Code (CALGreen).

B. Paints and Coatings: Provide paints and coatings that comply with VOC limits in Table 1 of the California Air Resources Board (ARB) Architectural Coatings Suggested Control Measure for Architectural Coatings, unless more stringent local limits apply.

2.3 PAINT, GENERAL

A. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. Colors: As indicated at end of this Section.

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2.4 ACCESSORY MATERIALS

A. Elastomeric Sealant: Single-component, non-sag, paintable joint sealant complying with ASTM C 920 Type S, Grade NS, Class 12.5.

2.5 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
   1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
   2. Testing agency will perform tests for compliance with product requirements.
   3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with electronic moisture meter as follows:
   1. Concrete: 12 percent.
   2. Wood: 15 percent.
   3. Portland Cement Plaster: 12 percent.
   4. Gypsum Board: 12 percent.

C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.

D. Gypsum Board Substrates: Verify that finishing compound is dry and sanded smooth.

E. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

F. Proceed with coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

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1. Beginning coating application constitutes acceptance of surfaces and conditions.

3.2 PREPARATION - GENERAL

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

1. For renovation products, comply with recommendations in "MPI Maintenance Repainting Manual."

B. Remove hardware, covers, plates, machined surfaces, and similar items already in place that are removable and not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Cement Plaster Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

F. Unprimed Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer, but not less than the following:

1. SSPC-SP 3.

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as is used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

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1. Scrape and clean knots, Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for use in paint system indicated.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood immediately upon delivery to Project site.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 PREPARATION - EXISTING PAINTED SURFACES

A. Exterior:
1. General: Mechanically clean surface using high-pressure water-wash or other feasible means to remove dirt, contaminants, rust scale, and loose and peeling paint or other coatings.
   a. Remove mildew with a solution of one part household bleach to three parts water, as required to leave an uncontaminated, clean surface. Where necessary, increase strength of solution and scrub with a soft bristle brush.
2. Cement Plaster:
   a. Patch voids and cracks with paintable elastomeric sealant, matching existing finish texture of surrounding cement plaster.
      i) Using wire brush or other suitable method, prepare surface of cracks as required to obtain a firm surface.
      ii) Cracks 1/64 to 1/32 Inch Wide: Apply elastomeric sealant system over area of crack.
      iii) Cracks Wider Than 1/32 Inch: Rout out crack to dimensions of 1/4 inch by 1/4 inch deep. Flush crack out to remove all grinding dust. Install bond breaker tape at bottom surface to prevent three-point adhesion.
   b. In areas where existing paint adhesion problems occur, perform pH tests to assure acceptable pH level of 8-10 prior to application of paint.
3. Concrete and Concrete Masonry:
   a. After initial washing, remove remaining loose and peeling paint and other coatings by use of wire brush, scraper, or sanding, as required to achieve a suitable surface for application of paint.
   b. In areas where existing paint adhesion problems occur, perform pH tests to assure acceptable pH level of 8-10 prior to application of paint.
   c. Remove efflorescence, and spot prime with specified primer product.
4. Nongalvanized Steel (Ferrous Metal):

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a. After initial washing, remove remaining loose and peeling paint and other coatings in accordance with SSPC-SP 2 "Hand Tool Cleaning," or SSPC-SP 3 "Power Tool Cleaning."

5. Galvanized Steel, Aluminum, Copper, Bronze (Nonferrous Metal):
   a. After initial washing, remove remaining loose and peeling paint and other coatings in accordance with SSPC-SP 2 "Hand Tool Cleaning."
6. Wood:
   a. After initial washing, remove remaining loose and peeling paint and other coatings by use of wire brush, scraper, or sanding, as required to achieve a suitable surface for application of paint.
   b. Reset and prime protruding nail heads with specified primer product.

B. Interior:
1. General: Mechanically clean surfaces to remove dirt, contaminants, rust scale, and loose and peeling paint or other coatings.
   a. Dull glossy surfaces by sanding or chemical means for maximum adhesion.
   b. Remove mildew with a solution of one part household bleach to three parts water, as required to leave an uncontaminated, clean surface. Where necessary, increase strength of solution and scrub with a soft bristle brush.

3.4 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
1. Use applicators and techniques suited for paint and substrate indicated.
2. Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as recommended in writing by paint manufacturer.
   a. In addition to paint manufacturer's recommendations, at high-impact gypsum board substrates, apply primer coat to a minimum dry film thickness of 1.8 mils.
3. Paint surfaces behind movable items, including equipment and furniture, same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
4. Paint doors on tops, bottoms, side edges, and cutouts same as faces of door, unless otherwise indicated.
5. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
6. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

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7. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where if feels firm, does not deform or feel sticky under moderate thumb pressure, and application of a subsequent coat does not cause lifting or loss of adhesion of the undercoat.
8. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to ensure a topcoat with no burn-through or other defects due to insufficient sealing.

B. Paint all exposed surfaces, regardless of whether designated in Color Schedule. The term "exposed surface" includes area visible when permanent or built-in fixtures, grilles, and similar components are in place. Extend coatings in these areas as required to maintain visual continuity and protection.

C. Do not paint the following prefinished items unless indicated otherwise:
1. Exterior Prefinished Items: Do not paint prefinished exterior items, including the following:
   a. Aluminum storefront, curtainwall, and entrance systems with factory-applied finish or anodized finish.
   b. Aluminum windows with factory-applied finish or anodized finish.
   c. Signage.
   d. Light fixtures.
2. Interior Prefinished Items: Do not paint prefinished interior items, including the following:
   a. Suspended acoustical ceiling panels and exposed grid.
   b. Applied acoustical ceiling and wall panels.
   c. Vinyl wall covering.
   d. Finish hardware.
   e. Plastic laminate-faced wood casework and other surfaces.
   f. Transparent finish wood casework.
   g. Ceramic tile.
   h. Signage.
   i. Operable panel partitions and accordion folding partitions.
   j. Toilet compartments and urinal screens.
   k. Elevator doors, frames, and car interior.
   l. Mechanical and electrical equipment with factory-applied finish.
   m. Light fixtures.
3. Wood Surfaces with Transparent Finish: Do not paint surfaces of wood indicated to receive transparent finish.
4. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces in concealed areas and inaccessible areas not exposed to view.

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5. Operating Parts: Do not paint moving parts of operating units, mechanical and electrical parts, such as valves, dampers, linkages, sensing devices, and motor and fan shafts.
6. Labels: Do not paint over labels, such as those indicating fire-ratings, or equipment identification, performance rating, or nomenclature plates.

D. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

E. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance. Give special attention to ensure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

F. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

G. Painting Roof Accessories: Paint penetrations and other items on roofs which are exposed to view. Unless noted otherwise, paint color is to match that of surrounding roofing material. Roof items to receive paint include, but are not limited to the following:
1. Plumbing vent stacks.
2. Exhaust caps.
3. Roof hatches.
4. Flues.

H. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work: Paint items exposed in occupied spaces including, but not limited to, the following:
1. Mechanical Work:
   a. Exposed metal ductwork and supports, unless noted otherwise.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Tanks that do not have factory-applied final finishes.
   f. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
      i) Paint with a flat black, non-specular paint.
   g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   h. Wall and ceiling access panels.

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i) Paint to match surrounding wall or ceiling surface, unless noted otherwise.

i. Air inlets and outlets.

i) Paint to match surrounding wall or ceiling surface, unless noted otherwise.

j. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical, Communication, and Electronic Safety and Security Work:

a. Switchgear without factory-applied final finish.

b. Panelboards.

c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

d. Exposed conduits.

e. Enclosures and boxes.

3.5 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.

2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendation, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.6 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.7 EXTERIOR PAINT SYSTEMS SCHEDULE – UNPAINTED SUBSTRATES

A. General: Subject to compliance with requirements, for each of the following exterior unpainted substrate types and sheens, provide one of the listed paint systems or equal products in accordance with Division 1 requirements for product substitutions.

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B. Portland Cement Plaster - Low Sheen:
   1. Dunn-Edwards Paints:
      a. First Coat: ESPR00-1 EFF-STOP Premium Interior/Exterior Masonry Primer/Sealer
      b. Second Coat: EVSH30-2 EVERSHIELD Exterior Eggshell Paint
      c. Third Coat: EVSH30-2 EVERSHIELD Exterior Eggshell Paint
   2. Kelly-Moore Paints:
      a. First Coat: 247 AcryShield Exterior Masonry Primer
      b. Second Coat: 1245 AcryShield Exterior Low Sheen Paint
      c. Third Coat: 1245 AcryShield Exterior Low Sheen Paint
   3. Sherwin-Williams Company:
      a. First Coat: A24W8300 Loxon Concrete & Masonry Primer/Sealer
      b. Second Coat: A75W00051 Solo 100% Acrylic Interior/Exterior Eg-Shel
      c. Third Coat: A75W00051 Solo 100% Acrylic Interior/Exterior Eg-Shel

C. Plywood Panel Siding - Semi-Gloss Sheen:
   1. Dunn-Edwards Paints:
      a. First Coat: EZPR00-1 EZ-PRIME Premium Exterior Wood Primer (prime all surfaces, including backside of panels, and panel ends and edges)
      b. Second Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
      c. Third Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
   2. Kelly-Moore Paints:
      a. First Coat: 255 AcryShield Exterior Wood Primer (prime all surfaces, including backside of panels, and panel ends and edges)
      b. Second Coat: 1250 AcryShield Exterior Semi-Gloss Enamel
      c. Third Coat: 1250 AcryShield Exterior Semi-Gloss Enamel
   3. Sherwin-Williams Company:
      a. First Coat: B51W00450 Multi-Purpose Interior/Exterior Latex Primer/Sealer
      b. Second Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

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c. Third Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

D. Wood Trim - Semi-Gloss Sheen:
1. Dunn-Edwards Paints:
   a. First Coat: EZPR00-1 EZ-PRIME Premium Exterior Wood Primer (prime all surfaces, including backside, ends, and edges)
   b. Second Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
   c. Third Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
2. Kelly-Moore Paints:
   a. First Coat: 255 AcryShield Exterior Wood Primer (prime all surfaces, including backside, ends, and edges)
   b. Second Coat: 1250 AcryShield Exterior Semi-Gloss Enamel
   c. Third Coat: 1250 AcryShield Exterior Semi-Gloss Enamel
3. Sherwin-Williams Company:
   a. First Coat: B51W00450 Multi-Purpose Interior/Exterior Latex Primer/Sealer
   b. Second Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss
   c. Third Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

E. Wood Doors and Frames - Semi-Gloss Sheen:
1. Dunn-Edwards Paints:
   a. First Coat: ULMS00 ULTRASHIELD Interior/Exterior Multi-Surface Primer
   b. Second Coat: ULDM50 ULTRASHIELD Interior/Exterior DTM Semi-Gloss Paint
   c. Third Coat: ULDM50 ULTRASHIELD Interior/Exterior DTM Semi-Gloss Paint
2. Kelly-Moore Paints:
   a. First Coat: 295 KEL-BOND Universal Primer
   b. Second Coat: 5885 DTM Acrylic Semi-Gloss Enamel
   c. Third Coat: 5885 DTM Acrylic Semi-Gloss Enamel
3. Sherwin-Williams Company:

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a. First Coat: B51W00450 Multi-Purpose Interior/Exterior Latex Primer/Sealer
b. Second Coat: B66W01151Pro Industrial DTM Acrylic Semi-Gloss
c. Third Coat: B66W01151Pro Industrial DTM Acrylic Semi-Gloss

F. Hollow-Metal Steel Doors and Frames (Shop-Primed), and Steel Railings (Galvanized or Shop-Primed) - Semi-Gloss Sheen:
1. Dunn-Edwards Paints:
a. First Coat: ULDM00-0-GR ULTRASHIELD Interior/Exterior Multi-Surface Primer
b. Second Coat: ULDM50 ULTRASHIELD Interior/Exterior DTM Semi-Gloss Paint
c. Third Coat: ULDM50 ULTRASHIELD Interior/Exterior DTM Semi-Gloss Paint
2. Kelly-Moore Paints:
a. First Coat: 5725 DTM Acrylic Primer/Finish
b. Second Coat: 5885 DTM Acrylic Semi-Gloss Enamel
c. Third Coat: 5885 DTM Acrylic Semi-Gloss Enamel
3. Sherwin-Williams Company:
a. First Coat: B66W01310 Pro Industrial Pro-Cryl Universal Primer
b. Second Coat: B66W01151Pro Industrial DTM Acrylic Semi-Gloss
c. Third Coat: B66W01151Pro Industrial DTM Acrylic Semi-Gloss

G. Galvanized Steel - Semi-Gloss Sheen:
1. Dunn-Edwards Paints:
a. Pretreatment: SCME01 Supreme Chemical Metal Etch
b. First Coat: UGPR00-1 ULTRA-GRIP Premium Interior/Exterior Multi-Surface Primer
c. Second Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
d. Third Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
2. Devoe High Performance Coatings:
a. Pretreatment: Devprep 88 Surface Cleaner and Degreaser
b. First Coat: Devcryl 1440 Water-Based Acrylic
c. Second Coat: Devcryl 1448 Water-borne Acrylic
d. Third Coat: Devcryl 1448 Water-borne Acrylic
3. Sherwin-Williams Company:
a. Pretreatment: Jasco Prep & Prime

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b. First Coat: B66W01310 Pro Industrial Pro-Cryl Universal Primer
c. Second Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss
d. Third Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

H. Galvanized Sheet Metal - Semi-Gloss Sheen
1. Dunn-Edwards Paints:
a. Pretreatment: SCME01 Supreme Chemical Metal Etch
b. First Coat: UGPR00-1 ULTRA-GRIP Premium Interior/Exterior Multi-Surface Primer
c. Second Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
d. Third Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
2. Devoe High Performance Coatings:
a. Pretreatment: Devprep 88 Surface Cleaner and Degreaser
b. First Coat: Devcryl 1440 Water-Based Acrylic
c. Second Coat: Devcryl 1448 Water-borne Acrylic
d. Third Coat: Devcryl 1448 Water-borne Acrylic
3. Sherwin-Williams Company:
a. Pretreatment: Jasco Prep & Prime
b. First Coat: B66W01310 Pro Industrial Pro-Cryl Universal Primer
c. Second Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss
d. Third Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

I. Nongalvanized Shop-Primed and Unprimed Steel (Other Than Hollow-Metal Steel Doors and Frames) - Semi-Gloss Sheen:
1. Dunn-Edwards Paints:
a. First Coat: BRPR00-2-WH BLOC-RUST Premium Interior/Exterior Rust Preventative Metal Primer
b. Second Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
c. Third Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
2. Devoe High Performance Coatings:
a. First Coat: Devprime 1405 Alkyd
b. Second Coat: Devcryl 1448 Water-borne Acrylic

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c. Third Coat: Devcryl 1448 Water-borne Acrylic

3. Sherwin-Williams Company:
   a. First Coat: B66W01310 Pro Industrial Pro-Cryl Universal Primer
   b. Second Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss
   c. Third Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

3.8 EXTERIOR PAINT SYSTEMS SCHEDULE - EXISTING PAINTED SUBSTRATES

A. General: Paint systems listed below are intended for application over exterior substrates with existing paint coatings. Subject to compliance with requirements, for each of the following substrate types and sheens, provide one of the listed paint systems or equal products in accordance with Division 1 requirements for product substitutions.
   1. Where spot priming is indicated, only those unpainted areas in which bare substrate is exposed are required to be primed.

B. Existing Painted Portland Cement Plaster - Low Sheen:
   1. Dunn-Edwards Paints:
      a. Spot Prime: ESPR00-1 EFF-STOP Premium Interior/Exterior Masonry Primer/Sealer
      b. First Coat: EVSH30-2 EVERSHIELD Exterior Eggshell Paint
      c. Second Coat: EVSH30-2 EVERSHIELD Exterior Eggshell Paint
   2. Kelly-Moore Paints:
      a. Spot Prime: 247 AcryShield Exterior Masonry Primer
      b. First Coat: 1245 AcryShield Exterior Low Sheen Paint
      c. Second Coat: 1245 AcryShield Exterior Low Sheen Paint
   3. Sherwin-Williams Company:
      a. Spot Prime: A24W8300 Loxon Concrete & Masonry Primer/Sealer
      b. First Coat: A75W00051 Solo 100% Acrylic Interior/Exterior Eg-Shel
      c. Second Coat: A75W00051 Solo 100% Acrylic Interior/Exterior Eg-Shel

C. Existing Painted Plywood Panel Siding - Semi-Gloss Sheen:
   1. Dunn-Edwards Paints:
      a. Spot Prime: EZPR00-1 EZ-PRIME Premium Exterior Wood Primer

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b. First Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint

c. Second Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint

2. Kelly-Moore Paints:
   a. Spot Prime: 295 KEL-BOND Universal Primer
   b. First Coat: 1250 AcryShield Exterior Semi-Gloss Enamel
   c. Second Coat: 1250 AcryShield Exterior Semi-Gloss Enamel
3. Sherwin-Williams Company:
   a. Spot Prime: B51W00450 Multi-Purpose Interior/Exterior Latex Primer/Sealer
   b. First Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss
   c. Second Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

D. Existing Painted Wood Trim - Semi-Gloss Sheen:
1. Dunn-Edwards Paints:
   a. Spot Prime: EZPR00-1 EZ-PRIME Premium Exterior Wood Primer
   b. First Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
   c. Second Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
2. Kelly-Moore Paints:
   a. Spot Prime: 295 KEL-BOND Universal Primer
   b. First Coat: 1250 AcryShield Exterior Semi-Gloss Enamel
   c. Second Coat: 1250 AcryShield Exterior Semi-Gloss Enamel
3. Sherwin-Williams Company:
   a. Spot Prime: B51W00450 Multi-Purpose Interior/Exterior Latex Primer/Sealer
   b. First Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss
   c. Second Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

E. Existing Painted Hollow-Metal Steel Doors and Frames, and Steel Railings - Semi-Gloss Sheen:
1. Dunn-Edwards Paints:

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a. Spot Prime: ULDM00-0-GR ULTRASHIELD Interior/Exterior Multi-Surface Primer
b. First Coat: ULDM50 ULTRASHIELD Interior/Exterior DTM Semi-Gloss Paint
c. Second Coat: ULDM50 ULTRASHIELD Interior/Exterior DTM Semi-Gloss Paint

2. Kelly-Moore Paints:
   a. Spot Prime: 5725 DTM Acrylic Primer/Finish
   b. First Coat: 5885 DTM Acrylic Semi-Gloss Enamel
   c. Second Coat: 5885 DTM Acrylic Semi-Gloss Enamel
3. Sherwin-Williams Company:
   a. Spot Prime: B66W01310 Pro Industrial Pro-Cryl Universal Primer
   b. First Coat: B66W01151Pro Industrial DTM Acrylic Semi-Gloss
   c. Second Coat: B66W01151Pro Industrial DTM Acrylic Semi-Gloss

F. Existing Painted Steel and Sheet Metal (Other Than Hollow-Metal Steel Doors and Frames, and Steel Railings) - Semi-Gloss Sheen:
1. Dunn-Edwards Paints:
   a. Spot Prime: UGPR00-1 ULTRA-GRIP Premium Interior/Exterior Multi-Surface Primer
   b. First Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
   c. Second Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
2. Devoe High Performance Coatings:
   a. Spot Prime: Devcryl 1440 Water-Based Acrylic
   b. First Coat: Devcryl 1448 Water-borne Acrylic
   c. Second Coat: Devcryl 1448 Water-borne Acrylic
3. Sherwin-Williams Company:
   a. Spot Prime: B66W01310 Pro Industrial Pro-Cryl Universal Primer
   b. First Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss
   c. Second Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

3.9 INTERIOR PAINT SYSTEMS SCHEDULE – UNPAINTED SUBSTRATES

A. General: Subject to compliance with requirements, for each of the following interior unpainted substrate types and sheens, provide one of the listed paint systems or equal products in accordance with Division 1 requirements for product substitutions.

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B. Concrete - Eggshell (Satin) Sheen:
   1. Dunn-Edwards Paints:
      a. First Coat: ESPR00-1 EFF-STOP Premium Interior/Exterior Masonry Primer/Sealer
      b. Second Coat: SPMA40 SUPREMA Interior Low Sheen Paint
      c. Third Coat: SPMA40 SUPREMA Interior Low Sheen Paint
   2. Kelly-Moore Paints:
      a. First Coat: 971 AcryPlex Interior PVA Primer/Sealer
      b. Second Coat: 1610 AcryPlex Interior Eggshell Enamel
      c. Third Coat: 1610 AcryPlex Interior Eggshell Enamel
   3. Sherwin-Williams Company:
      a. First Coat: B51W00450 Multi-Purpose Interior/Exterior Latex Primer/Sealer
      b. Second Coat: A75W00051 Solo 100% Acrylic Interior/Exterior Eg-Shel
      c. Third Coat: A75W00051 Solo 100% Acrylic Interior/Exterior Eg-Shel

C. Regular Gypsum Board - Eggshell (Satin) Sheen:
   1. Dunn-Edwards Paints:
      a. First Coat: VNPR00-1 VINYLASTIC Premium Interior Wall Sealer
      b. Second Coat: SPMA40 SUPREMA Interior Low Sheen Paint
      c. Third Coat: SPMA40 SUPREMA Interior Low Sheen Paint
   2. Kelly-Moore Paints:
      a. First Coat: 971 AcryPlex Interior PVA Primer/Sealer
      b. Second Coat: 1610 AcryPlex Interior Eggshell Enamel
      c. Third Coat: 1610 AcryPlex Interior Eggshell Enamel
   3. Sherwin-Williams Company:
      a. First Coat: B28W02600 ProMar 200 Zero VOC Interior Latex Primer
      b. Second Coat: A75W00051 Solo 100% Acrylic Interior/Exterior Eg-Shel
      c. Third Coat: A75W00051 Solo 100% Acrylic Interior/Exterior Eg-Shel

D. Regular Gypsum Board (in restrooms) - Semi-Gloss Sheen:
   1. Dunn-Edwards Paints:
      a. First Coat: VNPR00-1 VINYLASTIC Premium Interior Wall Sealer
      b. Second Coat: SPMA50 SUPREMA Interior Semi-Gloss Paint
      c. Third Coat: SPMA50 SUPREMA Interior Semi-Gloss Paint
   2. Kelly-Moore Paints:
      a. First Coat: 971 AcryPlex Interior PVA Primer/Sealer
      b. Second Coat: 1650 AcryPlex Interior Semi-Gloss Enamel

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c. Third Coat: 1650 AcryPlex Interior Semi-Gloss Enamel

3. Sherwin-Williams Company:
   a. First Coat: B28W02600 ProMar 200 Zero VOC Interior Latex Primer
   b. Second Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss
   c. Third Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

E. Gypsum Board to Receive Wall Covering:
1. Zinsser:
   a. First Coat: Shieldz Universal Wallcovering Primer
2. Dunn-Edwards Paints:
   a. First Coat: UGSL00-1 ULTRA-GRIP Select Interior/Exterior Multi-Surface Primer

F. Wood Trim - Satin Sheen:
1. Dunn-Edwards Paints:
   a. First Coat: IKPR00-1 INTER-KOTE Premium Interior Undercoater
   b. Second Coat: SPMA40 SUPREMA Interior Low Sheen Paint
   c. Third Coat: SPMA40 SUPREMA Interior Low Sheen Paint
2. Kelly-Moore Paints:
   a. Spot Prime: 295 KEL-BOND Acrylic Universal Primer
   b. Second Coat: 1610 AcryPlex Interior Eggshell Enamel
   c. Third Coat: 1610 AcryPlex Interior Eggshell Enamel
3. Sherwin-Williams Company:
   a. Spot Prime: B28W08111 Premium Wall & Wood Primer
   b. First Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss
   c. Second Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

G. Wood Doors - Semi-Gloss Sheen:
1. Dunn-Edwards Paints:
   a. First Coat: ULMS00 ULTRASHIELD Interior/Exterior Multi-Surface Primer
   b. Second Coat: ULDM50 ULTRASHIELD Interior/Exterior DTM Semi-Gloss Paint
   c. Third Coat: ULDM50 ULTRASHIELD Interior/Exterior DTM Semi-Gloss Paint
2. Kelly-Moore Paints:

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a. First Coat: 973 AcryPlex Interior Enamel Undercoat
b. Second Coat: 1685 DuraPoxy Interior Semi-Gloss Enamel
c. Third Coat: 1685 DuraPoxy Interior Semi-Gloss Enamel

3. Sherwin-Williams Company:
a. First Coat: B51W00450 Multi-Purpose Interior/Exterior Latex Primer/Sealer
b. Second Coat: B66W01151 Pro Industrial DTM Acrylic Semi-Gloss
c. Third Coat: B66W01151 Pro Industrial DTM Acrylic Semi-Gloss

H. Hollow-Metal Steel Doors and Frames (Shop-Primed), and Steel Railings - Semi-Gloss Sheen:
1. Dunn-Edwards Paints:
a. First Coat: ULDM00-0-GR ULTRASHIELD Interior/Exterior DTM Gray Primer
b. Second Coat: ULDM50 ULTRASHIELD Interior/Exterior DTM Semi-Gloss Paint
c. Third Coat: ULDM50 ULTRASHIELD Interior/Exterior DTM Semi-Gloss Paint

2. Kelly-Moore Paints:
a. First Coat: 5725 DTM Acrylic Primer/Finish
b. Second Coat: 5885 DTM Acrylic Semi-Gloss Enamel
c. Third Coat: 5885 DTM Acrylic Semi-Gloss Enamel

3. Sherwin-Williams Company:
a. First Coat: B66W01310 Pro Industrial Pro-Cryl Universal Primer
b. Second Coat: B66W01151 Pro Industrial DTM Acrylic Semi-Gloss
c. Third Coat: B66W01151 Pro Industrial DTM Acrylic Semi-Gloss

I. Shop-Primed and Unprimed Steel (Other Than Hollow-Metal Steel Doors and Frames, and Steel Railings) - Semi-Gloss Sheen:
1. Dunn-Edwards Paints:
a. First Coat: BRPR00-2-WH BLOC-RUST Premium Interior/Exterior Rust Preventative Metal Primer
b. Second Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
c. Third Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint

2. Kelly-Moore Paints:
a. First Coat: 5725 DTM Acrylic Primer/Finish
b. Second Coat: 1650 AcryPlex Interior Semi-Gloss Enamel

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c. Third Coat: 1650 AcryPlex Interior Semi-Gloss Enamel

3. Sherwin-Williams Company:
   a. First Coat: B66W01310 Pro Industrial Pro-Cryl Universal Primer
   b. Second Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss
   c. Third Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

3.10 INTERIOR PAINT SYSTEMS SCHEDULE - EXISTING PAINTED SUBSTRATES

A. General: Paint systems listed below are intended for application over interior substrates with existing paint coatings. Subject to compliance with requirements, for each of the following substrate types and sheens, provide one of the listed paint systems or equal products in accordance with Division 1 requirements for product substitutions.
   1. Where spot priming is indicated, only those unpainted areas in which bare substrate is exposed are required to be primed.

B. Existing Painted Concrete - Eggshell (Satin) Sheen:
   1. Dunn-Edwards Paints:
      a. Spot Prime: ESPR00-1 EFF-STOP Premium Interior/Exterior Masonry Primer/Sealer
      b. First Coat: SPMA40 SUPREMA Interior Low Sheen Paint
      c. Second Coat: SPMA40 SUPREMA Interior Low Sheen Paint
   2. Kelly-Moore Paints:
      a. Spot Prime: 971 AcryPlex Interior PVA Primer/Sealer
      b. First Coat: 1610 AcryPlex Interior Eggshell Enamel
      c. Second Coat: 1610 AcryPlex Interior Eggshell Enamel
   3. Sherwin-Williams Company:
      a. Spot Prime: B51W00450 Multi-Purpose Interior/Exterior Latex Primer/Sealer
      b. First Coat: A75W00051 Solo 100% Acrylic Interior/Exterior Eg-Shel
      c. Second Coat: A75W00051 Solo 100% Acrylic Interior/Exterior Eg-Shel

C. Existing Tackboards – Satin Sheen:
   1. Dunn-Edwards Paints:
      a. Spot Prime: SLPR00-2-WH SUPERLOC Premium Interior/Exterior Masonry/Bonding Primer
      b. First Coat: SPMA40 SUPREMA Interior Low Sheen Paint

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c. Second Coat: SPMA40 SUPREMA Interior Low Sheen Paint

2. Kelly-Moore Paints:
   a. Spot Prime: Zinsser GardZ, GardZ Problem Surface Sealer
   b. First Coat: 1610 AcryPlex Interior Eggshell Enamel
   c. Second Coat: 1610 AcryPlex Interior Eggshell Enamel
3. Sherwin-Williams Company:
   a. Spot Prime: Zinsser GardZ, GardZ Problem Surface Sealer
   b. First Coat: A75W00051 Solo 100% Acrylic Interior/Exterior Eg-Shel
   c. Second Coat: A75W00051 Solo 100% Acrylic Interior/Exterior Eg-Shel

D. Existing Painted Regular Gypsum Board - Eggshell (Satin) Sheen:
1. Dunn-Edwards Paints:
   a. Spot Prime: VNPR00-1 VINYLASTIC Premium Interior Wall Sealer
   b. First Coat: SPMA40 SUPREMA Interior Low Sheen Paint
   c. Second Coat: SPMA40 SUPREMA Interior Low Sheen Paint
2. Kelly-Moore Paints:
   a. Spot Prime: 971 AcryPlex Interior PVA Primer/Sealer
   b. First Coat: 1610 AcryPlex Interior Eggshell Enamel
   c. Second Coat: 1610 AcryPlex Interior Eggshell Enamel
3. Sherwin-Williams Company:
   a. Spot Prime: B28W02600 ProMar 200 Zero VOC Interior Latex Primer
   b. First Coat: A75W00051 Solo 100% Acrylic Interior/Exterior Eg-Shel
   c. Second Coat: A75W00051 Solo 100% Acrylic Interior/Exterior Eg-Shel

E. Existing Painted Regular Gypsum Board - Semi-Gloss Sheen:
1. Dunn-Edwards Paints:
   a. Spot Prime: VNPR00-1 VINYLASTIC Premium Interior Wall Sealer
   b. First Coat: SPMA50 SUPREMA Interior Semi-Gloss Paint
   c. Second Coat: SPMA50 SUPREMA Interior Semi-Gloss Paint
2. Kelly-Moore Paints:
   a. Spot Prime: 971 AcryPlex Interior PVA Primer/Sealer
   b. First Coat: 1650 AcryPlex Interior Semi-Gloss Enamel
   c. Second Coat: 1650 AcryPlex Interior Semi-Gloss Enamel
3. Sherwin-Williams Company:
   a. Spot Prime: B28W02600 ProMar 200 Zero VOC Interior Latex Primer
   b. First Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

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c. Second Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

F. Existing Painted Wood Trim - Satin Sheen:
1. Dunn-Edwards Paints:
a. Spot Prime: UGPR00-1 ULTRA-GRIP Premium Interior/Exterior Multi-Surface Primer
b. First Coat: SPMA40 SUPREMA Interior Low Sheen Paint
c. Second Coat: SPMA40 SUPREMA Interior Low Sheen Paint
2. Kelly-Moore Paints:
a. Spot Prime: 295 KEL-BOND Acrylic Universal Primer
b. Second Coat: 1610 AcryPlex Interior Eggshell Enamel
c. Third Coat: 1610 AcryPlex Interior Eggshell Enamel
3. Sherwin-Williams Company:
a. Spot Prime: B28W08111 Premium Wall & Wood Primer
b. First Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss
c. Second Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

G. Existing Painted Wood Doors and Frames - Semi-Gloss Sheen:
1. Dunn-Edwards Paints:
a. Spot Prime: ULMS00 ULTRASHIELD Interior/Exterior Multi-Surface Primer
b. First Coat: ULDM50 ULTRASHIELD Interior/Exterior DTM Semi-Gloss Paint
c. Second Coat: ULDM50 ULTRASHIELD Interior/Exterior DTM Semi-Gloss Paint
2. Kelly-Moore Paints:
a. Spot Prime: 973 AcryPlex Interior Enamel Undercoat
b. First Coat: 1685 DuraPoxy Interior Semi-Gloss Enamel
c. Second Coat: 1685 DuraPoxy Interior Semi-Gloss Enamel
3. Sherwin-Williams Company:
a. Spot Prime: B51W00450 Multi-Purpose Interior/Exterior Latex Primer/Sealer
b. First Coat: B66W01151 Pro Industrial DTM Acrylic Semi-Gloss
c. Second Coat: B66W01151 Pro Industrial DTM Acrylic Semi-Gloss

H. Existing Painted Hollow-Metal Steel Doors and Frames, and Steel Railings - Semi-Gloss Sheen:

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1. Dunn-Edwards Paints:
    a. Spot Prime: ULDM00-0-GR ULTRASHIELD Interior/Exterior DTM Gray Primer
    b. First Coat: ULDM50 ULTRASHIELD Interior/Exterior DTM Semi-Gloss Paint
    c. Second Coat: ULDM50 ULTRASHIELD Interior/Exterior DTM Semi-Gloss Paint
2. Kelly-Moore Paints:
    a. Spot Prime: 5725 DTM Acrylic Primer/Finish
    b. Second Coat: 5885 DTM Acrylic Semi-Gloss Enamel
    c. Third Coat: 5885 DTM Acrylic Semi-Gloss Enamel
3. Sherwin-Williams Company:
    a. Spot Prime: B66W01310 Pro Industrial Pro-Cryl Universal Primer
    b. First Coat: B66W01151 Pro Industrial DTM Acrylic Semi-Gloss
    c. Second Coat: B66W01151 Pro Industrial DTM Acrylic Semi-Gloss

I. Existing Painted Steel (Other Than Hollow-Metal Steel Doors and Frames and Steel Railings) - Semi-Gloss Sheen:
1. Dunn-Edwards Paints:
    a. Spot Prime: UGPR00-1 ULTRA-GRIP Premium Interior/Exterior Multi-Surface Primer
    b. First Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
    c. Second Coat: EVSH50-2 EVERSHIELD Exterior/Interior Semi-Gloss Paint
2. Kelly-Moore Paints:
    a. Spot Prime 5725 DTM Acrylic Primer/Finish
    b. First Coat: 1650 AcryPlex Interior Semi-Gloss Enamel
    c. Second Coat: 1650 AcryPlex Interior Semi-Gloss Enamel
3. Sherwin-Williams Company:
    a. Spot Prime: B66W01310 Pro Industrial Pro-Cryl Universal Primer
    b. First Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss
    c. Second Coat: A76W00051 Solo 100% Acrylic Interior/Exterior Semi-Gloss

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3.11 PAINT COLOR/SHEEN SCHEDULE

A. Paint Colors: As specified in Section 09 06 00 "Colors and Finishes."

END OF SECTION 09 91 00

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SECTION 10 11 00

VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Markerboards.
      a. Fixed, wall-mounted.
      b. Sliding assemblies.
   2. Tackboards, fixed wall-mounted.
   3. Accessories for visual display units.

B. Related Sections include:
   1. Section 06 10 53 "Miscellaneous Carpentry" for concealed wood blocking in wood stud-framed walls for anchoring wall-mounted visual display surfaces.
   2. Section 09 72 21 "Vinyl-Wrapped Panels" for tackable panels prewrapped with vinyl wall covering.

1.3 REFERENCES

A. American Architectural Manufacturers Association (AAMA):
   1. AAMA 611: Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.

B. American National Standards Institute (ANSI):
   1. ANSI A 208.1: Particleboard.

C. American Society for Testing and Materials International (ASTM):
   1. ASTM A 424: Specification for Steel, Sheet, for Porcelain Enameling.
   2. ASTM B 221: Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   3. ASTM E 84: Test Method for Surface Burning Characteristics of Building Materials.

D. Builders Hardware Manufacturers Association (BHMA):
   1. BHMA A156.18: Materials and Finishes.

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E. Chemical Fabrics & Film Association, Inc. (CFFA):
   1. CFFA-W-101: Quality Standard for Vinyl Coated Fabric Wallcovering.

F. Federal Specification (FS):
   1. FS CCC-W-408: Wall Covering, Vinyl-Coated.

G. National Association of Architectural Metal Manufacturers (NAAMM):
   1. Metal Finishes Manual for Architectural and Metal Products.

H. Underwriters Laboratory (UL).

1.4 DEFINITIONS

A. Tackboard: Framed tackable visual display board assembly.

B. Visual Display Boards: Chalkboards, markerboards, and tackboards.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Include individual panel weights for sliding visual display units.

B. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other Work.
   1. Show locations of panel joints.
   2. Show location of special-purpose graphics for visual display surfaces.
   3. Include sections of typical trim members.

C. Samples for Verification: For each type of visual display surface indicated and as follows:
   1. Visual Display Surface: Not less than 8-1/2 inches by 11 inches, mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
   2. Trim: 6-inch long sections of each trim profile.
   3. Display Rail: 6-inch long section.
   4. Rail Support System: Six-inch long sections.
   5. Accessories: Full-size Sample of each type of accessory.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of vinyl fabrics.

E. Qualification Data: For qualified Installer.

F. Maintenance Data: For visual display surfaces to include in maintenance manuals.

G. Warranties: Special warranties specified in this Section.

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1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of sliding visual display units required for this Project.

B. Source Limitations: Obtain each type of visual display surface from single source from a single manufacturer.

1. Provide hardware and accessories by same manufacturer of visual display boards.

C. Fire-Test-Response Characteristics: Provide fabrics with the surface-burning characteristics indicated, as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section for project meetings, to review methods and procedures related to installation of visual display surfaces.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display boards completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display units vertically with packing materials between each unit.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication..

1.9 COORDINATION

A. Coordinate sizes and locations of concealed framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that visual display units can be supported and installed as indicated.

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1.10 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Surfaces lose original writing and erasing qualities.
      b. Surfaces exhibit crazing, cracking, or flaking.
   2. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet: Manufacturer's standard steel sheet with porcelain-enamel coating fused to steel; uncoated thickness as indicated.
   1. Matte Finish: Low reflective; chalk wipes clean with dry cloth or standard eraser.
   2. Gloss Finish: Gloss as indicated; dry-erase markers wipe clean with dry cloth or standard eraser.

B. Particleboard: ANSI A208.1 ,Grade 1-M-1.

C. Fiberboard: Mineral fiberboard, sanded and coated; flame spread not to exceed 15 per ASTM E84; smoke developed not to exceed 5 per ASTM E84.

D. Natural Cork Sheet: Seamless, single layer, compressed fine-grain cork sheet, bulletin board quality; face sanded for natural finish.

E. Vinyl Fabric: FS CCC-W-408, Type II, weighing not less than 13.0 oz/sq yd; with flame-spread index of 25 or less when tested according to ASTM E 84.

F. Extruded Aluminum: ASTM B 221, Alloy 6063.

G. Adhesives for Facing Materials: Provide adhesive, produced expressly for use with selected facing material on substrate indicated, and as recommended in writing by manufacturer of facing material. Provide materials which are mildew-resistant and non-staining to facing material.
   1. VOC Content: Provide adhesives that comply with local regulatory limits for VOC content when calculated according to 40 CFR, Part 59, Subpart D (EPA Method 24).

2.2 WALL-MOUNTED TACKBOARDS

A. General: Factory-fabricated units consisting of aluminum-framed tackboard panels of dimensions indicated on Drawings.

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1. Products: Subject to compliance with requirements, provide one of the following:
    a. Claridge Products & Equipment, Inc.; Series 4.
    b. Platinum Visual Systems, a Division of ABC School Equipment, Inc.; DTS Series.
    c. Equal product in accordance with Division 1 requirements for product substitutions.

B. Tackable Core Assembly: 1/8-inch thick, vinyl-fabric-faced cork sheet factory-laminated to 3/8-inch thick fiberboard backing.

C. Vinyl-Fabric Facing: Complying with FS CCC-W-408A, Type II, Class A; CFFA-W-101A; meeting Class I flame spread and smoke developed requirements per ASTM E 84.
    1. Color/Pattern: RJF International Corporation; Koroseal Wallcoverings, Harborweave.
        a. Color: As specified in Section 09 06 00 "Colors and Finishes."

D. Aluminum Frames: Fabricated from not less than 0.062-inch-thick, extruded aluminum.
    1. Face Trim Width: 5/8 inch to 3/4 inch.

E. Display Rail: Aluminum, 1-inch wide with natural cork insert; provide aluminum end caps at ends of display rail.

2.3 FIXED WALL-MOUNTED MARKERBOARDS

A. Factory-fabricated units consisting of aluminum-framed markerboard panels of dimensions indicated on Drawings; balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and porcelain-enamel face sheet.
    1. Products: Subject to compliance with requirements, provide one of the following:
        a. Claridge Products & Equipment, Inc.; Series 4.
        b. Platinum Visual Systems, a Division of ABC School Equipment, Inc.; DTS Series.
        c. Equal product in accordance with Division 1 requirements for product substitutions.
    2. Core Material: 1/2-inch thick particleboard.
    3. Face Sheet: 0.021-inch (24 gage) thick, porcelain-enamel with high-gloss finish.
        a. Color: White.
    4. Backing Sheet: 0.005-inch thick aluminum foil backing.

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5. Aluminum Frames: Fabricated from not less than 0.062-inch thick, extruded aluminum.
    a. Face Trim Width: 5/8 to 3/4 inch.
6. Mounting Hardware: Manufacturer's standard L-shaped mounting clips.
7. Pen Tray: Manufacturer's standard, continuous.
    a. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.
8. Display Rail: Aluminum, 1-inch wide with natural cork insert; provide aluminum end caps at ends of display rail.

2.4 HORIZONTAL-SLIDING VISUAL DISPLAY ASSEMBLIES FOR INSTALLATION IN CASEWORK

A. General: Manufacturer's standard double-track, top-supported trolley system, with factory-fabricated aluminum-framed horizontal-sliding panels of dimensions indicated on Drawings; provide panels that operate smoothly without vibration or chatter.
    1. Products: Subject to compliance with requirements, provide one of the following:
        a. Claridge Products & Equipment, Inc.; Top-hung Horizontal Slider.
        b. Platinum Visual Systems, a Division of ABC School Equipment, Inc.; THS Series.
        c. Equal product in accordance with Division 1 requirements for product substitutions.
    2. Sliding Panels: Balanced, high-pressure factory-laminated assembly of three-ply construction consisting of backing sheet, core material, and porcelain-enamel face sheet.
        a. Core Material: Kraft-paper honeycomb designed to be rigid and to resist warpage.
        b. Face Sheet:
            i) Markerboards: 0.021-inch (24 gage) thick, porcelain-enamel with high-gloss finish.
                a) Color: White.
        c. Backing Sheet: 0.015-inch thick aluminum sheet, or 0.021-inch (24 gage) thick steel sheet.
        d. Aluminum Frames: Fabricated from not less than 0.062-inch thick, extruded aluminum.
            i) Face Trim Width: 5/8 to 3/4 inch.
    3. Hardware: Trolley system as required for size and weight of sliding panels, and for easy, quiet operation.
        a. Overhead Tracks: Manufacturer's standard extruded-aluminum overhead tracks with aluminum fascia that conceals tracks.

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b. Top Carriers: Adjustable ball-bearing carriers with nylon rollers; provide two per sliding panel.

c. Bottom Guide Tracks: Manufacturer's standard extruded-aluminum channel-shaped bottom guide tracks with integral extruded-aluminum pen/chalk tray with ribbed section and smoothly rounded corners at ends.

d. Bottom Guides: Manufacturer's standard nylon guides; two per sliding panel.

4. Accessories:

a. Aluminum display rail for mounting on overhead track fascia, 1 inch wide with natural cork insert along horizontal length of top frame member. Provide aluminum end caps at ends of display rail.

b. Finger Pulls: Manufacturer's standard aluminum edge pull mounted to edge of sliding panels; dimension of protruding portion of edge pull as required to allow pull with finger, but not exceeding that which would interfere with bypass sliding panel on adjacent track.

c. Bumpers: Manufacturer's standard rubber bumper designed for installation on vertical edge of sliding panel frame or adjacent surface opposite vertical edge of sliding panel.

2.5 ACCESSORIES

A. Display Rail Accessories: Provide accessories designed to clip onto display rail, with ability to adjust location by sliding along rail; clear anodized aluminum finish.

1. Map Hooks and Clips: Map hooks with flexible spring-action metal clips, designed for hanging maps and other large sheet materials; provide two map hooks for every 48 linear inches of display rail.

2. Roller Bracket: Slotted bracket for suspending projection screen cases or tubular map holders; provide threaded knob for fixing bracket in place on display rail; provide two roller brackets per room.

3. Flag Holder: Provide one flag holder per classroom, designed for mounting on display rail.

2.6 FABRICATION

A. Visual Display Panels: Factory-assemble visual display panels, unless otherwise indicated.

1. Trim shall be assembled and attached to visual display panels at manufacturer's factory before shipment.

B. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

C. Tackboard Visual Display Assemblies: Fully laminate vinyl fabric facing material to cork/fiberboard core material.

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D. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

1. Make joints only where total length exceeds maximum manufactured length. If joints are required, fabricate with a minimum number of joints, balanced around center of board as indicated on approved Shop Drawings.
2. Provide manufacturer's standard vertical-joint spline system between abutting sections of chalkboards and markerboards.
3. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards of combination units.
4. Where size of visual display panels or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

E. Aluminum Frames: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to neat, hairline closure.

1. Trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.
2. At sliding visual display panels, install finger pulls and bumper stops at jambs of frame at both ends.

F. Display Rails:

1. At fixed, wall mounted chalkboards, markerboards, and tackboards, mount display rail along top edge trim of unit.
2. At sliding chalkboard and markerboard panels, install display rail on fascia as indicated. Display rail to run continuously for entire length of overhead track.

G. Pen Trays: Install pen tray to run continuously along entire length of markerboard units.

1. At fixed wall-mounted markerboards, install pen tray at bottom edge.
2. At horizontally-sliding chalkboards and markerboards installed in casework, install chalk/pen tray in conjunction with bottom guide track.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display surfaces.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.

3.3 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

1. Refer to Drawings for mounting heights of visual display units.

3.4 INSTALLATION OF VISUAL DISPLAY UNITS

A. Wall-Mounted Fixed Visual Display Units: Attach concealed clips, hangers, and grounds to solid framing in wall with fasteners of size and at spacings recommended in writing by manufacturer. Secure both top and bottom of units to walls.

B. Sliding Visual Display Units in Casework: Install units in casework as indicated. Attach hardware level and plumb to casework with fasteners of size and at spacings recommended in writing by manufacturer. Ensure tracks and guides are parallel to each other.

3.5 ADJUSTING

A. Adjust sliding visual display panels to operate smoothly without warp or bind. Lubricate operating hardware as recommended in writing by manufacturer.

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3.6 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 10 11 00

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SECTION 10 14 00

SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Panel Signs.
      a. Room identification.
      b. Toilet rooms.
      c. Miscellaneous informational signage.
      d. Fire protection signage.
      e. Tactile exit signage.
   2. Accessibility decal.
   3. Exterior pole-mounted signs and concrete footings.

B. Related Sections include:
   1. Section 06 10 53 "Miscellaneous Carpentry" for concealed wood blocking, where needed, in wood stud-framed walls for anchoring wall-mounted signage.

1.3 REFERENCES

A. ASTM International (American Society for Testing and Materials).
   1. ASTM A 53: Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   2. ASTM A 123: Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   3. ASTM B 26: Specification for Aluminum-Alloy Sand Casting.
   4. ASTM B 209: Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   5. ASTM B 221: Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   6. ASTM C 33: Specification for Concrete Aggregates.
   7. ASTM C 94: Specification for Ready-Mixed Concrete.
   8. ASTM C 150: Specification for Portland Cement.

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9. ASTM D 1187: Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
10. ASTM D 4956: Specification for Retroreflective Sheeting for Traffic Control.

B. California Building Code (CBC) - California Code of Regulations, Title 24, Part 2.

C. Code of Federal Regulations (CFR):
1. 40 CFR, Part 59, Subpart D: National Volatile Organic Compound Emission Standards.

D. Federal Standard 595B: Colors.

E. National Association of Architectural Metal Manufacturers (NAAMM):
1. Metal Finishes Manual for Architectural and Metal Products.

F. United States Department of Justice:
1. 2010 ADA Standards for Accessible Design.

1.4 COORDINATION

A. Coordinate placement of anchorage devices and concealed framing and backing in other Sections with templates for installing signs to ensure that signs can be supported and installed as indicated.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

B. Shop Drawings: Show fabrication and installation details for signs.
1. Include elevations and layout for each sign. Show sign message, typestyles, graphic elements, including tactile characters and Braille.
2. Show sign mounting heights, anchorage details, locations of supplementary supports to be provided by others, and accessories.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for selection by Architect for the following:
1. Aluminum:
a. Minimum Number of Available Colors: 25.
2. Polymer signs:
a. Minimum Number of Available Colors: 40.
3. Include representative Samples of available typestyles and graphic symbols, if not specified in Contract Documents.

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D. Samples for Verification: For each type of sign assembly, for each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:

1. Panel Signs: 12 inches by 12 inches.
2. Reviewed Samples will not be returned for installation in Project.

E. Sign Schedule: Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in protective wrapping or packaging to protect from damage during handling and storage.

B. Store and handle in accordance with manufacturer's written instructions.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturer's written instructions and warranty requirements.

B. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication and indicate measurements on Shop Drawings.

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1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration, including fading, of metal and polymer finishes beyond normal weathering.
      b. Deterioration of embedded graphic images.
      c. Separation or delamination of sheet materials and components.
   2. Warranty Period:
      a. Polymer-Based Panel Signs: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with requirements for signage as per the following:
   1. California Building Code (Title 24, Part 2), Chapter 11B.
   2. United States Department of Justice's 2010 ADA Standards for Accessible Design.

2.2 PANEL SIGNS

A. General: Unframed, polymer-based panel sign. Applied text is not acceptable. Panel and text color achieved through applied UV-resistant polyurethane enamel paint.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
      a. ASI-Modulex, Inc.
      b. Corporate Sign Systems.
      c. Mohawk Sign Systems.
      d. Nova Polymers, Inc
      e. Equal product in accordance with Division 1 requirements for product substitutions.

B. Exterior signs to be rated by manufacturer for exterior installation.

C. Thickness: 1/4 inch.

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D. Fabricate signs with smooth uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; edges smoothly finished to comply with the following requirements:

1. Edge Conditions: Square cut, with edges eased to 1/32 inch radius.
2. Corner Conditions: Square, with corners eased to 1/16 inch radius.

E. Sign Text and Graphic Content: In addition to requirements specified herein, comply with requirements indicated on Drawings for content, fonts, sizes, spacing, and layout. Italicized text used in this Section indicates actual text message to be fabricated on sign.

F. Tactile and Braille Copy: Where indicated, provide tactile text characters and corresponding Braille. Fabricate by manufacturer's photopolymer (exterior grade at exterior signs), blast-etching, engraving, or other process to form raised text and Braille dots in conformance with requirements of California Building Code and United States Justice Department's 2010 ADA Standards for Accessible Design, and integral with sign panel. Produce precisely formed characters with clean square-cut edges for text and rounded edges for Braille. Applied text is not acceptable.

1. Tactile Text:
   a. Raised Text Depth: 1/32 inch above background.
   b. Text Character Type: Uppercase, sans serif. Font as indicated.
   c. Text Character Proportions: As indicated, and conforming with the following:
      i) Width-to-Height Ratio: For indicated font, uppercase letter "O" shall have a width which is 60 percent minimum and 110 percent maximum of the height of uppercase letter "I."
      ii) Stroke Thickness: For indicated font, stroke thickness of uppercase letter "I" shall be 15 percent maximum of the height of the character.
   d. Text Character Spacing: Character spacing shall be measured between the two closest points of adjacent raised characters within a message, excluding word spaces.
      i) Characters With Rectangular Cross Sections: Spacing between individual raised characters shall be a minimum of 1/8 inch, and a maximum of 4 times the raised character stroke width.
      ii) Characters With Other Cross Sections: Spacing between individual raised characters shall be a minimum of 1/16 inch, and a maximum of 4 times the raised character stroke width at the base of the cross sections, and a minimum of 1/8 inch, and a maximum of 4 times the raised character stroke width at the top of the cross sections.
      iii) Characters shall be separated from raised borders and decorative elements 3/8 inch minimum.
   e. Line Spacing: Spacing between baselines of separate lines of tactile text within a message shall be a minimum of 135 percent, and maximum of 170 percent of the raised character height.

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f. Format: Text shall be in a horizontal format.

2. Braille Dots: Grade 2 contracted California Braille; domed or rounded.
   a. Capitalization: Indication of an uppercase letter or letters shall be used only before the first word of sentences, proper nouns and names, individual letters of the alphabet, initials, and acronyms.
   b. Dimensions:
      i) Dot Base Diameter: 0.059 inch minimum, 0,063 inch maximum.
      ii) Distance Between Two Dots in Same Cell (Measured Center-to-Center): 0.100 inch.
      iii) Distance Between Corresponding Dots in Adjacent Cells (Measured Center-to-Center): 0.300 inch.
      iv) Dot Height: 0.025 inch minimum, 0.037 inch maximum.
      v) Distance Between Corresponding Dots From One Cell Directly Below (Measured Center-to-Center): 0.395 inch minimum, 0.400 inch maximum.
   c. Position: Braille shall be positioned directly below corresponding tactile text in a horizontal format, flush left or centered. If text is multi-lined, Braille shall be placed below entire text.
      i) Distance Between bottom of tactile characters and top of Braille: 3/8 inch minimum, 1/2 inch maximum.
      ii) Distance Between Braille and raised borders or decorative elements: 3/8 inch minimum.

G. Pictograms: Pictograms, where indicated, shall have a field height of 6 inches minimum. Characters and Braille shall not be located in the pictogram field.
   1. Contrast: Pictogram shall contrast with background field.
   2. Finish: Both pictogram and background field shall have non-glare finish.
   3. Corresponding descriptive text and Braille shall be located directly below pictogram field.

H. Colored Coatings for Polymer Sheet: For text and graphics, and background colors, provide acrylic polyurethane enamel paints recommended by polymer manufacturer for optimum adherence to polymer surface and which are UV- and water-resistant for colors and exposures indicated. Paint to fully cover all surfaces of sign.
   1. Product: Subject to compliance with requirements, provide the following topcoat material:
      a. Matthews Paint Company; Matthews Satin VOC MAP.
   2. VOC Content: No more than that allowed by local and federal regulations when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      a. In addition to local regulatory limits, provide paint used inside the weatherproofing system that comply with requirements of "Sustainability Characteristics" Article.

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3. Primer: As recommended in writing for intended substrate material by manufacturer of topcoat material.
4. Sign Finish: Sign characters and background to have non-glare (matte) finish.
5. Visual Contrast: Provide minimum 70 percent contrast between sign characters and sign background.
6. Sign Colors: As selected by Architect from manufacturer's full range of standard colors.
    a. For bidding purposes, assume three separate colors for sign panel, in equal quantities for each color, and one color for sign text.

I. Sign Mounting: Manufacturer's noncorroding anchors suitable for substrate being mounted to as detailed on Drawings.
1. Anchors to be countersunk flush with face of sign, and finished to match surrounding color of sign face.

J. Panel Sign Types:
1. Room Identification Signs:
    a. Sign Size and Layout: As indicated on Drawings.
    b. Tactile characters and Braille required.
    c. Typeface: Futura Book, upper case.
    d. Text Character Height: As indicated on Drawings (minimum 5/8 inch high, maximum 2 inches high).
    e. Sign Message Text and Graphics: As indicated on Drawings.
    f. Mounting Location: As indicated on Drawings.
2. Toilet Room Identification Signs (Jamb Sign):
    a. Sign Size and Layout: As indicated on Drawings.
    b. Tactile characters and Braille required.
    c. Typeface: Futura Book, upper case.
    d. Text Character Height: As indicated on Drawings (minimum 1 inch high, maximum 2 inches high).
    e. Sign Message Text: *MEN, WOMEN*, or *UNISEX*, as indicated on Drawings.
    f. Pictogram:
        i) Women: International symbol for women adjacent to International Symbol of Accessibility.
        ii) Men: International symbol for men adjacent to International Symbol of Accessibility.
        iii) Unisex: International symbols for both men and women adjacent to International Symbol of Accessibility.
    g. Colors: As selected by Architect from manufacturer's full range.

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f. Mounting Location: Latch side of door, 5'-0" above floor to baseline of uppermost line of tactile text, unless indicated otherwise on Drawings.

3. Toilet Room Door Signs:
   a. Sign Size:
      i) Women/Girls: 12 inch diameter circle, 1/4 inch thick.
      ii) Men/Boys: Equilateral triangle with 12-inch long sides, 1/4 inch thick, vertex pointing up.
      iii) Unisex: Equilateral triangle, 1/4 inch thick, vertex pointing up, superimposed within 12 inch diameter circle, 1/4 inch thick.
   b. Tactile characters and Braille not required.
   c. Pictogram:
      i) Women/Girls: International symbol for women.
      ii) Men/Boys: International symbol for men.
      iii) Unisex: International symbol for women adjacent to international symbol for men.
   d. Colors: As selected by Architect from manufacturer's full range.
   e. Mounting Location: Centered on width of door, 5'-0" above floor to center of sign.
4. Miscellaneous Informational Signage for Persons With Disabilities:
   a. Sign Size and Layout: As indicated on Drawings.
   b. Tactile characters and Braille required.
   c. Typeface: Futura Book, upper case.
   d. Text Character Height: As indicated on Drawings (minimum 1 inch high, maximum 2 inches high).
   e. Sign Message Text and Pictograms: As indicated on Drawings.
   f. Colors: As selected by Architect from manufacturer's full range.
   g. Mounting Location: As indicated on Drawings, and minimum of 4'-0" above floor to baseline of the lowest Braille cells, and maximum of 5'-0" above floor to baseline of uppermost line of tactile text
5. Fire Protection Specialties Signage:
   a. Sign Size and Layout: As indicated on Drawings.
   b. Tactile characters and Braille not required.
   c. Typeface: Futura Book, upper case.
   d. Text Character Height: 3/4 inch.
   e. Sign Message Text: *FIRE EXTINGUISHER* as indicated on Drawings.
   f. Pictogram:
      i) Fire Extinguisher: Abstract representation of fire extinguisher with directional arrow, as indicated on Drawings.

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ii) Fire Hose: Abstract representation of fire hose with direction arrow, as indicated on Drawings.

g. Colors:

i) Background: Red.

ii) Text and Pictogram: White.

h. Mounting Location: Wall-mounted directly above fire protection cabinet or wall-mounted fire extinguisher, as indicated on Drawings.

6. Tactile Exit Signs:

a. General:

i) Typeface: Futura Book, upper case.

ii) Tactile characters and Braille required.

iii) Layout as indicated on Drawings.

iv) Colors: As selected by Architect from manufacturer's full range.

v) Mounting Location: Latch side of door, 5'-0" above floor to baseline of uppermost line of tactile text, unless indicated otherwise on Drawings.

b. Grade Level Exterior Exit Doors:

i) Sign Size: 4 inches wide by 2-1/2 inches high.

ii) Text Character Height: 1 inch.

iii) Sign Message Text: *EXIT*

c. Doors Into Exit Corridors:

i) Sign Size: 4 inches wide by 3-1/2-inches high.

ii) Text Character Height: 3/4 inch.

iii) Sign Message Text: *EXIT*
ROUTE

K. Accessories:

1. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

a. Use concealed fasteners and anchors unless indicated to be exposed.

b. For exterior exposure, furnish nonferrous-metal, stainless-steel, or hot-dip galvanized devices unless otherwise indicated.

c. Fastener Heads: For nonstructural connections, use flathead countersunk screws with tamper-resistant slots unless otherwise indicated.

i) Finish exposed portion of fastener head to match surrounding sign color and finish.

d. Furnish inserts to be set by other trades into concrete or masonry work.

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2. Adhesives: Silicone adhesive as recommended by sign manufacturer.
    a. VOC Content: Provide adhesive that complies with local regulatory limits for VOC content when calculated according to 40 CFR, Part 59, Subpart D (EPA Method 24).
        i) In addition to local regulatory limits, provide adhesives used inside the weatherproofing system that comply with requirements of "Sustainability Characteristics" Article.

2.3 PRESSURE-SENSITIVE ADHESIVE-APPLIED ACCESSIBILITY SYMBOL

A. International Symbol of Accessibility: Six-inch by six-inch symbol fabricated from opaque nonreflective vinyl film, 0.0035-inch nominal thickness, with pressure-sensitive adhesive backing suitable for both exterior and interior applications.
    1. Colors:
        a. Field: Blue, Federal Standard 595B, Color No. 15090.
        b. Symbol: White.

2.4 EXTERIOR POLE-MOUNTED SIGNS

A. General: Freestanding pole-mounted sign for exterior installation.
    1. Sign Face: Aluminum sheet, ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 5005-H32.
        a. Thickness: 0.080 inch.
        b. Round all corners to 1/2 inch radius.
    2. Reflective Sheeting: Reflective sheet with pressure-sensitive adhesive backing; ASTM D 4956, Type I.
    3. Sign Text and Graphic Content: In addition to requirements specified herein, comply with requirements indicated on Drawings for content, fonts, sizes, spacing, and layout. Italicized text used in this Section indicates actual text message to be fabricated on sign
    4. Sign Mounting Height: As shown on Drawings.
    5. Pole: Steel pipe, ASTM A 53, standard weight (Schedule 40), standard steel pipe, 2-inch nominal size (2.375-inch outside diameter).
        a. Finish: Hot-dip galvanize to comply with ASTM A 123.
    6. Footing: Portland cement concrete.
        a. Materials:
            i) Portland Cement: ASTM C 150, Type I or II.
            ii) Aggregates: ASTM C 33.
            iii) Water: Clean and potable.

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b. Concrete Mixes: Normal-weight concrete with not less than 2500 psi compressive strength (28 days), 3 inch slump, and 1 inch maximum size aggregate.

i) Measure, batch, and mix Project-site-mixed concrete according to ASTM C 94.

B. Fabrication:

1. Fabricate sign face from single sheet without splices or joints.
2. Prior to application of reflective sheeting, pretreat and clean sign face in accordance with written instructions of reflective sheeting manufacturer.
3. Apply reflective sheeting without wrinkles, stretching, tearing, or damage in accordance with written instructions of reflective sheeting manufacturer.
4. Apply text and graphics with clean, sharp edges, using inks of a type and quality as approved for compatibility by manufacturer of reflective sheeting.

C. Sign Types:

1. Van-Accessible Parking Stall: Complying with requirements of California Building Code and United States Justice Department's 2010 ADA Standards for Accessible Design.
   a. Upper Sign:
      i) Size: 12 inches wide by 12 inches high.
      ii) Colors:
         a) Field: Blue, Federal Standard 595B, Color No. 17886.
         b) Graphic Symbol and Border: White.
      iii) Typeface: Helvetica Light.
      iv) Sign Message Text: *MINIMUM FINE $250*
         a) Pictogram: International Symbol of Accessibility, centered over sign message text.
   b. Lower Sign:
      i) Sign Size: 12 inches wide by 4 inches high.
      ii) Colors:
         a) Field: Blue, Federal Standard 595B, Color No. 17886.
         b) Text and Border: White.
      iii) Typeface: Helvetica Light.
      iv) Sign Message Text: *VAN ACCESSIBLE*
      MINIMUM FINE $250
2. Standard Accessible Parking Stall: Complying with requirements of California Building Code and United States Justice Department's 2010 ADA Standards for Accessible Design.
   a. Sign Size: 12 inches wide by 12 inches high.

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b. Colors:
   i) Field: Blue, Federal Standard 595B, Color No. 17886.
   ii) Graphic Symbol and Border: White.
c. Typeface: Helvetica Light.
d. Sign Message Text: *MINIMUM FINE $250*
e. Pictogram: International Symbol of Accessibility, centered over sign message text.

3. Accessible Drop-off Area:
   a. Sign Size: 12 inches wide by 18 inches high.
   b. Colors:
      i) Field: Blue, Federal Standard 595B, Color No. 17886.
      ii) Text, Graphic Symbol, and Border: White.
   c. Typeface: Helvetica Light.
   d. Sign Message Text: *PASSENGER LOADING ZONE ONLY* arranged in three lines.
   e. Pictogram: International Symbol of Accessibility, centered over sign message text.

4. Towing Warning Sign: Complying with 2010 California Building Code Chapter 11B.
   a. Sign Size: 18 inches wide by 24 inches high.
   b. Colors:
      i) Field: White.
      ii) Text and Border: Black.
   c. Typeface: Helvetica Light.
   d. Text Character Height: 1 inch.
   e. Sign Message Text:

      UNAUTHORIZED VEHICLES PARKED IN DESIGNATED ACCESSIBLE SPACES NOT DISPLAYING DISTINGUISHING PLACARDS OR SPECIAL LICENSE PLATES ISSUED FOR PERSONS WITH DISABILITIES WILL BE TOWED AWAY AT OWNER'S EXPENSE. TOWED VEHICLES MAY BE RECLAIMED AT ***[insert name and address of towing company as indicated on sign detail on drawings]*** OR BY TELEPHONING ***[insert telephone number of towing company as indicated on sign detail on drawings]***.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify anchor inserts are sized and located to accommodate signs.

D. Verify painting and finishing of wall substrates are complete.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and complying with manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Panel Signs: Comply with sign manufacturer's written instructions, except where more stringent requirements apply.

1. Silicone-Adhesive Mounting: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads of adhesive symmetrically to back of sign in suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
2. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled and countersunk holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
    a. Install silicone-adhesive at perimeter of backside of sign.

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C. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

1. Concealed Studs (Flush Mounting): Mount characters with backs in contact with wall surface. Using a template, drill holes in substrate aligning with studs on back of characters. Remove loose debris from hole and substrate surface. Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding the studs in holes. Temporarily support sign in position until adhesive full sets

[or]

2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of characters. Remove loose debris from hole and substrate surface. Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until spacers are in contact with both substrate and back of sign, embedding the stud ends in holes and providing projected distance indicated below. Temporarily support sign in position until adhesive is cured.
    a. Projected Distance: Mount characters at a projection distance from back of character to face of wall, of ***[1/2 the depth of the character]***, or as indicated otherwise.

D. Pole-Mounted Signs:

1. Set posts for pole-mounted signs plumb in minimum 12 inch diameter concrete footing with top of footing 6 inches below finish grade and bottom of footing minimum 30 inches below finish grade. Cap top of pipe.
2. Secure signs to posts with saddles and vandalproof nuts. Provide back-to-back signs where indicated.
3. Install signs at mounting height indicated.
    a. Bottom of signs to be minimum of 80 inches above finish grade.
    b. Lower sign of two-sign assemblies to be placed with bottom a minimum of 80 inches above finish grade, and with a one-inch space between upper and lower sign.

3.3 CLEANING AND PROTECTION

A. Remove and replace damaged or deformed signage that does not comply with specified requirements. Replace signs and dimensional characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signage according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish.

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Maintain signage in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 00

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SECTION 10 21 13

SOLID-PLASTIC TOILET COMPARTMENTS AND SCREENS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Solid-plastic toilet compartments configured as toilet enclosures.

B. Related Sections include:
   1. Section 05 41 00 "Cold-Formed Structural Metal Framing" for concealed metal backing in structural metal stud-framed walls for anchoring compartments and screens to walls.
   2. Section 05 50 00 "Metal Fabrications" for support framing supporting ceiling-hung solid-plastic toilet compartments.
   3. Section 06 61 00 "Rough Carpentry" for concealed wood blocking in wood stud-framed walls for anchoring compartments and screens to walls.
   4. Section 09 22 16 "Cold-Formed Non-Structural Metal Framing" for concealed metal backing in nonstructural metal stud-framed walls for anchoring compartments and screens to walls.
   5. Section 10 28 00 "Toilet Accessories" for toilet tissue dispensers, grab bars, and similar accessories mounted on solid-plastic toilet compartments.

1.3 REFERENCES

A. ASTM International:
   1. ASTM B 86: Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings.
   2. ASTM B 221: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   3. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
   4. ASTM E 488: Standard Test Methods for Strength of Anchors in Concrete Elements.
   5. ASTM F 593: Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
   6. ASTM A 594: Standard Specification for Stainless Steel Nuts.

B. California Building Code (CBC) – California Code of Regulations, Title 24, Part 2.

C. California Department of Public Health (CDPH):
   1. Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers – Version 1.1, February 2010.

D. Health Product Declaration Collaborative:
   1. Health Product Declaration Open Standard.

E. International Organization for Standardization (ISO):
   1. ISO 14021: Environmental Labels and Declarations – Self-Declared Environmental Claims (Type II Environmental Labeling).

F. National Fire Protection Association (NFPA):
   1. NFPA 286: Standard Methods of Fire Tests for Evaluation Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

G. UL Environment:
   1. GREENGUARD Gold certification program.

H. Underwriters Laboratories (UL).

I. United States Department of Justice:
   1. 2010 ADA Standards for Accessible Design.

1.4 COORDINATION

A. Coordinate sizes and locations of concealed framing, blocking, backing, furring, reinforcements, and other related Work specified in other Sections to ensure that solid-plastic toilet compartments can be supported and installed as indicated.

1.5 ACTION SUBMITTALS

A. Product Data: For solid-plastic toilet compartments.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for solid-plastic toilet compartments.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of cutouts for compartment-mounted toilet accessories.
   2. Show locations of centerlines of toilet fixtures.
   3. Show locations of floor drains.
   4. Show anchoring and bracing locations.

C. Samples for Initial Selection: For each type of unit indicated, including Samples of hardware and accessories involving material and color selection. Submit manufacturer's full range of available colors for selection by Architect.
   1. Minimum Number of Solid-Plastic Colors for Selection: 6

D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each color of solid-plastic material required for units, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
2. Each type of hardware and accessory.

E. Product Schedule: For solid-plastic toilet compartments***[and screens]***, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.

1.6 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of solid-plastic toilet compartment, indicating compliance with specified requirements.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions for delivery, storage, and handling of toilet compartment materials to prevent damage.

B. Deliver panels, doors, and pilasters with manufacturer's protective removable plastic covering.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Provide manufacturer's standard written warranty against defects in the manufacture of toilet compartments and all related components, including doors, panels, pilasters, benches, hardware, and accessories.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LEED v4 REQUIREMENTS

A. Recycled Content of Solid-Plastic Toilet Compartments. Provide products with recycled content as defined in ISO 14021, such that sum of postconsumer recycled content plus one-half of preconsumer recycled content as measured by percentage of overall weight of product is not less than that indicated elsewhere in this Section.

B. Material Ingredient Reporting: Provide solid-plastic toilet compartments for which manufacturer has published a complete Health Product Declaration with full

disclosure of known hazards in compliance with the Health Product Declaration Open Standard.

C. VOC Emissions of Solid-Plastic Toilet Compartments: Provide solid-plastic toilet compartments that comply with the testing and product requirements of the California Department of Public Health "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers – Version 1.1, February 2010," using the applicable exposure scenario.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: Solid-plastic material shall comply with the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    a. Flame-Spread Index: 75 or less.
    b. Smoke-Developed Index: 450 or less.
2. Room Corner Test: Meeting the following criteria when tested according to NFPA 286:
    a. During the 40 kW exposure, flames shall not spread to ceiling.
    b. During the 160 kW exposure:
        i) Flame shall not spread to the outer extremity of the sample on any wall or ceiling.
        ii) Flashover, as defined in NFPA 286, shall not occur.
    c. The peak rate of heat release throughout the NFPA 286 test shall not exceed 800 kW.
    d. The total smoke released throughout the NFPA 286 test shall not exceed 1000 sq meters.

B. Accessibility Requirements: For toilet compartments designated as accessible, comply with applicable provisions of the following:

1. California Building Code (Title 24, Part 2), Chapter 11B.
2. United States Department of Justice's 2010 ADA Standards for Accessible Design.

2.3 SOLID-PLASTIC TOILET COMPARTMENTS

A. Solid-Plastic Toilet Compartments: Manufacturer's complete system consisting of solid-plastic partitions, doors, pilasters, and associated hardware and accessories.

1. Manufacturers: Subject to compliance with requirements, provide solid-plastic toilet compartments by one of the following:
    a. Accurate Partitions Corporation, an ASI Group Company.
    b. Scranton Products.

c. Manufacturer of equal products in accordance with Division 1 requirements for product substitutions.

B. Toilet-Enclosure Style: Floor-anchored, overhead braced.

C. Door, Panel, Screen, and Pilaster Construction: Solid-plastic panel material, not less than 1 inch thick, seamless, with eased edges, and with homogeneous color and pattern throughout thickness of material.

1. Texture: Orange Peel.
2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip fastened to exposed bottom edges of solid-plastic components to prevent burning.
3. Shiplap privacy joints at door latches and door hinges.
4. Color***[s]***: As specified in Section 09 06 00 "Colors and Finishes."

D. Pilaster Shoes and Sleeves (Caps): Manufacturer's standard design; solid-plastic.

1. Plastic Color and Pattern: Matching pilaster.

E. Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters.

F. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; extruded aluminum.

2.4 MATERIALS

A. Solid-Plastic: Solid high-density polyethylene (HDPE), manufactured under high pressure forming a single component section that is waterproof, nonabsorbent, with a self-lubricating surface resistant to marking with writing utensils; homogeneous color and pattern throughout thickness of material.

B. Aluminum Extrusions: ASTM B 221.

C. Zamac: ASTM B 86, commercial zinc-alloy die castings.

2.5 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories; fabricated from heavy-duty extruded aluminum with bright anodized finish, except where indicated otherwise.

1. Material: Clear-anodized aluminum.
2. Hinges: Manufacturer's standard 8-inch hinge with wrap-around flanges, through-bolted to doors with stainless steel tamper-resistant sex bolts; self-closing; hinges operate with field-adjustable nylon cams, field-adjustable in 30-degree increments.
   a. Hinges to allow for removal of door, if required for maintenance.
3. Latch and Keeper: Manufacturer's standard 6-inch long surface-mounted sliding latch unit designed for emergency access and with combination rubber-

faced door strike and keeper; through-bolted to doors and pilasters with stainless steel tamper-resistant sex bolts Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.

a. Latch shall be operable with one hand and without requiring tight grasping, pinching, or twisting of the wrist.

4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories; fabricated from chrome-plated zamak.
5. Door Bumper: Manufacturer's standard rubber-tipped bumper at outswinging doors; fabricated from chrome-plated zamak.
6. Door Pull: Manufacturer's standard U-shaped unit at outswinging doors that complies with regulatory requirements for accessibility; fabricated from chrome-plated zamak; provide units on both sides of doors at compartments designated as accessible.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners:

1. Screws and Bolts: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with tamper-resistant-type heads. Provide sex-type bolts for through-bolt applications. Use countersunk, flush-type bolt heads or otherwise make fasteners inconspicuous if exposed on opposite side of panel from hardware or accessory item. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.
2. Post-Installed Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to five times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

a. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.6 FABRICATION

A. Fabrication, General: Fabricate toilet compartment to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Edge Condition: Square-cut, with edges eased.

1. Cut edges shall be free of saw marks.
2. Edges at latch side and hinge side shall be shiplap and allow for "no-view" into stall (privacy partition).

C. Floor-Anchored Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

D. Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at top and bottom of post. Provide shoes at posts to conceal anchorage.

E. Dimensions: Fabricate to following dimensions, unless indicated otherwise.
   1. Toilet Compartments:
      a. Panels: 55 inches high, with bottom edge mounted at 14 inches above floor.
      b. Pilasters: 82 inches high.
   2. Urinal Screens:
      a. Panels: 18 inches wide by 42 inches high, with bottom edge mounted 14 inches above floor.
      b. Pilasters: 5 inches wide by 56 inches high.

F. Door Size and Swings: Unless otherwise indicated, provide 24-inch wide, inswinging doors for standard (non-accessible) toilet compartments and 36-inch wide, outswinging doors with a minimum 34-inch-wide clear opening for side-entry compartments designated as accessible.

G. Hardware Mounting Locations:
   1. Latch and Keeper for Toilet Compartment Door: 40 inches above floor.
   2. Coat Hook for Toilet Compartment Door:
      a. 60 inches above floor at standard (non-accessible) toilet compartments.
      b. 40 inches above floor at toilet compartments designated as accessible.
   3. Door Pulls: Directly below latch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, including supporting framing and blocking, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, installation tolerances, and other conditions affecting performance of the Work.
   1. Confirm location and adequacy of blocking and supports required for installation.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
   1. Full-Height (Continuous) Brackets for Toilet Compartments: Secure panels to walls and to pilasters with full-height brackets.
      a. Align brackets at pilasters with brackets at walls.

B. Floor-Anchored Overhead-Braced Units: Secure pilasters to floor, and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

D. Where installing partitions in areas where previous partitions were removed, all holes remaining from previous attachments shall be fully grouted to match floor and/or wall.

3.3 ADJUSTING AND CLEANING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

B. Clean exposed surfaces as recommended by manufacturer.

END OF SECTION 10 21 13

SECTION 10 28 00

TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following toilet accessories:
   1. Toilet room accessories.

B. Related Sections include:
   1. Section 05 50 00 "Metal Fabrications" for concealed metal backing in non-load-bearing metal stud-framed walls for anchorage of wall-mounted toilet accessories.
   2. Section 06 10 00 "Rough Carpentry" for concealed wood blocking in wood stud-framed walls for anchorage of wall-mounted toilet accessories.

1.3 REFERENCES

A. ASTM International:
   1. ASTM A 153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   2. ASTM A 653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   3. ASTM A 666: Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   4. ASTM A 1008: Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy With Improved Formability, Solution Hardened, and Bake Hardenable.
   5. ASTM B 16: Standard Specification for Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines.
   6. ASTM B 456: Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
   7. ASTM C 1503: Standard Specification for Silvered Flat Glass Mirror.
   8. ASTM F 446: Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area.

B. National Fire Protection Association (NFPA):

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1. NFPA 70: National Electrical Code.

C. National Sanitation Foundation (NSF):
1. NSF Protocol P335: Hygienic Commercial Hand Dryers.

1.4 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by persons with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

C. Coordinate sizes and locations of concealed framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that toilet accessories can be supported and installed as indicated.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:
1. Construction details and dimensions individual components and profiles.
2. Material and finish descriptions.
3. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
4. Electrical power requirements for electric hand dryers.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
1. Identify locations using room designations indicated on Drawings.
2. Identify accessories using designations indicated.

1.6 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet accessories to include in maintenance manuals.

1.8 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: 15 years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain toilet accessories from same manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 TOILET ACCESSORIES

A. Paper Towel Dispenser/Waste Receptacle, Semi-Recessed:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. American Specialties, Inc.; #0469.
      b. Bobrick Washroom Equipment, Inc.; #B-3944.
      c. Bradley Corporation #234.
   2. Mounting: Semi-recessed.
   3. Material: Stainless-steel.
   4. Dimensions:
      a. Width: 17-1/8 inches to 17-3/16 inches.
      b. Height: 56 inches.
      c. Depth: 4 inches (in wall) with 4-31/32-inch maximum projection from wall.
   5. Waste Receptacle Capacity: 12 gallon (removable, with reusable vinyl liner).
   6. Paper Towel Capacity: 600 C-fold or 800 multi-fold paper towels.
   7. Hardware: Full length stainless steel piano hinge at cabinet door with tumbler lock.

B. Paper Towel Dispenser, Surface-Mounted.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. American Specialties, Inc.; #0210.
      b. Bobrick Washroom Equipment, Inc.; #B-262.
      c. Bradley Corporation #230-15.
   2. Mounting: Surface (ADA-compliant).
   3. Material: Stainless-steel.
   4. Dimensions:
      a. Width: 10-13/16 inches to 11 inches.
      b. Height: 14-1/16 inches to 15-5/16 inches.

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c. Depth: 3-15/16 inches to 4-1/16 inches.

5. Paper towel capacity: 400 C-fold or 525 multi-fold paper towels.
   a. Provide viewing slot for indicating need for refill.
6. Hardware: Full length stainless steel piano hinge at cabinet door with tumbler lock.

C. Soap Dispenser at Lavatories and Sinks:
1. Products: Subject to compliance with requirements, provide one of the following:
   a. American Specialties, Inc.; #0347.
   b. Bobrick Washroom Equipment, Inc.; #B-2111.
   c. Bradley Corporation #6563.
2. Mounting: Surface.
3. Material: Stainless-steel.
4. Dimensions:
   a. Width: 4-3/4 inches to 4-13/16 inches.
   b. Height: 8-1/8 inches to 8-3/16 inches.
   c. Depth: 2-3/4 inches to 3 inches.
5. Capacity: 40 fluid oz liquid or lotion soap.
6. Valve: Push-in corrosion-resistant plastic ABS valve and spout.
   a. Operation: One hand with less than 5 pounds of force.
7. Features: Clear acrylic refill indicator window; lockable lid for top filling.

D. Mirror at Single-Occupant Toilet Rooms:
1. Products: Subject to compliance with requirements, provide one of the following:
   a. American Specialties, Inc.; #0605.
   b. Bobrick Washroom Equipment, Inc.; #B-292.
   c. Bradley Corporation #7805.
2. Mounting: Concealed wall hangers.
3. Mirror material: Float glass.
4. Frame material: Stainless-steel.
5. Frame Construction: Welded, one-piece angle frame.
6. Dimensions: 18 inches wide by 36 inches high.
7. Shelf: Stainless steel, 5 inches deep, with concealed bracket reinforcing.

E. Grab Bar:
1. Products: Subject to compliance with requirements, provide one of the following:

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a. American Specialties, Inc.; #3800 Series.
b. Bobrick Washroom Equipment, Inc.; #B-6806 Series.
c. Bradley Corporation #812 Series.

2. Mounting: Concealed mounting flanges with two screw holes.
   a. Provide stainless-steel snap flange cover.
3. Material: Stainless-steel tubing, satin finish, 18 gage wall thickness.
4. Outside Diameter: 1-1/2 inches.
5. Length: As indicated on Drawings.
6. Clearance between grab bar and face of wall: 1-1/2 inches.
7. Concealed Anchor Plate for Grab Bar Mounting on Wall:
   a. Product: Subject to compliance with requirements provide one of the following:
      i) Bobrick Washroom Equipment, Inc.; #2562 Series.
      ii) Equal product in accordance with Division 1 requirements for product substitutions.
   b. Material: 12 gage galvanized steel plate with 1/4-20 threaded holes extruded and tapped to give minimum .200 inch of usable thread per hole.
   c. Dimensions: 3 inches high by length as required by locations of grab bar anchoring flanges.
8. Anchor Plate for Grab Bar Mounting on Toilet Compartment:
   a. Product: Subject to compliance with requirements provide one of the following:
      i) Bobrick Washroom Equipment, Inc.; #258 Series.
      ii) Equal product in accordance with Division 1 requirements for product substitutions.
   b. Material: 16 gage stainless-steel.
   c. Dimensions: 3-1/2 inches high by 1-1/4 inches wide.
   d. Fasteners: Manufacturer's standard stainless-steel connectors and Phillips round-head machine screws.

F. Toilet-Seat-Cover Dispenser:
1. Products: Subject to compliance with requirements, provide one of the following:
   a. American Specialties, Inc.; #0477-SM.
   b. Bobrick Washroom Equipment, Inc.; #B-221.
   c. Bradley Corporation #5831.
2. Mounting: Surface-mounted.
3. Material: Stainless-steel.
4. Dimensions:

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a. Width: 15-3/4 inches.
b. Height: 11 inches.
c. Depth: 1-7/8 inches to 2 inches.

5. Capacity: 250 toilet-seat-covers, minimum.
6. Features: Dispenser fills from bottom through concealed opening.

G. Toilet Tissue Dispenser, Semi-Recessed:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. American Specialties, Inc.; #0031.
   b. Bobrick Washroom Equipment, Inc.; #B-3888.
   c. Bradley Corporation #5412.
2. Mounting: Semi-recessed.
3. Material: Stainless-steel.
4. Dimensions:
   a. Width: 7-9/16 inches to 8 inches.
   b. Height: 12-3/8 inches to 14 inches.
   c. Depth: 3 inches to 3-1/2 inches (in wall) with 3-inch maximum projection from wall.
5. Capacity: Two standard core toilet tissue rolls, up to 5-1/4 inches in diameter.
6. Hardware: Heavy-duty, one-piece molded ABS spindles; tumbler lock.
7. Operation: Tissue rolls are loaded and locked into dispensing mechanism. Extra roll automatically drops into place when bottom roll is depleted; continuous-flow delivery of toilet tissue (no controlled-delivery).

H. Toilet Tissue Dispenser, Surface-Mounted:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. American Specialties, Inc.; #0030.
   b. Bobrick Washroom Equipment, Inc.; #B-2888.
   c. Bradley Corporation #5402.
2. Mounting: Surface-mounted.
3. Material: Stainless-steel.
4. Dimensions:
   a. Width: 5-9/16 inches to 6-1/16 inches.
   b. Height: 10-3/8 inches to 12 inches.
   c. Depth: 5-5/16 inches to 6-1/2 inches.
5. Capacity: Two standard core toilet tissue rolls, up to 5-1/4 inches in diameter.
6. Hardware: Heavy-duty, one-piece molded ABS spindles; tumbler lock.

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7. Operation: Tissue rolls are loaded and locked into dispensing mechanism. Extra roll automatically drops into place when bottom roll is depleted; continuous-flow delivery of toilet tissue (no controlled-delivery).

I. Sanitary Napkin Disposal, Surface-Mounted:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. American Specialties, Inc.; #0473-1A.
   b. Bobrick Washroom Equipment, Inc.; #B-254.
   c. Bradley Corporation #4722-15.
2. Mounting: Surface.
3. Dimensions:
   a. Width: 10-11/16 inches to 11 inches.
   b. Height: 15-1/8 inches to 15-1/4 inches.
   c. Depth: 4 inches to 4-1/16 inches.
4. Material: Stainless-steel.
5. Disposal Panel: Spring-loaded self-closing panel with graphic symbol indicating sanitary napkin disposal.
6. Receptacle: Removable leak-proof stainless-steel or polyethylene.
   a. Capacity: 1.2 gallons minimum.
7. Hardware: Full length stainless steel piano hinge at cabinet door with tumbler lock for access to receptacle.

2.4 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch (22 gage) minimum nominal thickness, unless otherwise indicated; No. 4 satin finish unless otherwise indicated.

B. Brass: ASTM B 16, rods, shapes, forgings, and flat products with finished edges.

C. Steel Sheet: ASTM A 1008, Designation CS (cold rolled, commercial steel), 0.0359-inch (20 gage) minimum nominal thickness.

D. Galvanized Steel Sheet: ASTM A 653, with G60 (Z180) hot-dip zinc coating.

E. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-resistant and theft-resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

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H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm (1/4-inch) thick.

I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.5 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and re-supplying. Provide minimum of six keys to Owner's representative.

2.6 TOILET ACCESSORIES

A. General: Provide toilet accessories as shown on Drawings and scheduled at end of this Section.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify concealed blocking and backing has been installed for all toilet accessories occurring on or within framed walls.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install accessories according to manufacturer's written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

1. Where piping or other obstructions within wall prevent the installation of wood blocking, install concealed anchor plate for anchorage of grab bars.

C. Folding Shower Seat: Install to withstand specified loading capacity of seat, anchored into solid backing.

D. Where piping or other obstructions within wall prevent the installation of blocking or backing, install concealed anchor plate for anchorage of toilet accessories.

3.3 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

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B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

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SECTION 10 44 13

FIRE-PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Fire-protection cabinets for the following:
      a. Portable fire extinguishers.

B. Related Sections include:
   1. Section 06 10 00 "Rough Carpentry" for concealed wood blocking in wood stud-framed walls for anchoring wall-mounted fire-protection cabinets.
   2. Section 09 91 00 "Painting" for field painting of fire-protection cabinets.
   3. Section 10 14 00 "Signage" for signage for fire-protection cabinets and wall-mounted fire extinguishers.
   4. Section 10 44 16 "Fire Extinguishers" for fire extinguishers installed inside fire-protection cabinets.

1.3 REFERENCES

A. ASTM International (American Society for Testing and Materials):
   1. ASTM A 1008: Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   2. ASTM C 1048: Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
   3. ASTM E 814: Test Method for Fire Tests of Through-Penetration Fire Stops.

B. National Association of Architectural Metal Manufacturers (NAAMM);
   1. NAAMM AMP 500: Metal Finishes Manual for Architectural and Metal Products.

C. The Society for Protective Coatings (SSPC):
   1. SSPC-SP5/NACE No. 1: Joint Surface Preparation Standard SSPC-SP 5/NACE No. 1: White Metal Blast Cleaning.
   2. SSPC-SP8: Surface Preparation Specification No. 8: Pickling.

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1.4 COORDINATION

A. Coordinate sizes and locations of concealed framing, blocking, backing, furring, reinforcements, and other related Work specified in other Sections to ensure that fire-protection cabinets can be supported and installed as indicated.

1.5 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site to review methods and procedures related to fire protection cabinets including, but not limited to, the following:
   1. Schedules and coordination requirements.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets. Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
   1. Show location of knockouts for hose valves, where applicable.

B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For each type of exposed factory-applied color finish required for fire-protection cabinets, prepared on Samples 6 inches by 6 inches in size.

D. Product Schedule: For fire protection cabinets. Indicate whether recessed, semirecessed, or surface-mounted. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINETS, GENERAL

A. Cabinet Construction:

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1. At Fire-Rated Walls: One-hour or two-hour rated, but not less than that of wall in which cabinet occurs
    a. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428 inch thick, cold-rolled steel sheet lined with minimum 5/8 inch thick, fire-barrier material. Provide factory-drilled mounting holes.
2. At Non-Fire-Rated Walls: Non-rated

B. Cabinet Material: Cold-rolled steel sheet.

C. Cabinet Trim Material: Steel sheet.

D. Door Material: Steel sheet.

E. Door Glazing: Tempered float glass (clear).

F. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
1. Provide projecting door pull and friction latch.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

G. Accessories:
1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated on Drawings.
    a. Location: Applied to cabinet door, oriented as indicated on Drawings.
    b. Application: Silk-screened.
    c. Identification: Identify with words as follows:
        i) Fire Extinguisher Cabinets: *FIRE EXTINGUISHER*

2.3 FIRE EXTINGUISHER CABINETS FOR MULTIPURPOSE FIRE EXTINGUISHERS

A. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.
1. Products: Subject to compliance with requirements, provide one of the following:
    a. JL Industries:
        i) At Fire-Rated Walls: #1815-G17-FX.
        ii) At Non-Fire-Rated Walls: #1815-G17.
    b. Larsen's Manufacturing Company:
        i) At Fire-Rated Walls: #FS-2409-R1.

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ii) At Non-Fire-Rated Walls: #2409-R1.

c. Potter Roemer LLC:

i) At Fire-Rated Walls: #FRC 7010-B.

ii) At Non-Fire-Rated Walls: #7010-B.

d. Equal product in accordance with Division 1 requirements for product substitutions.

2. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend) of 1/4 to 5/16 inch.

3. Door Style: Fully glazed panel with frame.

4. Box (Tub) Dimensions: 9 to 10 inches wide by 24 inches high by 5 to 5-1/2 inches deep.

B. Finishes:

1. Exterior of Cabinet and Door: Manufacturer's standard baked-enamel paint.

a. Color: White.

2. Interior of Cabinet and Door: Manufacturer's standard baked-enamel paint.

a. Color: White.

2.4 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B.

B. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm (1/4 inch) thick.

2.5 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.

2. Provide factory-drilled mounting holes.

3. Prepare doors and frames to receive locks.

4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.

2. Fabricate door frames of one-piece construction with edges flanged.

3. Miter and weld perimeter door frames.

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C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

2.7 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning" or SSPC-SP 8, "Pickling." After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for hose racks and valves and cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where recessed or semirecessed cabinets are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed or semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated.

B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.

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1. Fasten mounting brackets to inside surface of fire-protection cabinets for fire extinguishers, square and plumb.
2. Fire-Rated Fire Hose Cabinets:
    a. Install cabinet with not more than 1/16-inch tolerance between pipe O.D. and knockout O.D. Center pipe within knockout.
    b. Seal through penetrations with firestopping sealant as specified in Section 07 84 13 "Penetration Firestopping."

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed, unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 13

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SECTION 10 44 16

FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Portable fire extinguishers.
      a. Multipurpose type.
      b. Class K type.
   2. Wall mounting brackets for wall mounted fire extinguishers not occurring in cabinet.

B. Related Sections include:
   1. Section 06 10 00 "Rough Carpentry" for concealed wood blocking in wood stud-framed walls for anchoring wall-mounted fire extinguishers.
   2. Section 10 14 00 "Signage" for signage for wall-mounted fire extinguishers.
   3. Section 10 44 13 "Fire Protection Cabinets" for cabinets to house fire extinguishers.

1.3 REFERENCES

A. California Code of Regulations, Title 19 - Public Safety.

B. National Fire Protection Association (NFPA):
   1. NFPA 10: Portable Fire Extinguishers.

1.4 COORDINATION

A. Coordinate sizes and locations of concealed framing, blocking, backing, furring, reinforcements, and other related Work specified in other Sections to ensure that wall-mounted fire extinguishers can be supported and installed as indicated.

1.5 PREINSTALLATION MEETING

A. Preinstallation Conference: Conduct conference at Project site to review pertinent issues related to fire extinguishers, including:
   1. Schedules and coordination requirements.

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1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguishers and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.

1.7 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.8 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of hydrostatic test according to NFPA 10.
      b. Faulty operation of valves or release levers.
   2. Warranty Period: 6 years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 REGULATORY REQUIREMENTS

A. In addition to requirements of authorities having jurisdiction, comply with applicable requirements of the following:
   1. California Code of Regulations, Title 19 - Public Safety, requirements for fire extinguishers (Division 1, Chapter 3).

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2.3 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS – MULTIPURPOSE TYPE

A. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity, with mono-ammonium phosphate-based dry chemical in enameled-steel container.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. JL Industries, Inc.; Cosmic 5E.
   b. Larsen's Manufacturing Company; MP5.
   c. Potter Roemer LLC; #3005.
   d. Equal product in accordance with Division 1 requirements for product substitutions.
2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Where occurring in fire protection cabinet, install fire extinguisher in mounting bracket inside cabinet. Refer to Section 10 44 13 "Fire Protection Cabinets."
2. Where occurring on wall-mounted bracket, fasten mounting bracket to surfaces, square and plumb.
3. At commercial kitchen areas, install Class K fire extinguishers.

END OF SECTION 10 44 16

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SECTION 11 52 23

AUDIO-VISUAL EQUIPMENT SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Manufactured mounting brackets for audio-visual equipment:
      a. Video screens.

B. Related Sections include:
   1. Section 06 10 53 "Miscellaneous Carpentry" for concealed wood blocking in wood stud-framed walls for anchoring audio-visual equipment supports.

1.3 COORDINATION

A. Coordinate sizes and locations of concealed framing, blocking, backing, furring, reinforcements, and other related Work specified in other Sections to ensure that audio-visual equipment supports can be supported and installed as indicated.

B. Coordinate layout and installation of audio-visual equipment supports with adjacent construction, including ceiling suspension systems, light fixtures, HVAC equipment, fire-suppression system, partitions, and other items occurring in the same area.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for audio-visual equipment supports.

B. Shop Drawings: For special components and installations not detailed or dimensioned on manufacturer's product data. Show layout of equipment and required clearances to adjacent construction, and locations of required electrical power connections.

C. Samples for Verification: For each color of exposed factory-applied finish required for audio-visual equipment supports, prepared on 4-inch by 4-inch Samples.

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1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not install audio-visual equipment supports until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are at levels to be maintained after building is occupied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain audio-visual equipment supports, including all components and related items, as complete units from a single source or manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Audio-visual equipment supports shall have current pre-approval on file with the California Office of Statewide Health Planning and Development (OSHPD), for use in hospitals and State structures.

2.3 VIDEO WALL MOUNT

A. General: Wall-mounted video monitor support assembly with pull-out mounting frame for flat-screen video monitor.
   1. Product: Subject to compliance with requirements, provide the following:
      a. Peerless Industries, Inc.; SmartMount #DS-VW765-LAND.
   2. Size: Suitable for video monitor displays of diagonal dimension from 40 inches to 65 inches.
   3. Load Capacity: 125 lbs.
   4. Material: Steel.
   5. Finish: Manufacturer's factory-applied epoxy finish.
      a. Color: Black.
   6. Wall Plate Dimensions: 35 inches wide by 20 inches high.
   7. Operation:
      a. Pull-Out Extension: 11 inches from fully retracted position.
      b. Upward Tilt: 24 degrees.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation of audio-visual equipment supports.

3.2 INSTALLATION

A. General: Install audio-visual equipment at locations and heights indicated, and to comply with manufacturer's written instructions.

B. Install units level, plumb, and firmly anchored in locations and at heights indicated, using fasteners appropriate to substrate indicated and recommended by manufacturer.

3.3 ADJUSTING AND CLEANING

A. Adjust and lubricate operable components to operate smoothly and easily, without binding or warping. Check and readjust operating hardware.

B. Clean exposed surfaces as recommended by manufacturer.

END OF SECTION 11 52 23

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SECTION 11 59 10

DISPLAY SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Display systems:
      a. Cable suspension hanging display system.
      b. Display rail.

B. Related Sections include:
   1. Section 06 10 00 "Rough Carpentry" for concealed wood blocking in wood stud-framed walls for anchoring wall-mounted art display system.

1.3 COORDINATION

A. Coordinate sizes and locations of concealed framing, blocking, backing, furring, reinforcements, and other related Work specified in other Sections to ensure that art display system can be supported and installed as indicated.

1.4 ACTION SUBMITALS

A. Product Data: For each type of display system. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For each type of display system. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification:
   1. Cable Suspension Hanging Display System:
      a. Track: 12-inch long section for each type of finish.
      b. C-Hanger. One unit.
      c. Suspension Cable: 12-long section.
      d. Cable Tensioner: One unit.
      e. Panel Hook Clip: One unit.

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f. Acrylic Pocket: One unit for each size.

g. Side Clamps: One unit of each type.

2. Display Rail: 12-inch long section of rail for each type of finish.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation, and standard of workmanship.

1. Build mockups of one unit of each type of display system.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions for delivery, storage, and handling of display system components and materials.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not install display systems until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are at levels to be maintained after building is occupied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain display systems, including all components and related items, as complete units from a single source or manufacturer.

2.2 CABLE SUSPENSION HANGING DISPLAY SYSTEM

A. General: Cable-suspended display system consisting of components which can be reconfigured and adjusted to accommodate different sizes and configurations of multiple display panels.

1. Product: AS Hanging Display Systems.

a. Track: Contempo Track, #U5600.

b. C-Hangers: C-Hanger, #U5015.

c. Suspension Cable: Barrel-End Stainless Steel Cable, #C2005.

d. Cable Tensioner: C-End Cable Tensioner, #U5494.

e. Acrylic Pockets:

i) Portrait Orientation: Acrylic Pocket Letter Size, Portrait, #U5001.

ii) Landscape Orientation: Acrylic Pocket Letter Size, Landscape, #U5005.

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f. Side Clamps:
    i) Single-Sided: Pro Side Clamp, Single Sided, Small, #H3050.
    ii) Double-Sided: Pro Side Clamp, Double Sided, Small, #H3055.

2. Components:
    a. Track: Flat plate for attaching upper and lower ends of suspension cable; capable of conforming to flat, or radiused concave and convex surfaces.
        i) Material: Aluminum.
        ii) Finish: Clear anodized.
        iii) Dimensions: 0.74 inch wide by 72 inches long.
        iv) Loading Capacity: 78 lbs per track (13 lbs per lineal foot).
        v) Spacers: Manufacturer's circular spacer with tapered base, for holding track 0.39 inch off surface of supporting surface.
        vi) Track Connectors: Snap-on connector for aligning ends of adjacent track sections; finish to match track finish.
        vii) Fasteners: Diameter to fit predrilled fastener holes in track, length and type of fastener as required by surface being fastened to.
            a) Spacing of Predrilled Holes for Fasteners: 4 inches from ends, and 8 inches on center between end fasteners.
            b) Fastener Finish: Head of fasteners to match finish of track.
    b. C-Hanger: C-shaped strap with profile for hooking end of cable to upper and lower tracks.
        i) Material: Aluminum.
        ii) Finish: Match finish of track.
        iii) Dimensions: 0.39 inch wide by 1.37 inches high by 0.38 inch deep.
        iv) Loading Capacity: 45 lbs.
    c. Suspension Cable: Stainless-steel, Type 304 flexible wire cable.
        i) Loading Capacity: 150 lbs.
        ii) Diameter: 0.07 inch.
        iii) End Fittings: 0.20-inch diameter stainless-steel barrel-end for securing end of cable in C-hanger.
    d. Cable Tensioner: Threaded inline spring-tensioned barrel for connecting two sections of cable and applying adjustable levels of tension to cable.
        i) Material: Aluminum.
        ii) Finish: Silver.

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e. Acrylic Pocket: Clear plastic double-sheet sleeve for holding display sheet material; extended tabs at vertical edges for attachment hardware.
   i) Material: Polished acrylic.
      a) Thickness: 1/8 inch.
      b) Edges: Polished.
   ii) Dimensions:
      a) Portrait Orientation: 8-1/2 inches wide by 11 inches high.

f. Side Clamps: Cylindrical fitting for securing display panel or acrylic pocket sleeve to suspension cable.
   i) Single-Sided: For securing display panel or acrylic pocket sleeve at one side of suspension cable.
      a) Material: Aluminum.
      b) Finish: Clear anodized.
      c) Dimensions: 0.43 inch diameter by 0.73 inch long.
      d) Loading Capacity: 20 lbs.
      e) Clamping screws for securing to cable and display sheet/acrylic pocket: Stainless-steel internal hex-socket-head set screws. Provide both nylon-flat-tipped and cone-tipped screws.
   ii) Double-Sided: For securing display panel or acrylic pocket sleeve at both sides of suspension cable.
      a) Material: Aluminum.
      b) Finish: Clear anodized.
      c) Dimensions: 0.43 inch diameter by 1.06 inches long.
      d) Loading Capacity: 20 lbs.
      e) Clamping screws for securing to cable and display sheet/acrylic pocket: Stainless-steel internal hex-socket-head set screws. Provide both nylon-flat-tipped and cone-tipped screws.

2.3 DISPLAY RAIL

A. General: Extruded aluminum rail with concealed gripping surface at lower edge, designed to retain display sheet of up to 1/16 inch thick by pushing top edge of sheet up into retainer slot, and release when pressure is applied to top edge of rail.
   1. Product: AS Hanging Display Systems; Casso Display Rail.

B. Material:
   1. Rail: Aluminum.
   2. Gripping Insert: Rubber.

C. Finish: Clear anodized.

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D. Dimensions:
   1. Width: 1.949 inches (49.5 mm).
   2. Depth: 0.394 inches (10 mm).
   3. Length: 24 inches and 72 inches.

E. Accessories:
   1. End caps. Manufacturer's closure piece to cap exposed end of rails; finish to match rail.
   2. Mounting clips: Manufacturer's wall-mounted clip for snap-on attachment of rail.
      a. Fasteners: As recommended by manufacturer for intended substrate and backing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, and other conditions affecting performance of the Work.
   1. Confirm location and adequacy of blocking/backing and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install display systems in accordance with manufacturer's written instructions, in locations indicated. Provide clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Install units level, plumb, and firmly anchored in locations and at heights indicated, using fasteners appropriate to substrate indicated and recommended by manufacturer.

3.3 ADJUSTING AND CLEANING

A. Adjust cable suspension hanging display system so that all components are engaged accurately and securely and cables are of proper tension.

B. Clean exposed surfaces as recommended by manufacturer.

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3.4 SCHEDULE

A. Cable Suspension Hanging Display System: Provide quantities of components as follows:

1. Track: As required by layout and configuration indicated on Drawings.
2. C-Hanger: Two for each suspension cable.
3. Suspension Cable: 24, of sufficient length required to span distance indicated between top and bottom tracks, including excess length required for installation of barrel-end fittings and cable tensioner.
4. Cable Tensioner: One for each suspension cable.
5. Acrylic Pockets:
   a. Portrait Orientation: 50.
6. Side Clamps:
   a. Single-Sided: 30.
   b. Double-Sided: 50.

END OF SECTION 11 59 10

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SECTION 11 61 43

STAGE CURTAINS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Stage curtains.
   2. Stage curtain track and hardware.

B. Related Sections include:
   1. Section 05 50 00 "Metal Fabrications" for supplementary metal members supporting stage curtain systems.

1.3 REFERENCES

A. ASTM International (American Society for Testing and Materials):
   1. ASTM A 653: Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM B 221: Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

B. National Fire Protection Association (NFPA):
   1. NFPA 701: Fire Tests for Flame Propagation of Textiles and Films.

1.4 DEFINITIONS

A. UL: Underwriters Laboratories.

1.5 PERFORMANCE REQUIREMENTS

A. Structural Performance: Rigging shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Design Loads: Weight of curtains.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated.

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B. Shop Drawings: Show fabrication and installation details for stage curtains. Include plans, elevations, sections, details, attachments to other work, and the following:
   1. Operating clearances.
   2. Requirements for supporting curtains, track, and equipment. Verify capacity of each track and rigging component to support loads.

C. Samples for Initial Selection: For each type of stage curtain indicated. Include color charts showing the full range of colors, textures, and patterns available, together with a 12-inch-square sample (any color) of each type of fabric, for selection by Architect.
   1. Minimum number of colors for velour fabric: 36

D. Samples for Verification: For each type of fabric from dye lot to be used for the Work, with specified treatments applied, and showing complete pattern and texture repeat, if any. Mark top and face of fabric. Prepare Samples of size indicated below.
   1. Size: As required to show complete pattern repeat, but not less than 18-inches-square.

E. Delegated-Design Submittal: For rigging indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Qualification Data: For qualified Installer.

G. Product Certificates: For the following, from manufacturer.
   1. Fabric: Provide name of flame-retardant chemical used, identification of applicator, treatment method, application date, allowable life span for treatment, and details of any restrictions and limitations.
   2. Rigging: Compliance of suspended battens and tracks with requirements.

H. Operation and Maintenance Data: For stage curtains and rigging to include in maintenance manuals.

I. Warranty: Sample of special warranty.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of stage curtains.

B. Fire-Test-Response Characteristics: Provide stage curtains with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Flame-Resistance Ratings: NFPA 701.
      a. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or treated with flame-retardant chemicals, and whether it requires retreatment after designated time period or cleaning.

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C. Preinstallation Conference: Conduct conference at Project site to review methods, procedures, and other issues related to installation of stage curtains.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings and construction contiguous with stage curtains and rigging by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 CURTAIN FABRICS

A. General: Provide fabrics inherently and permanently flame resistant or chemically flame resistant by immersion treatment to comply with requirements indicated. Provide fabrics of each type and color from the same dye lot.

B. Woven Cotton Velour: Napped fabric of 100 percent cotton; 54-inch minimum width.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. KM Fabrics, Inc.; Memorable. 864·295·2550
   b. Equal product in accordance with Division 1 requirements for product substitutions.
2. Weight: 25 oz per linear yard (before flame-retardant treatment).
3. Fiber Content: 100 percent cotton.
4. Backing Ends: 40 per inch.
5. Picks: 32 per inch.
6. Pile Tufts: 640 per sq in.
7. Approximate Pile Height: 0.135-inch.
8. Width: 54-inches.
9. Flame Resistance: Reg. No. A-358/NFPA 701 Small.
10. Color: As specified in Section 09 06 00 "Colors and Finishes."

C. Lining: Yarn-dyed denim cloth of 100 percent cotton; woven in a warp-faced twill; 54-inch minimum width; black.

D. CALIFORNIA STATE FIRE MARSHALL CERTIFICATE CH101 REQUIRED FOR FR APPLIED TREATMENT.

2.2 CURTAIN FABRICATION

A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on curtain not visible to audience. Provide vertical seams, unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than one-half width.

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1. Vertical Hems: Provide vertical hems not less than 2 inches wide, with not less than a 1-inch tuck, and machine sew with no selvage material visible from front of curtain. Sew open ends of hems closed.
2. Leading Edge Turnbacks: Provide turnbacks formed by folding back not less than 12 inches of face fabric, with not less than a 1-inch tuck, and secure by sewing turnbacks vertically.
3. Top Hems: Reinforce top hems by double-stitching 3-1/2-inches wide, heavy jute webbing to top edge on back side of curtain with not less than 2 inches of face fabric turned under.
4. Pleats: Provide 50 percent fullness in curtains, exclusive of turnbacks and hems, by sewing additional material into 6-inch double-stitched box pleats sewn flat and spaced at 12 inches on center along top hem reinforcement.
5. Grommets: Brass, No. 3, centered on each box pleat and 1-inch from corner of curtain, for snaps or S-hooks.
    a. For black curtains, provide brass or aluminum grommets with black finish.
6. Bottom Hems: For curtains with fullness.
    a. For curtains that do not hang to the floor, provide hems not less than 3 inches deep with 3/4-inch weight tape. Sew open ends of hems closed.
    b. For floor-length curtains, provide hems not less than 6 inches deep with 1-inch weight tape sewn to the top seam of the bottom hem clear of the finished bottom edge. Sew open ends of hems closed.
7. Velour Curtains: Fabricate with the fabric nap down.
8. Lining: Provide lining for each velour curtain in same fullness as face fabric, and finished 2 inches shorter than face fabric. Sew or otherwise securely attach lining to top hem of face fabric. Attach lining to face fabric along bottom and side seams with 4-inch-long strips of heavy woven cotton tape.
9. S-Hooks: Manufacturer's standard heavy-duty plated-wire hooks, not less than 2 inches long.

2.3 ALUMINUM CURTAIN TRACK

A. Aluminum Track: Fabricate curtain tracks of 0.125-inch thick extruded aluminum consisting of I-beam with intermediate flange; complying with ASTM B 221; alloy and temper recommended by manufacturer for strength and corrosion resistance; mill finish. Provide end stops for track.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. H & H Specialties, Inc.; 300 Series.
    b. Tru-Roll, Inc.; Tru-Roll Model No. 2300.
    c. Equal product in accordance with Division 1 requirements for product substitutions.

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B. Curtain Carriers: Standard carriers with a pair of nylon-tired ball-bearing wheels riveted parallel to plated-steel body. Equip carriers with rubber or neoprene bumpers and nylon glide strips to reduce noise, and heavy-duty, plated-steel swivel eye for attaching curtain S-hook. Provide quantity of curtain carriers sufficient for track length, to suit curtain fabrication.

1. Master Curtain Carriers: One master curtain carrier, for each leading curtain edge, with two pairs of nylon-tired ball-bearing wheels riveted parallel to plated-steel body.

C. Clamp and Bracket Hangers: Manufacturer's steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.

D. Track Lap Clamp: Metal to match track channel for attaching double-sectioned track at center overlap.

E. Manual Operation: Fabricate curtain track with cord, pulleys, and floor block.

1. Operating Line: Manufacturer's standard 3/8-inch diameter, stretch-resistant operating cord consisting of braided synthetic-fiber jacket over solid, synthetic-fiber, linear filaments.
2. End Pulleys: One single dead-end and one double live-end pulley. Provide sheave with shielded ball bearings housed in a plated-steel body finished to match track. Provide with bracket for securing off-stage curtain end.
3. Floor Block: Sheave with shielded ball bearing housed in plated-steel body finish painted black.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions affecting performance of stage-curtain work. Examine inserts, clips, blocking, or other supports required to support tracks.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install stage-curtain system according to track manufacturer's and curtain fabricator's written instructions.

3.3 TRACK INSTALLATION

A. Ceiling-Mounted Tracks: Drill track at intervals not greater than manufacturer's written instructions for spacing, and fasten directly to structure.

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B. Beam-Mounted Tracks: Install tracks by suspending from manufacturer's special beam clamps securely mounted to I-beam structure at spacing, according to manufacturer's written instructions.

C. Spacing: Do not exceed the following dimensions between supports:

1. Medium-Duty Track: 48 inches.
2. Curved Walk-Along Track: 48 inches. Provide additional supports at curves and splices.

D Install track for center-parting curtains with not less than 24-inch overlap of track section at center, supported by special lap clamps.

3.4 CURTAIN INSTALLATION

A. Track Hung: Secure curtains to track carriers with S-hooks.

END OF SECTION 11 61 43

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SECTION 12 24 13

ROLLER SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Manually-operated roller shades with single rollers for windows.
   2. Manually-operated roller shades with double rollers for windows.
   3. Motorized roller shades with single rollers for windows.
   4. Motorized roller shades with double rollers for windows.
   5. Motorized roller shades for skylights.

B. Related Sections include:
   1. Section 05 41 00 "Cold-Formed Metal Framing" for concealed metal stud framing and backing in load-bearing metal stud-framed walls and soffits for mounting roller shades and accessories.
   2. Section 06 10 00 "Rough Carpentry" for concealed wood framing and blocking for mounting roller shades and accessories.
   3. Section 09 22 16 "Non-Load-Bearing Metal Framing" for concealed metal stud framing and backing in non-load-bearing metal stud-framed walls and soffits for mounting roller shades and accessories.
   4. Division 26 Sections for electrical service and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized shade operation.

1.3 REFERENCES

A. National Electrical Manufacturer's Association (NEMA):
   1. NEMA ICS 6: Industrial Control and Systems Enclosures

B. National Fire Protection Association (NFPA):
   1. NFPA 70: National Electrical Code.
   2. NFPA 701: Fire Tests for Flame-Resistant Textiles and Films.

C. Window Covering Safety Council (formerly Window Covering Manufacturer's Association, WCMA):

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1. WCMA A100.1: Safety of Corded Window Covering Products (ANSI).

1.4 COORDINATION

A. Coordinate sizes and locations of concealed framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that roller shades can be supported and installed as indicated.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
   2. Motors: Show nameplate data, ratings, characteristics, electrical power requirements, and mounting arrangements.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
   1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.
      a. Indicate integration of motor controllers with energy management, lighting control, and audio-visual systems, as applicable.

C. Samples for Initial Selection: For each colored component of each type of shade indicated, submit manufacturer's full range of colors for selection by Architect for the following:
   1. Shadeband material:
      a. Minimum Number of Colors for Selection: ***[8]***.

D. Samples for Verification:
   1. For each color and pattern of the following:
      a. Shadeband Material: Not less than 10 inches square. Mark inside face of material if applicable.
      b. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
      c. Exposed metal finishes, 4 inches by 4 inches on same metal used for fabrication of unit.

E. Roller Shade Schedule: Use same designations indicated on Drawings, and include opening sizes.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

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B. Product Certificates: For each type of shadeband material, signed by product manufacturer.

C. Product Test Reports: For each type of shadeband material, for tests performed by a qualified testing agency.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roller shades to include in maintenance manuals. Include the following.

1. Methods for maintaining roller shades and finishes.
2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
3. Operating hardware.
4. Motorized shade operator.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Roller Shades: Full-size units equal to ***[5]*** percent of quantity installed for each size, color, and pattern of shadeband material indicated, but no fewer than ***[two]*** units.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Firm experienced in installing roller shades, with a 5 year minimum record of successful in-service performance, and employing workers trained and approved by manufacturer.

B. Source Limitations: Obtain roller shades through one source from a single manufacturer.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer and product name, and location of installation using same designations indicated on Drawings.

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1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when completed for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace roller shade units that fail in materials or workmanship within specified warranty period.
   1. Roller Shade Hardware, Chain, and Shade Band Material:
      a. Warranty Period: 25 years from date of Substantial Completion.
   2. Roller Shade Motors and Control Systems:
      a. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUALLY-OPERATED SINGLE-ROLLER SHADES

A. General: Manufacturer's complete system for manually operated single-roller window shades, including operator, operating hardware, and accessories.
   1. Subject to compliance with requirements, provide one of the following:
      a. MechoSystems, Inc.; Mecho/5.
      b. Equal product in accordance with Division 1 requirements for product substitutions.

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead-chain and clutch that stops shade movement when bead-chain is released; permanently adjusted and lubricated.
   1. Bead-Chains: Stainless-steel.
      a. Loop Length: Length required to make operation from convenient from floor level, but not less than full length of roller shade.
      b. Limit Stops: Provide upper and lower ball stops.
      c. Chain-Retainer: Manufacturer's standard plastic wall- or jamb-mounted retaining clip, designed for securing bead-chain when shades are not being operated.

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C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shadeband material without deflection; designed to be easily removable from support brackets. Provide capacity for one roller shade band per roller, unless otherwise indicated. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-end Location: Right side of inside face of shade, as determined by hand of user facing shade from inside, unless project conditions dictate left side installation, or indicated otherwise.
2. Direction of Shadeband Roll: Regular from back of roller.
3. Shadeband-to-Roller Attachment: Removable spline fitting integral channel in tube, allowing shadeband removal without removal of roller from brackets.

D. Mounting Hardware: Brackets or endcaps, minimum 1/8-inch thick steel, corrosion resistant and compatible with roller assembly, operating mechanisms, installation accessories, and installation locations and conditions indicated.

1. Mounting: ***[Inside] [Outside] [Ceiling] [Recessed in ceiling pocket] [As indicated on Drawings]***; permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated with one roller drive-end assembly.

F. Shadebands:

1. Shadeband Material:
   a. At Light-Transmitting Shades: Light-filtering fabric.
   b. At Light-Blocking Shades: Light-blocking fabric.
2. Shadeband Bottom (Hem) Bar:
   a. At Light-Transmitting Shades: Steel or extruded aluminum enclosed in sealed pocket of shadeband material.
   b. At Light-Blocking (Blackout) Shades: Extruded aluminum with endcaps and integral light seal.
      i) Color***: [As selected from manufacture's full range] [clear anodized] [black] [white]***.

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L-shaped.
   b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches.

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c. Color: Manufacturer's standard white.

i) Sheen: Semi-gloss.

[or]

d. Color: Custom color to match ***[Dunn-Edwards #DE6388 Smoky Mountain]***.

i) Sheen: Semi-gloss.

2. Endcap Covers: To cover exposed endcaps.

a. Color: Matching ***[fascia] [headbox]***.

3. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.

a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 4 inches.

b. Provide pocket with lip at lower edge to support acoustical ceiling panel.

c. Provide factory-formed and welded corner section where recessed shade pockets meet at corners.

d. Color: Manufacturer's standard white.

i) Sheen: Semi-gloss.

[or]

e. Color: Custom color to match ***[Dunn-Edwards #DE6388 Smoky Mountain]***.

i) Sheen: Semi-gloss.

4. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket for snap-in attachment to wall clip without fasteners.

a. Color: Manufacturer's standard white.

i) Sheen: Semi-gloss.

[or]

b. Color: Custom color to match ***[Dunn-Edwards #DE6388 Smoky Mountain]***.

i) Sheen: Semi-gloss.

5. Light-Blocking Shades: Design roller shades for eliminating all visible light gaps when shades are fully closed.

a. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.

i) Color: ***[As selected from manufacture's full range] [clear anodized] [black] [white]***.

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2.2 MANUALLY-OPERATED DOUBLE-ROLLER SHADES

A. General: Manufacturer's complete system for manually operated double-roller window shades, including operators, operating hardware, and accessories.
   1. Subject to compliance with requirements, provide one of the following:
      a. MechoSystems, Inc.; Mecho/5 DoubleShades.
      b. Equal product in accordance with Division 1 requirements for product substitutions.

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead-chain and clutch that stops shade movement when bead-chain is released; permanently adjusted and lubricated.
   1. Bead-Chains: Stainless-steel.
      a. Loop Length: Length required to make operation from convenient from floor level, but not less than full length of roller shade.
      b. Limit Stops: Provide upper and lower ball stops.
      c. Chain-Retainer: Manufacturer's standard plastic wall- or jamb-mounted retaining clip, designed for securing bead-chain when shades are not being operated.

C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shadeband material without deflection; designed to be easily removable from support brackets. Provide capacity for one roller shade band per roller, unless otherwise indicated. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
   1. Double-Roller Mounting Configuration: Offset, outside roller over and inside roller under.
   2. Inside Roller:
      a. Drive-end Location: Right side of inside face of shade, as determined by hand of user facing shade from inside, unless project conditions dictate left side installation, or indicated otherwise.
      b. Direction of Shadeband Roll: Regular, from back of roller.
   3. Outside Roller:
      a. Drive-end Location: Right side of inside face of shade, as determined by hand of user facing shade from inside, unless project conditions dictate left side installation, or indicated otherwise.
      b. Direction of Shadeband Roll: Regular, from back of roller.
   4. Shadeband-to-Roller Attachment: Removable spline fitting integral channel in tube, allowing shadeband removal without removal of roller from brackets.

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D. Mounting Hardware: Brackets or endcaps, minimum 1/8-inch thick steel, corrosion resistant and compatible with roller assembly, operating mechanisms, installation accessories, and installation locations and conditions indicated.

1. Mounting: ***[Inside] [Outside] [Ceiling] [Recessed in ceiling pocket] [As indicated on Drawings]***; permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated with one roller drive-end assembly.

F. Inside Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum enclosed in sealed pocket of shadeband material.

G. Outside Shadebands:

1. Shadeband Material: Light-blocking fabric.
2. Shadeband Bottom Bar: Extruded aluminum with endcaps and integral light seal.
   a. Color***: [As selected from manufacture's full range] [clear anodized] [black] [white]***.

H. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L-shaped.
   b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches.
   c. Color: Manufacturer's standard white.
      i) Sheen: Semi-gloss.

   [or]

   d. Color: Custom color to match ***[Dunn-Edwards #DE6388 Smoky Mountain]***.
      i) Sheen: Semi-gloss.
2. Endcap Covers: To cover exposed endcaps.
   a. Color: Matching ***[fascia] [headbox]***.
3. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
   a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 4 inches.

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b. Provide pocket with lip at lower edge to support acoustical ceiling panel.

c. Provide factory-formed and welded corner section where recessed shade pockets meet at corners.

d. Color: Manufacturer's standard white.

i) Sheen: Semi-gloss.

[or]

e. Color: Custom color to match ***[Dunn-Edwards #DE6388 Smoky Mountain]***.

i) Sheen: Semi-gloss.

4. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket for snap-in attachment to wall clip without fasteners.

a. Color: Manufacturer's standard white.

i) Sheen: Semi-gloss.

[or]

b. Color: Custom color to match ***[Dunn-Edwards #DE6388 Smoky Mountain]***.

i) Sheen: Semi-gloss.

5. Light-Blocking Shades: Design roller shades for eliminating all visible light gaps when shades are fully closed.

a. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.

i) Color: ***[As selected from manufacture's full range] [clear anodized] [black] [white]***.

2.3 MOTOR-OPERATED SINGLE-ROLLER SHADES

A. General: Manufacturer's complete system for motor-operated single-roller window shades, including operator, operating hardware, and accessories.

1. Subject to compliance with requirements, provide the one of the following:

a. MechoSystems, Inc.; ElectroShade Series.

b. Equal product in accordance with Division 1 requirements for product substitutions.

B. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

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1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Electric Motor: Manufacturer's standard, tubular, enclosed in roller.
    a. Electrical Characteristics: Single phase, 110V, 60 Hz.
        i) Maximum Current Draw: 2.3 amps.
3. Where more than one motorized roller shade occurs in room, all motors in room to be rated at same speed.
4. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:
    a. Individual Switch Control Station with Preset Shade Positions: Momentary-contact, five-button wall-switch-operated control station with fully open, fully closed, and three pre-set partially closed position functions.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel] [Match typical electrical wallplate color in room]***.
    b. Individual Switch Control Station: Momentary-contact, three-position, rocker-style,wall-switch-operated control station with open, close, and center off functions.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel] [Match typical electrical wallplate color in room]***.
    c. Individual Keyed Control Station: Keyed momentary-contact, three-position, switch-operated control station with open, close, and off functions. Provide two keys per station.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel] [Match typical electrical wallplate color in room]***.
    d. Group Control Station with Preset Shade Positions: Momentary-contact, five-button wall-switch-operated control station with fully open, fully closed, and three pre-set partially closed position functions for single-switch group control.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel] [Match typical electrical wallplate color in room]***.
    e. Group Control Station: Momentary-contact, three-position, rocker-style, wall-switched-operated control station with open, close, and center off functions for single-switch group control.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel] [Match typical electrical wallplate color in room]***.
    f. Group Keyed Control Station: Keyed momentary-contact, three-position, switch-operated control station with open, close, and off functions. for single-switch group control. Provide two keys per station.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel] [Match typical electrical wallplate color in room]***.

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g. Individual/Group Control Station: Momentary-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for individual and group control.

i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel] [Match typical electrical wallplate color in room]***.

h. Sun Sensor Control: Adjustable system consisting of digital displays detecting sun intensity and responding by automatically adjusting shades.

i. Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features; isolated from voltage spikes and surges.

5. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.

6. Operating Features:

a. Group Switching with integrated switch control; single faceplate for multiple switch cutouts.

b. Capable of interface with audio-visual control system.

c. Capable of accepting input from building automation control system.

d. Override switch.

C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shadeband material without deflection; designed to be easily removable from support brackets. Provide capacity for one roller shade band per roller, unless otherwise indicated. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-end Location: Right side of inside face of shade, as determined by hand of user facing shade from inside, unless project conditions dictate left side installation, or indicated otherwise.

2. Direction of Shadeband Roll: Regular from back of roller.

3. Shadeband-to-Roller Attachment: Removable spline fitting integral channel in tube, allowing shadeband removal without removal of roller from brackets.

D. Mounting Hardware: Brackets or endcaps, minimum 1/8-inch thick steel, corrosion resistant and compatible with roller assembly, operating mechanisms, installation accessories, and installation locations and conditions indicated.

1. Mounting: ***[Inside] [Outside] [Ceiling] [Recessed in ceiling pocket] [As indicated on Drawings]***; permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated with one roller drive-end assembly.

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F. Shadebands:

1. Shadeband Material:
   a. At Light-Transmitting Shades: Light-filtering fabric.
   b. At Light-Blocking Shades: Light-blocking fabric.
2. Shadeband Bottom (Hem) Bar:
   a. At Light-Transmitting Shades: Steel or extruded aluminum enclosed in sealed pocket of shadeband material.
   b. At Light-Blocking (Blackout) Shades: Extruded aluminum with endcaps and integral light seal.
      i) Color***: [As selected from manufacture's full range] [clear anodized] [black] [white]***.

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L-shaped.
   b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches.
   c. Color: Manufacturer's standard white.
      i) Sheen: Semi-gloss.

   [or]

   d. Color: Custom color to match ***[Dunn-Edwards #DE6388 Smoky Mountain]***.
      i) Sheen: Semi-gloss.
2. Endcap Covers: To cover exposed endcaps.
   a. Color: Matching ***[fascia] [headbox]***.
3. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
   a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 4 inches.
   b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
   c. Provide factory-formed and welded corner section where recessed shade pockets meet at corners.
   d. Color: Manufacturer's standard white.
      i) Sheen: Semi-gloss.

   [or]

   e. Color: Custom color to match ***[Dunn-Edwards #DE6388 Smoky Mountain]***.

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i) Sheen: Semi-gloss.

4. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket for snap-in attachment to wall clip without fasteners.
   a. Color: Manufacturer's standard white.
      i) Sheen: Semi-gloss.

   [or]

   b. Color: Custom color to match ***[Dunn-Edwards #DE6388 Smoky Mountain]***.
      i) Sheen: Semi-gloss.
5. Light-Blocking Shades: Design roller shades for eliminating all visible light gaps when shades are fully closed.
   a. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
      i) Color: ***[As selected from manufacture's full range] [clear anodized] [black] [white]***.

2.4 MOTOR-OPERATED DOUBLE-ROLLER SHADES

A. General: Manufacturer's complete system for motor-operated double-roller window shades, including operator, operating hardware, and accessories.
   1. Subject to compliance with requirements, provide one of the following:
      a. MechoSystems, Inc.; ElectroShade Series DoubleShades.
      b. Equal product in accordance with Division 1 requirements for product substitutions.

B. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
   1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Electric Motor: Manufacturer's standard, tubular, enclosed in roller.
      a. Electrical Characteristics: Single phase, 110V, 60 Hz.
         i) Maximum Current Draw: 2.3 amps.
   3. Where more than one motorized roller shade occurs in room, all motors in room to be rated at same speed.

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4. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:
    a. Individual Switch Control Station with Preset Shade Positions: Momentary-contact, five-button wall-switch-operated control station with fully open, fully closed, and three pre-set partially closed position functions.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel] [Match typical electrical wallplate color in room]***.
    b. Individual Switch Control Station: Momentary-contact, three-position, rocker-style,wall-switch-operated control station with open, close, and center off functions.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel] [Match typical electrical wallplate color in room]***.
    c. Individual Keyed Control Station: Keyed momentary-contact, three-position, switch-operated control station with open, close, and off functions. Provide two keys per station.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel] [Match typical electrical wallplate color in room]***.
    d. Group Control Station with Preset Shade Positions: Momentary-contact, five-button wall-switch-operated control station with fully open, fully closed, and three pre-set partially closed position functions for single-switch group control.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel] [Match typical electrical wallplate color in room]***.
    e. Group Control Station: Momentary-contact, three-position, rocker-style, wall-switched-operated control station with open, close, and center off functions for single-switch group control.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel] [Match typical electrical wallplate color in room]***.
    f. Group Keyed Control Station: Keyed momentary-contact, three-position, switch-operated control station with open, close, and off functions. for single-switch group control. Provide two keys per station.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel] [Match typical electrical wallplate color in room]***.
    g. Individual/Group Control Station: Momentary-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for individual and group control.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel] [Match typical electrical wallplate color in room]***.
    h. Sun Sensor Control: Adjustable system consisting of digital displays detecting sun intensity and responding by automatically adjusting shades.

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i. Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features; isolated from voltage spikes and surges..

5. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.

6. Operating Features:

a. Group Switching with integrated switch control; single faceplate for multiple switch cutouts.

b. Capable of interface with audio-visual control system.

c. Capable of accepting input from building automation control system.

d. Override switch.

C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shadeband material without deflection; designed to be easily removable from support brackets. Provide capacity for one roller shade band per roller, unless otherwise indicated. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Double-Roller Mounting Configuration: Offset, outside roller over and inside roller under.

2. Inside Roller:

a. Drive-end Location: Right side of inside face of shade, as determined by hand of user facing shade from inside, unless project conditions dictate left side installation, or indicated otherwise.

b. Direction of Shadeband Roll: Regular, from back of roller.

3. Outside Roller:

a. Drive-end Location: Right side of inside face of shade, as determined by hand of user facing shade from inside, unless project conditions dictate left side installation, or indicated otherwise.

b. Direction of Shadeband Roll: Regular, from back of roller.

4. Shadeband-to-Roller Attachment: Removable spline fitting integral channel in tube, allowing shadeband removal without removal of roller from brackets.

D. Mounting Hardware: Brackets or endcaps, minimum 1/8-inch thick steel, corrosion resistant and compatible with roller assembly, operating mechanisms, installation accessories, and installation locations and conditions indicated.

1. Mounting: ***[Inside] [Outside] [Ceiling] [Recessed in ceiling pocket] [As indicated on Drawings]***; permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

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E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated with one roller drive-end assembly.

F. Inside Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum enclosed in sealed pocket of shadeband material.

G. Outside Shadebands:

1. Shadeband Material: Light-blocking fabric.
2. Shadeband Bottom (Hem) Bar: Extruded aluminum with endcaps and integral light seal.
   a. Color: ***[As selected from manufacture's full range] [clear anodized] [black] [white].***

H. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L-shaped.
   b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 4 inches.
   c. Color: Manufacturer's standard white.
      i) Sheen: Semi-gloss.

   [or]

   d. Color: Custom color to match ***[Dunn-Edwards #DE6388 Smoky Mountain].***
      i) Sheen: Semi-gloss.
2. Endcap Covers: To cover exposed endcaps.
   a. Color: Matching ***[fascia] [headbox].***
3. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
   a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 4 inches.
   b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
   c. Provide factory-formed and welded corner section where recessed shade pockets meet at corners.
   d. Color: Manufacturer's standard white.
      i) Sheen: Semi-gloss.

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[or]

e. Color: Custom color to match ***[Dunn-Edwards #DE6388 Smoky Mountain]***.

i) Sheen: Semi-gloss.

4. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket for snap-in attachment to wall clip without fasteners.

a. Color: Manufacturer's standard white.

i) Sheen: Semi-gloss.

[or]

b. Color: Custom color to match ***[Dunn-Edwards #DE6388 Smoky Mountain]***.

i) Sheen: Semi-gloss.

5. Light-Blocking Shades: Design roller shades for eliminating all visible light gaps when shades are fully closed.

a. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.

i) Color: ***[As selected from manufacture's full range] [clear anodized] [black] [white]***.

2.5 MOTOR-OPERATED SKYLIGHT ROLLER SHADES

A. General: Manufacturer's complete system for motor-operated tensioned roller shades, including operator, operating hardware, and accessories.

1. Subject to compliance with requirements, provide one of the following:

a. MechoSystems, Inc.; Flat SkyLighter Roller Shade, ElectroShade Series.

i) Contact: Julie Trautman, MechoSystems, (650) 728-2100.

b. Equal product in accordance with Division 1 requirements for product substitutions.

B. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

1. System Type: Two-roller, two-motor system, one for shadeband roll-up, one for cable take-up.

2. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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3. Electric Motor: Manufacturer's standard, tubular, enclosed in roller.
    a. Electrical Characteristics: Single phase, 110V, 60 Hz.
        i) Maximum Current Draw: 2.3 amps.
4. Where more than one motorized skylight roller shade occurs in room, all motors in room to be rated at same speed.
5. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:
    a. Individual Switch Control Station with Preset Shade Positions: Momentary-contact, five-button wall-switch-operated control station with fully open, fully closed, and three pre-set partially closed position functions.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel]***.
    b. Individual Switch Control Station: Momentary-contact, three-position, rocker-style,wall-switch-operated control station with open, close, and center off functions.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel]***.
    c. Individual Keyed Control Station: Keyed momentary-contact, three-position, switch-operated control station with open, close, and off functions. Provide two keys per station.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel]***.
    d. Group Control Station with Preset Shade Positions: Momentary-contact, five-button wall-switch-operated control station with fully open, fully closed, and three pre-set partially closed position functions for single-switch group control.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel]***.
    e. Group Control Station: Momentary-contact, three-position, rocker-style, wall-switched-operated control station with open, close, and center off functions for single-switch group control.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel]***.
    f. Group Keyed Control Station: Keyed momentary-contact, three-position, switch-operated control station with open, close, and off functions. for single-switch group control. Provide two keys per station.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel]***.
    g. Individual/Group Control Station: Momentary-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for individual and group control.
        i) Wallplate Color/Finish: ***[White] [Ivory] [Stainless-steel]***.
    h. Sun Sensor Control: Adjustable system consisting of digital displays detecting sun intensity and responding by automatically adjusting shades.

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i. Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features; isolated from voltage spikes and surges.

6. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully open and fully closed positions.

7. Operating Features:

   a. Group Switching with integrated switch control; single faceplate for multiple switch cutouts.

   b. Capable of interface with audio-visual control system.

   c. Capable of accepting input from building automation control system.

   d. Override switch.

C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shadeband material without deflection; designed to be easily removable from support brackets. Provide capacity for one roller shade band per roller, unless otherwise indicated. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Direction of Shadeband Roll: Regular from back of roller.

2. Shadeband-to-Roller Attachment: Removable spline fitting integral channel in tube, allowing shadeband removal without removal of roller from brackets.

D. Shadeband Retention System: Manufacturer's standard design for guiding shadeband material through range of travel and holding shadeband flat and taut with edges of material within side channels and firmly attached to cables or wires; including concealed battens or rods connected to fabric guides or exposed idler rollers for stiffening shadeband material across glazed opening.

E. Mounting Hardware: Corrosion-resistant, minimum 1/8-inch thick steel, and compatible with operating mechanism, installation accessories, and mounting location and conditions indicated.

F. Shadebands:

1. Shadeband Material:

   a. At Light-Transmitting Shades: Light-filtering fabric.

   b. At Light-Blocking Shades: Light-blocking fabric.

2. Shadeband Bottom (Hem) Bar: Manufacturer's standard for operating mechanism indicated.

   a. At Light-Transmitting Shades: Enclosed in sealed pocket of shadeband material.

   b. At Light-Blocking (Blackout) Shades: Exposed with endcaps and integral light seal for fitting into sill channel.

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G. Installation Accessories:

1. Exposed Headboxes and Bottom Boxes: Rectangular, extruded-aluminum enclosure including front fasciae, top and back covers, endcaps, and removable closures.
   a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open.
   b. Color: Manufacturer's standard white.
      i) Sheen: Semi-gloss.

   [or]

   c. Color: Custom color to match ***[Dunn-Edwards #DE6388 Smoky Mountain]***.
      i) Sheen: Semi-gloss.
2. Channels or Angles: Manufacturer's standard design for operating mechanism indicated and shadeband take-up and support.
   a. Color: Manufacturer's standard white.
      i) Sheen: Semi-gloss.

   [or]

   b. Color: Custom color to match ***[Dunn-Edwards #DE6388 Smoky Mountain]***.
      i) Sheen: Semi-gloss.
3. Light-Blocking Shades: Design roller shades for eliminating all visible light gaps when shades are fully closed.
   a. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn closed. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
      i) Color: ***[As selected from manufacture's full range] [clear anodized] [black] [white]***.

2.6 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric – Type 1: Woven fabric, non-reversible face, stain- and fade-resistant.
   1. Source: Roller shade manufacturer
      a. Product: MechoSystems; ThermoVeil Dense Basket Weave 1500 Series.
   2. Type: Woven PVC-coated polyester.
   3. Weave: Basketweave.
   4. Thickness: 0.030 inch.

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5. Roll Widths: 63 inches, 96 inches, and 126 inches.
6. Orientation on Shadeband: Up the bolt, except as follows.
    a. Where width of shadeband exceeds width of largest available roll, fabric to be railroaded with least number of seams possible.
7. Openness Factor: 3 percent.
8. Color: As selected from manufacturer's full range.
    a. For bidding purposes, assume ***[two]*** separate colors, in equal quantities for each color.

[or]

9. Color***[s]***:
    a. RS-1: ***[MechoSystems #1501 White]***.
    b. RS-2: ***[MechoSystems #1502 Beige]***.

[or]

10. Color***[s]***: As specified in Section 09 06 00 "Colors and Finishes."

C. Light-Filtering Fabric – Type 2: Woven fabric, reversible-face, stain- and fade-resistant.
1. Source: Roller shade manufacturer
    a. Product: MechoSystems; EuroTwill Reversible Weave 6000 Series.
2. Type: Woven PVC-coated polyester.
3. Weave: Basketweave.
4. Thickness: 0.025 inch.
5. Roll Widths: 63 inches and 96 inches.
6. Orientation on Shadeband: Up the bolt, except as follows.
    a. Where width of shadeband exceeds width of largest available roll, fabric to be railroaded with least number of seams possible.
7. Openness Factor: 3 percent.
8. Color: As selected from manufacturer's full range.
    a. For bidding purposes, assume ***[two]*** separate reversible shadeband color sets in equal quantities.

[or]

9. Color***[s]***:
    a. RS-1:
        i) Room-Facing Side: ***[MechoSystems #6017 Sandalwood]***.
        ii) Window-Facing Side: ***[MechoSystems #6001 White]***.
    b. RS-2:
        i) Room-Facing Side: ***[MechoSystems #6009 Dove Grey]***.
        ii) Window-Facing Side: ***[MechoSystems #6001 White]***.

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[or]

10. Color***[s]***: As specified in Section 09 06 00 "Colors and Finishes."

D. Light-Blocking Fabric (Blackout Fabric): Opaque fabric, stain- and fade-resistant.

1. Source: Roller shade manufacturer
    a. Product: MechoSystems; Midnight Blackout 0200 Series.
2. Type: Polyester yarns, PVC-free, with acrylic backing.
3. Thickness: 0.008 inch.
4. Roll Width: 126 inches.
5. Orientation on Shadeband: Up the bolt, except as follows.
    a. Where width of shadeband exceeds width of largest available roll, fabric to be railroaded with least number of seams possible.
6. Features: Washable.
7. Openness Factor: 0 percent (opaque).
8. Color: As selected from manufacturer's full range.
    a. For bidding purposes, assume ***[two]*** separate colors, in equal quantities for each color.

[or]

9. Color***[s]***:
    a. RS-3: ***[MechoSystems #0202 Ice]***.
    b. RS-4: ***[MechoSystems #0208 Napa]***.

[or]

10. Color***[s]***: As specified in Section 09 06 00 "Colors and Finishes."

2.7 ACCESSORY MATERIALS

A. Paint: Manufacturer's paint as recommended by roller shade manufacturer for application to exposed aluminum surfaces of roller shade unit.

1. Color: ***[Custom color to match paint chip provided by Architect] [Match (insert paint manufacturer's color designation)]***.
2. Sheen: Semi-gloss.

2.8 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less than 1/4 inch per side or 1/2-inch total,

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plus or minus 1/8 inch. Length equal to head-to-sill or –floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.

2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than manufacturer's written recommendations, but not less than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion or the material.
2. Skylight Shades: Provide battens and seams at uniform spacings along shadeband as required to ensure shadeband tracking and alignment through its full range of movement without distortion or sag of material.
3. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

D. Fabricate roller shade to allow removal of rollers from brackets without removal of brackets and other hardware from window opening or ceiling pocket.

E. Factory-Applied Color Finishes: For metal components exposed to view, apply manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Electrical Connections: Connect motorized operators to building electrical system.

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C. Apply paint to exposed surfaces of roller shade units according to paint manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as recommended in writing by paint manufacturer.
3. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 12 24 13

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SECTION 12 32 14

MANUFACTURED DISPLAY SHELVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes a wall-anchored manufactured shelving unit.

B. Related Sections include:

1. Section 06 10 00 "Rough Carpentry" for concealed wood blocking in wood stud-framed walls for anchoring wall-mounted art display system.

1.3 COORDINATION

A. Coordinate sizes and locations of concealed framing, blocking, backing, furring, reinforcements, and other related Work specified in other Sections to ensure that art display system can be supported and installed as indicated.

1.4 ACTION SUBMITALS

A. Product Data: For manufactured display shelving units. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions for delivery, storage, and handling of manufactured display shelving units.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not install manufactured display shelving units until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are at levels to be maintained after building is occupied.

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PART 2 - PRODUCTS

2.1 DISPLAY SHELVING UNIT

A. Manufactured Shelving Unit: Premanufactured shelving unit consisting of five fixed shelves supported by two inclined vertical end frame members at front corner of shelves; depth of shelves varies with incline of vertical end frame, such that back edge of each shelf extends back to wall; anchored to wall at top portion of frame.

1. Product: Crate & Barrel; Sawyer Mocha Leaning 24.5" Bookcase.
2. Dimensions: 24-1/2 inches wide by 14-1/2 inches deep by 76-14 inches high.
3. Material:
    a. Frame: Solid mahogany.
    b. Shelves: Mahogany veneer over engineered wood.
4. Loading Capacity: 40 lbs per shelf.
5. Finish: Mocha.

B. Accessories:

1. Fasteners: Manufacturer's standard fasteners of type and length suitable for substrate and backing being fastened to.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking/backing and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install manufactured display shelving units in accordance with manufacturer's written instructions, in locations indicated. Provide clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

B. Install units level, plumb, and firmly anchored in locations and at heights indicated, using fasteners appropriate to substrate indicated and recommended by manufacturer.

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3.3 CLEANING

A. Clean exposed surfaces as recommended by manufacturer.

END OF SECTION 12 32 14

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SECTION 12 52 19

UPHOLSTERED SEAT CUSHIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Upholstered seat cushions.

B. Related Sections include:
   1. Section 06 20 00 "Finish Carpentry" for built-in benches to receive upholstered seat cushions.

1.3 REFERENCES

A. ASTM International:
   1. ASTM D 3453: Standard Specification for Flexible Cellular Materials – Urethane for Furniture and Automotive Cushioning, Bedding, and Similar Applications.
   2. ASTM D 3574: Standard Test Methods for Flexible Cellular Materials – Slab, Bonded, and Molded Urethane Foams.

B. California Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation:
   1. Technical Bulletin 117: Requirements, Test Procedure, and Apparatus for Testing the Flame Retardance of Resilient Filling Materials Used in Upholstered Furniture.
   2. Technical Bulletin 133: Flammability Test Procedure for Seating Furniture for Use in Public Occupancies.

1.4 COORDINATION

A. Coordinate layout, fabrication, and installation of upholstered seat cushions with construction of substrates to receive upholstered cushions.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

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B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Cushion Layout: Show layout and dimensions of cushions, including direction of fabric weave and pattern matching.

C. Samples for Initial Selection: For upholstery fabrics, submit manufacturer's full range of colors/patterns for selection by Architect.
   1. Minimum Number of Colors for Selection: 16

D. Samples for Verification:
   1. Fabric: For each type and color/pattern of fabric, full width by 24-inch long section of fabric from dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.
   2. Foam Padding: For each type and thickness of foam padding, 12-inches by 12-inches.

1.6 INFORMATIONAL SUBMITTALS

A. Installer's Qualification Data: For fabricator and installer of upholstered seat cushions.

B. Product Certificates:
   1. For each fabric treated with flame retardant, signed by fabric supplier and indicating treatment durability and cleaning procedures required to maintain treatment effectiveness.
   2. For cushion pads, signed by manufacturer, and certifying that material complies with specified requirements.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For products to include in maintenance manuals.
   1. Include methods for maintaining upholstery fabric.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fabrics: For each fabric color and pattern indicated, from the same product run, full-width lengths equal to 5 percent of amount installed, but no fewer than 10 yards of each fabric, color, and pattern.

1.9 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications: A firm experienced in the fabrication and installation of upholstered seat cushions as indicated for this Project, and with a record of successful in-service performance, and which employs skilled workers qualified to perform such work.

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B. Mockup: Build mockup to verify selections made under Sample submittals, and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation, and standard of workmanship.

1. Build mockup of one upholstered seat unit.
2. Maintain mockup during construction in an undisturbed condition as a standard for judging the completed Work.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Follow manufacturers' written instructions for delivery, storage, and handling of upholstered seat cushion materials.

B. Do not deliver upholstered seat cushion materials until after other finish work, including painting, is complete and spaces are otherwise ready for occupancy.

1.11 FIELD CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before upholstered seat cushion fabrication, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics of Upholstered Seat Cushions:

1. Fabric: Comply with California Technical Bulletin 117-2013.
2. Padding and Wrapping: Comply with California Technical Bulletin 117-2013.
3. Full-Scale Fire Test: Comply with California Technical Bulletin 133.

2.2 UPHOLSTERED SEATING CUSHIONS

A. Seat Cushion Fabric: Manufacturer's 100 percent solution-dyed polyolefin, with flame-retardant, stain-resistant and antimicrobial treatments.

1. Product: Carnegie
   a. Color: As specified in Section 09 06 00 "Colors and Finishes."
2. Width: 54 inches.
3. Weight: 15 oz per lineal yard.
4. Abrasion: No wear after 70,000 double-rubs.

B. Cushion Pad: Open-cell polyurethane foam, meeting the following:

1. Physical Characteristics: As follows, according to ASTM D 3574:
   a. Seat:

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i) Density: 3.1 lbs per cubic foot.

ii) Indentation Force Deflection: 33 lbs/50 sq inches at 25 percent deflection on 4-inch thick specimen.

b. Seat Backs:

i) Density: 2.4 lbs per cubic foot.

ii) Indentation Force Deflection: 26 lbs/50 sq inches at 25 percent deflection on 4-inch thick specimen

2. Pounding-Fatigue Performance: As follows, according to ASTM D 3453:

a. Seats: Grade AP (heavy-duty use).

b. Seat Backs: Grade BP (normal duty use).

3. Padding Thickness:

a. Seat: 3 inches.

C. Cushion Pad Wrapping: X-Protect Sit.

1. Manufacturer: Carnegie.

2.3 FABRICATION

A. Laminate cushion pad wrapping to padding for full bonding.

B. Fit seat cushion fabric covers to snugly cover cushion pad, free of welts, creases, stretch lines, sages, wrinkles, sags, and ripples. Attach material so there are no exposed fasteners or seams or gathering of materials.

1. Fabricate cushion cover to removal from cushion pad for cleaning.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install upholstered seat cushions in accordance with manufacturer's written instructions.

B. Install seat cushions as indicated, and in alignment and fitted to adjacent construction. Attach material so there are no exposed fasteners or seams or gathering of materials.

1. Install seat cushions in manner which facilitates removal and replacement.

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3.3 CLEANING AND PROTECTION

A. Provide protection and maintain conditions, in a manner acceptable to Installer, to ensure that upholstered seating is without damage or deterioration at time of Substantial Completion.

B. Clean upholstered seating cushions according to fabric manufacturer's written instructions.

END OF SECTION 12 52 19

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SECTION 14 20 00

LIMITED USE LIMITED APPLICATION ELEVATOR

PART 1 GENERAL

1.1 SECTION INCLUDES

A. LULA Elevator.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-in-Place Concrete.

B. Section 06 10 00 – Rough Carpentry.

C. Section 08 10 00 – Doors and Frames.

D. Section 09 21 16 – Gypsum Board Assemblies.

E. Section 09 60 00 – Flooring.

F. Section 28 36 33 – Water Detection Sensors.

G. Division 16 – Electrical.

1. Electrical service and disconnects.

2. Wire routing and connections.

3. Telephone service.

1.3 REFERENCES

A. ASME A17.1 / CSA B44 – Safety Code for Elevators and Escalators.

B. NFPA 70 – National Electric Code.

C. CSA C22.1 – Canadian Electric Code.

D. ICC/ANSI A117.1 – Accessible and Usable Buildings and Facilities.

E. Local state, province, city, township applicable codes.

1.4 REGULATORY REQUIREMENTS

A. Obtain approvals from local jurisdiction authority.

B. Complete work in compliance with national and local codes as listed in 1.3.

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1.5 SUBMITTALS

A. Submit under provisions of 01 30 00.

B. Product Information.

1. Site preparation instructions.

2. Freight receiving, handling, and storage instructions.

3. Installation methods.

C. Shop Drawings.

1. Plan view with finished dimensions.

2. Elevation view with travel distances and anchor locations.

3. Isometric view showing orientation of openings.

4. Machine room details.

5. Electrical requirements.

D. Finish Selection.

1. Make finish selections available digitally and physically.

2. Provide video with 3D virtual walk thru showing elevator with selected finishes.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products (unopened) until installation.

B. Store products in covered, dry location.

C. Protect products from theft and vandalism.

1.7 PROJECT CONDITIONS

A. Elevator may not be used for hoisting materials and personnel during construction period.

1.8 WARRANTY

A. Provide a 3-Year Warranty on mechanical components.

B. Provide a 3-Year Warranty on electrical components.

C. Provide a 1-Year Warranty on labor.

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1.9 MAINTENANCE SERVICE

A. Provide service and maintenance for one year after date of substantial completion.

B. Provide maintenance contract for paid maintenance beyond 1st year.

C. Provide 24/7 phone support.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Acceptable Manufacturer: Nationwide Lifts

1. Address: 10 Holden Avenue, Queensbury, NY 12804

2. Email: info@elevators.com

3. Toll Free: 888-323-8755

4. Website: www.elevators.com

B. Substitutions not permitted.

2.2 LULA ELEVATOR

A. Model Name.

1. Freedom Commercial LULA.

B. Drive System.

1. Roped Hydraulic (hole-less).

2. Submersible pump unit.

C. Safety Features.

1. Overspeed valve.

2. Safety brake system.

3. Emergency alarm and stop switch.

4. Final limit switches.

5. Gate switch.

6. Landing door interlocks.

D. Elevator Power Requirements. *(choose one of the options below)*

1. 208V, 3 Phase, 30A service to fused, lockable disconnect with auxiliary contact.

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2. 240V, 1 Phase, 40A service to fused, lockable disconnect with auxiliary contact.

E. Lighting Power Requirements.

1. 120V, 20A service to a fused, lockable disconnect (for lighting circuit).

F. Communication Requirements.

1. Dedicated phone line.

G. Controls.

1. Fully automatic push button in cab and at landings.

2. Automatic car lighting.

3. Position indicator in cab.

4. Microprocessor based controller.

H. Speed.

1. 30 fpm (0.15 m/s).

I. Number of Levels Serviced.

1. 2 levels.

J. Travel.

1. 14 feet (up to 25 ft).

K. Capacity.

1. 1400 lbs (635 kg).

L. Car Size.

1. 48 inches by 54 inches (1219 mm by 1371 mm).

M. Platform Configuration.

1. Enter/exit same side.

N. Cab Fixtures Finish.

1. Stainless Steel

O. Cab Gate(s).

1. Sliding 2-speed gate.

P. Cab Gate Finish.

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1. Stainless Steel.

Q. Landing Doors.

1. Sliding 2-speed doors.

R. Landing Door Finish.

1. Stainless Steel.

S. Cab Wall Finish.

1. Stainless Steel.

T. Cab Ceiling

1. White Melamine.

U. Cab Lighting

1. LED recessed lights.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site must be properly prepared prior to starting installation.

B. Hoistway must be built to correct finished dimensions.

C. Landing openings must have correct size and centerline location.

D. Electrical power must be provided to disconnects as directed.

E. Phone line must be provided.

F. Controller space must have proper electrical clearances.

G. Light and GFI outlet provided in machine room.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces according to manufacturer's recommendations.

3.3 ELEVATOR INSTALLATION

A. Install elevator in compliance with applicable codes noted in section 1.3.

B. Install according to manufacturer's manuals and drawings.

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C. Startup and adjust equipment according to manufacturer's instructions.

3.4 FIELD QUALITY CONTROL

A. Perform tests in compliance with applicable codes as noted in section 1.3.

B. Perform tests/inspections as required by local jurisdiction.

C. Demonstrate operation in front of Owner and Contractor.

3.5 CLEANING

A. Remove protective films and coverings from equipment.

B. Clean all components.

3.6 PROTECTION

A. Protect installed products until completion of the project.

B. Touch-up, repair, or replace any damaged components prior to completion.

END OF SECTION

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SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes general administrative and procedural requirements and applies to all sections in this Division.

B. The following requirements are included in this Section to expand the requirements specified in Division 1:

1. Drawings and Specifications
2. Submittals.
3. Shop drawings.
4. Product data.
5. Coordination.
6. Coordination drawings.
7. Record documents.
8. Operation and Maintenance manuals.
9. Delivery, storage and handling.
10. General Installation.
11. Cutting and patching.
12. Guarantee and Warranties
13. Quality Assurance
14. Codes and Standards
15. UL Label

C. This Section also includes the following which applies to all Sections in this Division:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout and Grouting.
8. Equipment installation requirements common to equipment sections.
9. Painting and finishing.
10. Concrete bases.
11. Supports and anchorages.
12. Waterproof and Corrosion Proof Construction
13. Trenching, Excavation, and Backfill
14. Access Doors and Panels

15. Noise and Vibration
16. Start-up and Commissioning

1.03 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms. In general, any item that is directly accessible without removing panels, walls, ceilings, or other parts of structure.
C. Exposed, Exterior Installations: Exposed to view outdoors, outside of building structure, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations, equipment yard, under eaves, etc.
D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
F. Furnish: Supply and deliver complete.
G. Install: Place, secure, and connect as required to make fully operational.
H. Provide: Furnish and install as defined above.
I. Connect: Complete hookup of item with required services.
J. Rough-in: Provide all indicated services in the necessary arrangement suitable for making final connections to fixture or equipment.

1.04 DRAWINGS AND SPECIFICATIONS

A. Consider all drawings and all divisions of this specification as a whole and provide work of this division shown anywhere therein.
B. Absolute accuracy of the contract drawings can not be guaranteed. It is the responsibility of the Contractor to coordinate exact requirements and locations as governed by actual job conditions. (See Coordination and Coordination Drawings below). Check all information and report any discrepancies to the Architect/Engineer before fabrication and in time to avoid any unnecessary work. Any changes or additions subject to additional charges made without written authorization, based upon an agreed price, shall be at the Contractor's own risk and cost.
C. The Contractor may and shift pipe and equipment as required to meet field conditions. The Contractor shall indicate, and clearly note, all changes on his shop and coordination drawings and submit them to the Architect/Engineer for review prior to ordering or fabrication. The Contractor must obtain submittal review indication “No Exception Taken” for any proposed modifications.
D. The Contractor shall provide all necessary offsets, transitions, fittings, and modifications required to complete the work.
E. Follow equipment and material manufacturer's instructions where items are not specifically covered on the drawings or within the specifications. If instructions are in conflict, obtain clarification before starting work.

F. Scaled and figured dimensions are approximate and are for estimating purposes only. Before proceeding with the work, check and verify dimensions and assume responsibility for fitting materials, equipment, and other parts of equipment within the structure.

G. Confirm all slopes and inverts. Route and coordinate all piping locations as required to obtain necessary slopes and proper drainage. This is particularly important for drainage piping.

H. Where apparatus and equipment have been shown on drawings, dimensions have been taken from the manufacturer's literature for the scheduled manufacturer. Check manufacturer's certified drawings to see that equipment proposed for installation will fit into the building and into spaces provided.

1.05 SUBMITTALS

A. General:

1. In addition to the procedures indicated below follow the procedures specified in Division 1 where they exceed the requirements of this section.
2. Provide submittals of material or equipment in accordance with each specification section.
3. Each item submitted shall be labeled or identified the same as on the drawings. (WH-1, SP-1, etc.)

B. Equipment, materials, and products specifically identified, described, and scheduled on the drawings are the basis of design. The other manufacturers or suppliers which may be named in the specification only indicate the general acceptability of the manufacturer or supplier and are considered alternates. It is the Contractor's responsibility to research, select, and prove, through the submittal process, that the specific model, size, or type of the alternate proposed manufacturer is equal and will perform equal to that which is the basis of the design. Operational characteristics for such items as outlet velocities, power input, sound levels, efficiencies, etc., shall be considered in addition to the overall performance, output, and physical constraints.

C. The Contractor assumes full responsibility that alternative items substituted for the scheduled manufacturer will meet the job requirements and is responsible for the cost of redesign and modifications necessary due to this substitution. Revisions or additional work required due to the use of substitute materials and equipment shall be fully indicated on detailed drawings submitted with the shop drawings.

D. Mark submittal "Exactly as Specified" or accompanied by a letter from the supplier explaining in detail what differences, if any, exist between the submitted item and the scheduled item. Failure to point out the differences will be considered cause for disapproval. If differences are not indicated and/or not discovered during the submittal review process, the Contractor will still remain responsible for providing equipment and materials that meet the specifications.

E. Acceptable Manufacturers:Subject to compliance with the requirements of the individual specification sections, provide materials and equipment from the indicated manufacturers only. Submittals of material or equipment manufactured by other than those indicated may be returned, not reviewed. If no manufacturers are indicated, then any product or material which complies with the specification and for the intended application may be submitted.

F. The plumbing and electrical components, structural systems, service clearances, and controls for all equipment are selected and sized, based on the manufacturer and equipment scheduled. If substitutions and/or equivalent alternate equipment are furnished, it shall be the responsibility of all parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics (capacity, size, clearance, acoustics, etc.) and requirements of that submitted to that scheduled. If greater capacity or more materials or labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then it shall be the responsibility of the parties involved in providing the substitute and/or equivalent alternate items of equipment to provide all compensation for additional charges made for the proper rough-in, circuitry, support, and connections for the equipment furnished for all trades affected. No additional charges shall be allowed for such revisions.

G. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals.

H. The Engineer and/or Architect will review submitted shop drawings and documents for general conformance with the design concept of the project and the information contained in the contract documents. The Engineer's and/or Architect's review is for the convenience of the Owner in following the work and does not relieve the Contractor of the responsibility of deviations from the requirements stated in this specification and contract documents.

I. The Engineer's and/or Architect's review shall not be construed as a complete or detailed check of the work submitted, nor shall it relieve the Manufacturer or Contractor of responsibility for errors or omissions of any sort in the shop drawings and samples, or from the necessity of furnishing any work required by the contract documents. The review of a separate item shall not indicate review of the complete assembly in which it functions. Nothing in the Engineer's and/or Architect's review of the shop drawings and samples shall be considered as authorizing 1) a departure from contract documents and specifications, or 2) additional cost to the owner, or 3) increased time for completion of the work.

J. Submittals are not reviewed for quantities, service clearance, dimensions, weights, fabrication processes, construction methods, coordination with work of other trades, construction safety practices, motor location, location of control and electrical panels, and other layout constraints. These items shall remain the sole responsibility of the contractor.

K. The Engineer and/or Architect will review submittals with reasonable promptness and will return them to the Vendor/Supplier/Manufacturer stamped to indicate the appropriate action taken as follows:
   1. No Exceptions Taken.
   2. Exceptions Taken As Noted. No resubmittal required.
   3. Exceptions As Noted. Resubmit.
   4. Rejected. Resubmit.
   5. Not Reviewed. Must Meet Plans, Specifications, and Codes.

L. Markings or comments or the lack thereof shall not be construed as relieving the Vendor/Supplier/Manufacturer from complete compliance with the project drawings and specifications.

M. No part of the work shall be started in the shop or in the field until the Engineer and/or Architect have reviewed the shop drawings and samples for that respective portion of the work. Shop drawings and samples shall be submitted for review sufficiently in advance of the scheduled start of the work in the shop or in the field to allow ample time, in consideration of the number and complexity of the drawings in the submittal, for the Engineer and/or Architect to make an orderly review. No extension of time to complete the work will be granted to the Vendor/Supplier/Manufacturer by reason of failure to perform in this respect.

N. Each shop drawing and sample submitted for review shall be accompanied by a letter of transmittal, and shall be identified by the project title, Vendor's/Supplier's/ Manufacturer's name, and a reference to the related part of the contract documents.

O. Product Data: For the following:
   1. Transition fittings.
   2. Dielectric fittings.
   3. Mechanical sleeve seals.
   4. Escutcheons.

P. Welding certificates.

1.06 SHOP DRAWINGS

A. Refer to "Submittals" above for additional requirements.

B. Submit information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

C. Shop Drawings include fabrication and installation drawings and directions, setting diagrams, schedules, patterns, templates and similar drawings, and installation for metal and wood supports and anchorages. Include as a minimum the following information on drawings or diagrams:
   1. Dimensions
   2. Identification of products and materials included
   3. Compliance with specified standards
   4. Notation of coordination requirements
   5. Allowance for expansion, contraction, and deflection/movement of support structures.

D. Notation of dimensions established by field measurement

E. Clearances for access and service

F. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

G. Upon contractor's request, engineer can make electronic data files available at contractor's expense in order to enable contractor to expedite the production of working/coordination/shop drawings for the project. Transfer of the electronic data files to Contractor is for informational purposes only and will only be completed after a waiver is signed by contractor and owner relieving engineer of all liability resulting from use of electronic files and all engineer costs to produce electronic files in a format suitable for distribution are paid by contractor.

1.07 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system.

B. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as Shop Drawings.

C. Product Data Information: Includes catalog cuts, sketches, or bulletins indicating performance characteristics and certified performance curves with operating point indicated, features of equipment, controls, instrumentation, valving, equipment dimensions, materials of construction, estimated weight of unit (shipping, installed, and operating), heat rejection load when operating, auxiliaries, specialties, or accessories furnished, roughing-in or anchor diagrams and templates, manufacturer's installation instructions, service clearance requirements, standard color charts, and wiring diagrams.

D. Schematic Drawings shall include elevation and plan views, and indicate all connections, attachments, and details to indicate field required general details of assembly, etc. (Piping, wiring, etc.)

E. Wiring diagrams shall detail wiring for power, signal, and control systems, differentiating between manufacturer-installed wiring and field-installed wiring.

F. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information with above product data:

1. Manufacturer's printed recommendations
2. Compliance with recognized trade association standards
3. Compliance with recognized testing agency standards
4. Application of testing agency labels and seals
5. Notation of dimensions verified by field measurement
6. Notation of coordination requirements

1.08 COORDINATION

A. Coordinate with work performed by other sections in order to accommodate the requirements of this section and to ensure adequate space and proper location for all necessary work on this project whether or not work is under this section. Provide coordination drawings, as indicated. Coordination shall be done prior to order or manufacture of any systems or components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces.

E. Coordinate work with the Electrical Division. Furnish the Electrical Division with shop drawing information for indicating ratings and control circuits required for the actual equipment furnished. Coordinate voltage, phase, and load requirements, prior to ordering equipment, to insure mechanical and electrical matches. All equipment shall be provided and ordered to suit the power available.

F. Layout support pads, curbs, sleepers, anchor bolts, etc., for all mechanical equipment and materials so as to be in the proper location for the equipment actually ordered. These pads shall be of adequate dimension to provide for proper mounting of equipment isolators and equipment mounting so that anchor bolts meet all seismic criteria. Contractor shall allow for proper service clearances.

G. Provide templates, information, and instructions to other divisions as necessary to properly locate holes and openings to be cut or provided for plumbing work.

H. Layout piping, and other plumbing systems and confirm all sizes of systems and components to be sure they fit the space available prior to ordering and manufacturing of components. Be certain to allow for proper pipe slopes.

I. Provide proper clearances for access to and service of all equipment and items requiring adjustment including shutoff valves.

J. Coordinate all disciplines to insure maximum point loads that can be attached to structural members are not exceeded. See other sections and structural contract documents for requirements. Provide intermediate supports between existing structural members (Unistrut, angle, etc.) as necessary to not exceed maximum point loads.

K. Lay out trench locations, do all excavation, shoring, laying, backfilling, and compacting for work performed under this division and not provided under other divisions. See other divisions for specification requirements.

1.09 COORDINATION DRAWINGS

A. Prepare and submit, for review, large scale (minimum 1/4" = 1'-0") coordination drawings showing location and elevations of all equipment, ducts, piping, cable trays, conduits, structural, and other items in the area. These shall be fully coordinated with all other trades and Owner supplied items. Check routing and elevations of all piping, ductwork, conduit and equipment before fabricating. Report any conflicts that cannot be solved in the field to the Architect. Extra charges shall not be allowed due to lack of coordination prior to, or during, construction. These drawings shall be distributed to, and coordinated with, all other trades that are affected.

1. In addition to plan view, indicate heights to clarify clearances from structure and from other trades. Use partial sections where necessary.
2. Provide proper clearances for access to and service of all equipment and items requiring adjustment including shutoff valves.
3. Coordinate the location of access panels in the hard ceiling areas to insure all equipment and devices have proper access for servicing and adjusting.
4. The coordination drawings shall be reviewed and checked for completeness by the general contractor. Review by the architect and engineer is to assist the contractor and to attempt to point out obvious errors. Responsibility for proper coordination shall remain with the contractor.

B. Differences or disputes concerning coordination, interference, or extent of work between sections shall be decided by general contractor.

C. Extra charges shall not be allowed due to lack of coordination (or lack of coordination drawings) prior to or during construction.

D. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work. Indicate the proposed locations of ductwork, piping, conduit, equipment, and materials. Include the following:
   1. Clearances for installing and maintaining insulation, including clearances for servicing and maintaining equipment, and space for equipment disassembly required for periodic maintenance.
   2. Clearances for electrical and control components and panels.
   3. Equipment connections and support details.
   4. Exterior wall and foundation penetrations.
   5. Interior floor penetrations
   6. Fire-rated wall and floor penetrations.
   7. Sizes and location of required concrete pads and bases.
   8. Support, bracing and anchor locations for equipment and conduit.

E. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction and for replacement in the future.

F. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

G. Prepare reflected ceiling plans to coordinate and integrate installations, access panel and door locations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items where ceilings are to be installed.

1.10 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 1. In addition to the requirements specified in Division 1, indicate the following installed conditions:
   1. Indicate actual inverts and horizontal locations of underground piping and conduits.
   2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
   3. Accepted substitutions, contract modifications, and actual equipment and materials installed. This includes updating all equipment schedules with actual equipment provided.
   4. Indicate duct and pipe routing and locations.

B. Contractor shall maintain a complete set of documents on site that are marked-up during the construction process indicating all changes that have been made. These mark-ups shall be maintained on a regular basis so they are current as the construction is in process and available for inspection by the Architect/Engineer. Markups shall include changes to pipe routing and sizing.

C. Upon completion of the construction, the contractor shall transfer all mark-ups into AutoCAD and update the contract documents into record documents and the shop/coordination drawings in to as-built documents.
   1. Upon contractor's request, engineer can make electronic data files available at contractor's expense in order to enable contractor to expedite the production of record drawings for the project. Transfer of the electronic data files to Contractor is for informational purposes only and will only be completed after a waiver is signed by contractor and owner

relieving engineer of all liability resulting from use of electronic files and all engineer costs to produce electronic files in a format suitable for distribution are paid by contractor.

2. Architect/engineer makes no representations as to the accuracy or completeness of electronic data files. They are provided to the contractor as a start point to upgrade to Record Drawings.
3. The contractor record documents shall be in the same CAD program, version, and operating system as the original Contract Drawings.

D. Record document updates shall include schedules where contractor has supplied alternate manufacturers to those scheduled or where submitted performance varies.

E. Provide a minimum of one copy of the markup documents, a hard copy set of prints of the record and as built documents, and one electronic copy (disk) of the CAD files.

1.11 OPERATION AND MAINTENANCE MANUALS

A. Prepare operation and maintenance manuals in accordance with Division 1. In addition to the requirements specified in Division 1, include the following information for equipment items:
1. Installation Instructions.
2. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
3. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions.
4. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
5. Servicing instructions and lubrication charts and schedules.
6. Recommended spare parts list:
a. Spare parts list shall be furnished listing all parts for equipment. Indicate part number and generic description of equipment part manufacturer.
b. Indicate part number and generic description of both equipment supplier and original part manufacturer if other than supplier.
c. Indicate delivery time required if not a stock item.
d. Vendor shall furnish an itemized, firm price quote list of all recommended spare parts for installed equipment.

B. A minimum of 2 complete sets of manuals shall be provided. Manuals shall be bound in a hard board binder and indexed.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

C. Deliver products, materials and equipment marked with product names, model numbers, types, grades, compliance labels, and other information needed for identification. Inspect items for shipping damage and refuse, return, or refurbish items to the satisfaction of the Owner. Maintain delivery records for inventory control and for use in processing payment request vouchers. Crosscheck delivery records with project schedule so as to eliminate work stoppages due to material shortages.

D. Store products, materials, and equipment in a manner to prevent damage and degradation. Store items on skids or pallets, elevated above the floor or grade. Store items subject to moisture damage in a dry location. Retain protective shipping covers, crates, and cartons during storage. Protect items from contamination by job site dirt and debris and other foreign matter. Segregate items into groups of like type for job site storage. Provide a secure, fenced and lighted area for outside job site storage.

E. Handle products, materials, and equipment in accordance with manufacturer's recommendations and recognized industry standards. Utilize lifting lugs, and designated lift points when hoisting equipment. In all cases, carefully handle, transport, and position items to prevent damage during construction. After placement or installation, cover items with tarps or sheeting where required to protect from damage during construction.

F. Immediately, upon delivery, inspect shipment including Owner furnished items to ensure that products are undamaged and in accordance with requirements. Should the product be damaged or not in compliance with requirements, immediately repair as directed or approved or order replacement at no additional cost to the Owner.

G. Any products, materials, or equipment damaged during storage on site, installation, or during construction shall be replaced by the contractor at no additional cost to the project to the satisfaction of the Owner or Owner's Representative.

H. Protect new and existing building structures and adjacent finished surfaces during construction. Patch, repair, and refinish existing work damaged by work under this division to match adjacent undisturbed area. Patching, repair, and refinishing shall be performed by workmen skilled in the section involved.

1.13 GENERAL INSTALLATION

A. General: Sequence, coordinate, and integrate the various elements of the systems, materials, and equipment.

B. Coordinate systems, equipment, and materials installation with other building components and other trades.

C. Verify all dimensions by field measurements and relative to the certified prints for the actual equipment to be installed.

D. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for installations.

E. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

F. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the Work.

G. Give particular attention to large equipment requiring positioning prior to closing in the building. Contractor shall be responsible for ensuring adequate space and pathways and shall break down and reassemble equipment as necessary for rigging, access, and setting of equipment.

H. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.

I. Coordinate connection of systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, service companies, and controlling agencies. Provide required connection for each service.

J. Install systems, materials, and equipment to conform with submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form.

K. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.

L. Install equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.

M. Install access panel or doors where units are concealed behind finished surfaces.

N. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

1.14 EXCAVATION AND BACKFILL

A. Provide excavation for the work of this Division. Excavate all material encountered, to the depths indicated on the Drawings or required. Remove excavated materials not required or suitable for backfill from the site. Provide grading as may be necessary to prevent surface water from flowing into trenches or other excavations. Remove any water that accumulates. Provide sheeting and shoring as may be necessary for the protection of the work and for the safety of personnel.

B. Provide trenches of widths necessary for the proper execution of the work. Grade bottom of the trenches accurately to provide uniform bearing and support the work on undisturbed soil at every point along its entire length. Except where rock is encountered, do not excavate below the depths indicated. Where rock excavations are required, excavate rock to a minimum overdepth of four inches below the trench depths indicated on the Drawings or required. Backfill overdepths in the rock excavation and unauthorized overdepths with loose, granular, moist earth, thoroughly machine tamped to a compaction level of at least 95 percent of standard proctor density or 75 percent relative density or as specified by the Architect. Whenever unstable soil that is incapable of properly supporting the work is encountered in the bottom of the trench, remove soil to a depth required and backfill the trench to the proper grade with coarse sand, fine gravel or other suitable material.

A.

C. Excavate trenches for utilities that will provide the required minimum depths of cover from existing grade or from indicated finished grade, whichever is lower, unless otherwise specifically shown.

B.

D. Trenches shall not be placed within ten (10) feet of foundation or soil surfaces that must resist horizontal forces.

C.

E. Do not backfill trenches until all required tests have been performed and the installation observed by the Architect. Comply with the requirements of other sections of the specifications. Backfill shall consist of non-expansive material with limited porosity. Deposit backfill in 6-inch thick layers and tamp carefully until the mechanical work is covered by not less than 12 inches of material. Backfill and tamp remainder of trench at 1 foot intervals until complete. Uniformly grade the finished surface.

F.

1.15 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 1. In addition to the requirements specified in Division 1, the following requirements apply:
   1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
   1. Uncover Work to provide for installation of ill-timed Work.
   2. Remove and replace defective Work.
   3. Remove and replace Work not conforming to requirements of the Contract Documents.
   4. Install equipment and materials in existing structures.

C. Upon written instructions from the Architect/Engineer, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.

D. Cut, remove and legally dispose of selected equipment, components, and materials as indicated, including but not limited to removal of piping, plumbing fixtures and trim, and other plumbing items made obsolete by the new Work.

E. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

F. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

G. Patch all finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

1.16 GUARANTEE AND WARRANTIES

A. All materials, parts, equipment, and workmanship shall be guaranteed for a period of one year from date of owner acceptance.

B. If the manufacturer provided for a longer guarantee period, it shall also be submitted.

1.17 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed revision is accepted in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified, all at no additional cost to owner. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.18 CODES AND STANDARDS

A. The work installed under this section shall conform to all applicable local codes, regulations, and standards.

B. Do not construe anything contained in these specifications or drawings to permit work to be installed that does not conform to code. The codes shall govern where they require higher standards or are violated by the drawings and specifications.

C. Consider interpretations and rulings of the enforcing agencies as part of these specifications.

D. Comply with drawings and specifications showing work exceeding minimum code requirements.

E. The Contractor shall furnish without any extra charge additional materials and labor required for the compliance with any rules and regulations.

1.19 UL LABEL

A. Furnish UL labeled and listed materials and equipment except when equipment is of a type for which labeling or listing services are not available from UL. Labeling must meet the requirements of the local authorities.

B. ETL label is acceptable if approved by the local authorities.

1.20 LEED REQUIREMENTS

A. This project will be submitted for LEED certification. The following is a general list of some of the LEED requirements that may affect this discipline. See Division 1 and www.USGBC.org for complete requirements.

B. Contractor shall generate, coordinate, and implement an erosion and sediment control plan per United States Green Building Council (USGBC) S.S. Prerequisite 1 requirements.

C. All site disturbances shall be limited to parameters defined by USGBC S.S. Credit 5.1.

D. Contractor shall develop and implement a construction waste management plan per USGBC M.R. Credit 2.1 requirements.

E. Contractor shall coordinate and implement use of wood-based materials per USGBC M.R. Credit 7 requirements.

F. Contractor shall develop and implement an indoor air quality management plan for the construction and pre-occupancy phases of the project per USGBC E.Q. Credit 3.1 requirements.
G. Contractor shall develop and implement an indoor air quality management plan for the pre-occupancy phases of the project per USGBC E.Q. Credit 3.2 requirements.
H. Contractor shall coordinate use of low emitting materials, adhesives and sealants per USGBC E.Q. Credit 4.1 requirements.
I. Contractor shall coordinate use of low emitting materials, paints and coatings per USGBC E.Q. Credit 4.2 requirements.

PART 2 - PRODUCTS

2.01 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.02 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
   2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
H. Solvent Cements for Joining Plastic Piping (if applicable):
   1. ABS Piping: ASTM D 2235.
   2. CPVC Piping: ASTM F 493.
   3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
   4. PVC to ABS Piping Transition: ASTM D 3138.

2.03 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
   1. Available Manufacturers:
      a. Cascade Waterworks Mfg. Co.
      b. Dresser Industries, Inc.; DMD Div.
      c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
      d. JCM Industries.
      e. Smith-Blair, Inc.
      f. Viking Johnson.
      g. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
   2. Underground Piping NPS 2(DN 50) and Larger: AWWA C219, metal sleeve-type coupling.
   3. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.
   1. Available Manufacturers:
      a. NIBCO INC.
      b. NIBCO, Inc.; Chemtrol Div.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.
   1. Available Manufacturers:
      a. Cascade Waterworks Mfg. Co.
      b. Fernco, Inc.
      c. Mission Rubber Company.
      d. Plastic Oddities, Inc.

2.04 DIELECTRIC FITTINGS

A. General: Isolate ferrous from non-ferrous material in piping systems and equipment connections with dielectric fittings.

B. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

C. Insulating Material: Suitable for system fluid, pressure, and temperature.

D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
   1. Available Manufacturers:
      a. Epco Sales, Inc.
      b. Capitol Manufacturing Co.
      c. Central Plastics Company.

d. Eclipse, Inc.
e. Hart Industries, International, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.

E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
1. Available Manufacturers:
a. Watts Industries, Inc.; Water Products Div.
b. Capitol Manufacturing Co.
c. Central Plastics Company.
d. Epco Sales, Inc.

F. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
1. Available Manufacturers:
a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.
2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

G. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
1. Available Manufacturers:
a. Calpico, Inc.
b. Lochinvar Corp.

2.05 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
1. Available Manufacturers:
a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.
2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.06 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint. Available Manufacturers: Pipe Shields, Inc.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

2.07 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
C. One-Piece, Cast-Brass Type: With set screw.
   1. Finish: Polished chrome-plated .
D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw and polished chrome-plated finish.
E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.
F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chrome-plated finish.
G. One-Piece, Floor-Plate Type: Cast-iron floor plate.
H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.08 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
   2. Design Mix: 5000-psi, 28-day compressive strength.
   3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are reviewed without exception on Coordination Drawings.
C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.
G. Install piping at indicated slopes.
H. Install piping free of sags and bends.
I. Install fittings for changes in direction and branch connections.
J. Install piping to allow application of insulation.
K. Select system components with pressure rating equal to or greater than system operating pressure.
L. Cut piping accurately to job measurements and install without springing or forcing, true to line and grade, generally square with building and adequately supported to prevent sagging or undue stress on pipe, fittings, and accessories.
M. Thoroughly clean all pipe and maintain in such condition throughout construction. Temporarily cap off plug ends of unprotected pipe.
N. Install unions or flanges at connections to equipment, on service side of valves and elsewhere as required or shown to facilitate maintenance. Install union and drain line on discharge side of relief valves.
O. Arrange piping and hangers to allow for expansion, contraction, and structural settlement. Do not install piping in contact with the building structure. Anchor pipes properly so expansion/contraction is controlled.
P. Provide piping subject to expansion or contraction with suitable offsets, expansion loops or manufactured expansion joints as necessary to control expansion/contraction. Provide adequate guides to prevent misalignment.
Q. Allow for pipe movement at all piping connections to equipment so that expansion/contraction does not stress the equipment or connections. Provide three changes of direction prior to connection for hard connected equipment.
R. Use flexible connectors where specifically called for.
S. Make changes in size or direction with manufactured reducing fittings. The use of bushings, reducing flanges, or bending of a pipe is not allowed.
T. Install piping full size through shutoff valves, balancing valves, etc. Change pipe size within three pipe size diameters of the final connection to fixtures and equipment.
U. Protect all piping (except soil pipe or nonferrous pipe) installed below grade and to a minimum of 6" above grade with a factory applied covering; plastic coating. Protect field joints as follows: Clean fittings, nipples, and other field joints thoroughly and apply prime coat and one layer of heat applied 62 mil tape in accordance with manufacturer's recommendations.
V. "Bull head" tees shall not be allowed.
W. Flush all pipes free from foreign substances before installing valves, stops, or making final connections.
X. Any section of pipe for which size is not shown or any intermediate section erroneously shown obviously undersized shall be the same size as the largest line connecting to it.
Y. Do not cover or enclose the piping work before it has been tested, inspected, and approved.
Z. Pipe the discharge of each relief valve, backflow preventer, and similar device to floor sink, floor drain, exterior, or other acceptable location whether indicated or not on the drawings and per code requirements.

AA. Make reduction in pipe sizes with concentric reducers unless eccentric reducers are indicated. Make branches from mains with straight or reducing tee fittings. Bushings are not allowed.
BB. Support piping to insure no strain or piping weight is transmitted to equipment.
CC. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
    1. New Piping:
        a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
        b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
        c. Insulated Piping: One-piece, stamped-steel type with spring clips.
        d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
        e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
        f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
        g. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
        h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
DD. Sleeves are not required for core-drilled holes.
EE. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
    1. Cut sleeves to length for mounting flush with both surfaces.
        a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
    2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
    3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
        a. Galvanized Steel Sheet Pipe Sleeves: For pipes smaller than NPS 6.
        b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
        c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.
        d. Seal space outside of sleeve fittings with grout.
    4. Pipe shall not rest directly on sleeve where passing through walls and partitions to avoid transmitting any noise or vibration into structure.
    5. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for

size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

FF. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Install steel pipe for sleeves smaller than 6 inches in diameter.
   2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
   3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

GG. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

HH. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to other Divisions Sections or drawings for materials. At a minimum, seal all penetrations with UL listed assembly matching rating of surrounding walls, partitions, ceilings, and floors. Install per manufacturer's requirements.

II. Verify final equipment locations for roughing-in.

JJ. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.02 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded

pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.03 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.04 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting,

with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

E. Follow manufacturers' installation details and directions except as specifically modified on the drawings, and provide any valves or special fittings or other specialty items called for by them as required in order to make the equipment perform as intended.

F. Provide all necessary rigging, rigging equipment, and manpower to set equipment and materials in place

3.05 PAINTING

A. Provide painting of systems, equipment, and components where specified or indicated on the drawings. Painting may also be specified in Division 09 Sections.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.06 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Sections regarding concrete.

3.07 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 specification sections for structural steel requirements.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.08 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
C. Attach to substrates as required to support applied loads.

3.09 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
B. Clean surfaces that will come into contact with grout.
C. Provide forms as required for placement of grout.
D. Avoid air entrapment during placement of grout.
E. Place grout, completely filling equipment bases.
F. Place grout on concrete bases and provide smooth bearing surface for equipment.
G. Place grout around anchors.
H. Cure placed grout.

3.10 WATERPROOF AND CORROSION PROOF CONSTRUCTION

A. Maintain the waterproof integrity of penetrations through materials intended to be waterproof. Provide flashings at exterior wall and roof penetrations. Caulk watertight penetrations of foundation walls and floors. Provide membrane clamps at penetrations of waterproof membranes.
B. Provide galvanized sheet-metal weather protection canopies, hoods or enclosures over all out-of-door equipment, the operation or maintenance of which would be impaired by rainwater. This requirement applies to, but is not limited to: non-outdoor rated equipment and materials, controls, instruments, and electrical devices.
C. Provide water tight flashing of all piping penetrations.
D. Products which will be installed exposed to the weather, moisture, or other potentially damaging conditions shall be constructed to resist the effects of such exposure.
E. Exterior casings shall have lapped or gasketed joints effectively sealed to prevent intrusion of moisture or other injurious substances.
F. Casing or parts shall be constructed of materials which are fully resistant to harmful substances they may normally contact or (if ferrous) shall be galvanized after fabrication or shall be fully protected from such substances by paint or other coating in appropriate thickness or number of coats.
G. All bolts, nuts, screws, and washers shall be galvanized or stainless steel.

3.11 TRENCHING, EXCAVATION, AND BACKFILL

A. Provide all necessary excavation and backfill for the installation of the work of this Division unless specifically included under another Division. Walls of all trenches shall be a minimum of six (6) inches from the side of the nearest pipe.
B. Backfill shall not be placed until all lines have been tested and approved.
C. Utility Trench Excavation:
    1. Keep excavated portions of the work free of water at all times and until backfilling is completed. Install adequate facilities for removing excess water.

2. Shore and brace excavations where necessary to prevent cave-ins and/or in accordance with all safety laws.

D. Meet the requirements of Division 31 and elsewhere in specifications for trenching, evacuation, backfill, and compaction.

3.12 ACCESS DOORS AND PANELS

A. Where Required: Wherever a piece of equipment or valve and dampers operator is inaccessible and requires access for maintenance, repair, or adjustment.

B. Size: Size is dependent upon the relationship of the door to the product being serviced; therefore, the size of the door shall be selected to provide convenient access to its contents.

C. Available Manufacturers: Karp, Inryco/Milcor, Bilco, Cesco.

3.13 NOISE AND VIBRATION

A. Quietness is a requirement. Eliminate noise, other than that caused by specific equipment operating at optimum conditions and at design noise criteria.

B. The limiting of transmission of noise and vibration is required. The Contractor is to pay particular attention that piping, equipment, and ductwork is installed so as not to chatter or rub against other materials, equipment, and the building structure. Provide isomode pads, insulation, or other suitable materials to avoid direct contact and noise conditions unacceptable to the Owner. Consider, in particular, pipe clamps at risers where they contact the structure, proper shields at pipe hangers, and pipe and duct penetrations of walls and floors.

3.14 START-UP AND COMMISSIONING

A. The Contractor shall provide all labor, materials and services necessary for the start-up, commissioning and testing of all systems and equipment furnished and installed under this Division.

B. Contractor shall be responsible for proper operation of all systems, assemblies, minor subsystems, equipment, and services provided under this Division. He shall coordinate start-up procedures, calibration, testing, and system commissioning with all subcontractors and trades involved. Any system operational problems shall be diagnosed and all correctional procedures shall be initiated with the various subcontractors as required to bring the system into compliance with the design intent.

C. Adjust all equipment and system components to meet the performance as scheduled on drawings, or as required, to result in the intended system operation. Thereafter, as a result of system operation or as directed by the Architect/Engineer, make readjustments as necessary to refine performance.

D. The Contractor shall be responsible for preparing a written start-up and commissioning procedure including check-off list and report format showing design conditions and blanks for indicating actual operating conditions. The report format shall include each piece of equipment, system and all items that require adjustment, testing, and verification. The written procedure shall be submitted for review 30 days prior to start-up.

E. Personnel performing start-up and commissioning services shall be fully qualified, experienced, and normally engaged in this type of work. If the

Contractor does not have such personnel available from his own company, he shall hire, at his own expense, subcontractors who are qualified.

F. The Contractor shall designate one field person who has the overall responsibility for start-up and commissioning procedures which includes testing and balancing. He shall directly supervise the start-up operations and be available for required coordination before, during, and after start-up.

G. Prior to start-up, ensure that the systems are ready, including but not limited to the checking the following: proper wiring, proper equipment rotation, the systems are flushed and are clean, auxiliary connections, lubrication, controls, venting, all filters and strainers installed, and properly set relief and safety valves.

H. All electrical testing must be complete and test results submitted before equipment start-up to avoid power interruptions during equipment start-up and commissioning.

I. Start and operate all systems. Provide the services of factory certified and trained technicians for start-up of major equipment and systems where the contractor does not have sufficient capability and where required in other sections.

J. The Contractor (and the factory technician where required) shall check all equipment during the initial start-up to ensure correct rotation, proper lubrication, adequate fluids, non-overloading electrical characteristics, proper alignment, and vibration isolation. Systems shall be checked for water flows throughout without blockages. Other miscellaneous equipment shall be started and operated as described above as applicable.

K. During initial operation of the system and until substantial completion, qualified personnel shall be provided and designated for maintaining the equipment and systems in good running order. Failure of equipment during this period due to lack of proper supervision is the responsibility of the Contractor and continued failures shall be grounds for the Owner to provide such services with back charges to the Contractor.

L. A final and complete start-up and commissioning report shall be submitted prior to final acceptance and payment. This report shall be signed by each person doing the start-up task and by the responsible field person. Report shall include, but not be limited to: date of test; instrument used, date of last calibration, set points, rpm, voltage, amperage, pressures, stability, and all other data necessary to indicate the equipment and systems have been properly tested, started-up, commissioned, labeled, and are operating within specified and manufacturers parameters.

M. See other sections for other specific system and equipment start-up and commissioning requirements.

END OF SECTION

SECTION 22 07 00

PIPE INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:

1. Division 7 Section "Firestop Systems" for firestopping materials and requirements for penetrations through fire and smoke barriers.

2. Division 23 Section "Duct Insulation" for insulation for ducts and plenums.

3. Division 23 Section "Equipment Insulation" for insulation materials and application for pumps, tanks, hydronic specialties, and other equipment.

4. Division 23 Section "Hangers and Supports" for pipe insulation shields and protection saddles.

1.03 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for the following:

1. Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.

2. Attachment and covering of heat trace inside insulation.

3. Insulation application at pipe expansion joints for each type of insulation.

4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.

5. Removable insulation at piping specialties and equipment connections.

6. Application of field-applied jackets.

C. Samples: For each type of insulation and jacket. Identify each Sample, describing product and intended use. Submit Samples in the following sizes:

1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.

2. Sheet Form Insulation Materials: 12 inches square.

3. Jacket Materials: 12 inches long by NPS 2.

4. Manufacturer's Color Charts: Show the full range of colors available for each type of field-applied finish material indicated.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

E. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.06 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Section 23 05 29 "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for insulation application.

C. Coordinate installation and testing of steam or electric heat tracing.

1.07 SCHEDULING

A. Schedule insulation application after testing piping systems and, where required, after installing and testing heat-trace tape. Insulation application may begin on segments of piping that have satisfactory test results.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mineral-Fiber Insulation:

a. CertainTeed Manson.

b. Knauf FiberGlass GmbH.

c. Owens-Corning Fiberglas Corp.

d. Schuller International, Inc.

2. Cellular-Glass Insulation:

a. Pittsburgh-Corning Corp.

3. Flexible Elastomeric Thermal Insulation:

a. Armstrong World Industries, Inc.

b. Rubatex Corp.

4. Polyolefin Insulation:

a. Armstrong World Industries, Inc.

b. IMCOA.

5. Closed-Cell Phenolic-Foam Insulation:

a. Kooltherm Insulation Products, Ltd.

6. Calcium Silicate Insulation:

a. Owens-Corning Fiberglas Corp.

b. Pabco.

c. Schuller International, Inc.

2.02 INSULATION MATERIALS

A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:

1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.

2. Blanket Insulation: Comply with ASTM C 553, Type II, without facing.

3. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:

a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.

b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.

4. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.

5. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.

6. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.

7. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

B. Cellular-Glass Insulation: Inorganic, foamed or cellulated glass, annealed, rigid, hermetically sealed cells, incombustible.

1. Preformed Pipe Insulation, without Jacket: Comply with ASTM C 552, Type II, Class 1.

2. Preformed Pipe Insulation, with Jacket: Comply with ASTM C 552, Type II, Class 2.

C. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Adhesive: As recommended by insulation material manufacturer.

2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.

D. Polyolefin Insulation: Unicellular polyethylene thermal plastic, preformed pipe insulation. Comply with ASTM C 534, Type I, except for density.

1. Adhesive: As recommended by insulation material manufacturer.

E. Closed-Cell Phenolic-Foam Insulation: Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.

F. Calcium Silicate Insulation: Preformed pipe sections of noncombustible, inorganic, hydrous calcium silicate with a nonasbestos fibrous reinforcement. Comply with ASTM C 533, Type I.

G. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

2.03 FIELD-APPLIED JACKETS

A. General: ASTM C 921, Type 1, unless otherwise indicated.

B. Foil and Paper Jacket (For indoor use only): Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

C. PVC Jacket (For indoor use only): High-impact, ultraviolet-resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming.

1. Adhesive: As recommended by insulation material manufacturer.

2. PVC Jacket Color: White or gray.

3. PVC Jacket Color: Color-code piping jackets based on materials contained within the piping system.

D. Heavy PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 30-mil thick, high-impact, ultraviolet-resistant PVC.

1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.

2. Adhesive: As recommended by insulation material manufacturer.

E. Standard PVC Fitting Covers (For indoor use only): Factory-fabricated fitting covers manufactured from 20-mil thick, high-impact, ultraviolet-resistant PVC.

1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.

2. Adhesive: As recommended by insulation material manufacturer.

F. Aluminum Jacket: Factory cut and rolled to indicated sizes. Comply with ASTM B 209 (ASTM B 209M), 3003 alloy, H-14 temper.

G. Aluminum Jacket: Aluminum roll stock, ready for shop or field cutting and forming to indicated sizes. Comply with ASTM B 209 (ASTM B 209M), 3003 alloy, H-14 temper.

1. Finish and Thickness: Smooth finish, 0.010 inch thick.

2. Finish and Thickness: Corrugated finish, 0.010 inch thick.

3. Finish and Thickness: Stucco-embossed finish, 0.016 inch thick.

4. Finish and Thickness: Painted finish, 0.016 inch thick.

5. Moisture Barrier: 1-mil thick, heat-bonded polyethylene and kraft paper.

6. Elbows: Preformed, 45- and 90-degree, short- and long-radius elbows; same material, finish, and thickness as jacket.

H. Stainless-Steel Jacket: ASTM A 666, Type 304 or 316; 0.10 inch thick; and factory cut and rolled to indicated sizes.

I. Stainless-Steel Jacket: ASTM A 666, Type 304 or 316; 0.10 inch thick; and roll stock ready for shop or field cutting and forming to indicated sizes.

1. Moisture Barrier: 1-mil thick, heat-bonded polyethylene and kraft paper.

2. Moisture Barrier: 3-mil thick, heat-bonded polyethylene and kraft paper.

3. Elbows: Gore type, for 45- and 90-degree elbows in same material, finish, and thickness as jacket.

4. Jacket Bands: Stainless steel, Type 304, 3/4 inch wide.

2.04 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd.

1. Tape Width: 4 inches.

B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:

1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.

2. Galvanized Steel: 0.005 inch thick.

3. Aluminum: 0.007 inch thick.

4. Brass: 0.010 inch thick.

5. Nickel-Copper Alloy: 0.005 inch thick.

C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

2.05 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.03 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.
C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
D. Apply insulation with longitudinal seams at the bottom of horizontal pipe runs.
E. Apply multiple layers of insulation with longitudinal and end seams staggered.
F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
G. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
H. Keep insulation materials dry during application and finishing.
I. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
J. Apply insulation with the least number of joints practical.
K. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.
L. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

1. Apply insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches (300 mm) from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.

M. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

N. Apply adhesives and mastics at the manufacturer's recommended coverage rate.

O. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.

2. Circumferential Joints: Cover with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches o.c.

3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

   a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.

4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.

5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

P. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.

2. Apply insulation for exterior applications tightly joined to interior insulation ends.

3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal metal jacket to roof flashing with vapor-retarder mastic.

Q. Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.

R. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

S. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.

1. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Firestop Systems."

T. Floor Penetrations: Apply insulation continuously through floor assembly.

1. For insulation with vapor retarders, seal insulation with vapor-retarder mastic where floor supports penetrate vapor retarder.

3.04 MINERAL-FIBER INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.

2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet to form a vapor retarder between pipe insulation segments.

3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.

3. Cover fittings with standard PVC fitting covers.

4. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.

3. Apply insulation to flanges as specified for flange insulation application.

4. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

5. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

6. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.05 CELLULAR-GLASS INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.

2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.

3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of the same thickness as pipe insulation.

4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When premolded sections of insulation are not available, apply mitered sections of cellular-glass insulation. Secure insulation materials with wire, tape, or bands.

3. Cover fittings with standard PVC fitting covers.

4. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded segments of cellular-glass insulation or glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.
2. Apply insulation to flanges as specified for flange insulation application.
3. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
4. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
5. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.06 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Follow manufacturer's written instructions for applying insulation.
2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply insulation to flanges as follows:

1. Apply pipe insulation to outer diameter of pipe flange.
2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of the same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

C. Apply insulation to fittings and elbows as follows:

1. Apply mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Apply insulation to valves and specialties as follows:

1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.

2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to strainer basket.

3. Apply insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.07 POLYOLEFIN INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Follow manufacturer's written instructions for applying insulation.

2. For split tubes, seal longitudinal seams and end joints with manufacturer's recommended adhesive.

3. For self-adhesive insulation, staple longitudinal seams after sealing. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply insulation to flanges as follows:

1. Apply pipe insulation to outer diameter of pipe flange.

2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of the same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

C. Apply insulation to fittings and elbows as follows:

1. Apply mitered sections of polyolefin pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Apply insulation to valves and specialties as follows:

1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.

2. Apply cut segments of polyolefin pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to strainer basket.

3. Apply insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.08 CLOSED-CELL PHENOLIC-FOAM INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with wire, tape, or bands without deforming insulation materials.

2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic.

3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of the same material and thickness as pipe insulation.

4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When premolded sections of insulation are not available, apply mitered sections of phenolic-foam insulation. Secure insulation materials with wire, tape, or bands.

3. Cover fittings with standard PVC fitting covers.

4. Cover fittings with heavy PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When premolded sections of insulation are not available, apply mitered segments of phenolic-foam insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.

3. Apply insulation to flanges as specified for flange insulation application.

4. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

5. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

6. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.09 CALCIUM SILICATE INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of insulation to pipe with stainless-steel bands at 12-inch intervals and tighten without deforming insulation materials.

2. Apply two-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch, soft-annealed, stainless-steel wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.

3. Apply a skim coat of mineral-fiber, hydraulic-setting cement to surface of installed insulation. When dry, apply flood coat of lagging adhesive and press on one layer of glass cloth or tape. Overlap edges at least 1 inch. Apply finish coat of lagging adhesive over glass cloth or tape. Thin the finish coat to achieve smooth finish.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of the same material and thickness as pipe insulation.

4. Finish flange insulation the same as pipe insulation.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When premolded sections of insulation are not available, apply mitered sections of calcium silicate insulation. Secure insulation materials with stainless-steel wire.

3. Finish insulation of fittings the same as pipe insulation.

D. Apply insulation to valves and specialties as follows:

1. Apply mitered segments of calcium silicate insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without dis-

turbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.

2. Apply insulation to flanges as specified for flange insulation application.

3. Finish valve and specialty insulation the same as pipe insulation.

3.10 FIELD-APPLIED JACKET APPLICATION

A. Glass-cloth Jacket (Indoor use only): Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.

1. Apply jacket smooth and tight to surface with 2-inch overlap at seams and joints.

2. Embed glass cloth between two 0.062-inch thick coats of jacket manufacturer's recommended adhesive.

3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

B. Foil and Paper Jackets (Indoor use only): Apply foil and paper jackets where indicated.

1. Draw jacket material smooth and tight.

2. Apply lap or joint strips with the same material as jacket.

3. Secure jacket to insulation with manufacturer's recommended adhesive.

4. Apply jackets with 1-1/2 inch laps at longitudinal seams and 3-inch wide joint strips at end joints.

5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

C. PVC Jacket (Indoor use only) Apply PVC jacket where indicated, with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

D. Apply metal jacket where indicated, with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.11 FINISHES

A. Glass-Cloth Jacketed Insulation: Paint insulation finished with glass-cloth jacket as specified in Division 9 Section "Painting."

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of the insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.12 PIPING SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors.
2. Vibration-control devices.
3. Fire-suppression piping.
4. Drainage piping located in crawl spaces, unless otherwise indicated.
5. Below-grade piping, unless otherwise indicated.
6. Chrome-plated pipes and fittings, unless potential for personnel injury.
7. Air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.13 FIELD QUALITY CONTROL

A. Inspection: Owner will engage a qualified inspection agency to perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements.

B. Inspection: Engage a qualified inspection agency to perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements.

C. Inspection: Perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements:

1. Inspect fittings and valves randomly selected by Architect.
2. Remove fitting covers from 20 elbows or 1 percent of elbows, whichever is less, for various pipe sizes.
3. Remove fitting covers from 20 valves or 1 percent of valves, whichever is less, for various pipe sizes.

D. Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.

E. Reinstall insulation and covers on fittings and valves uncovered for inspection according to these Specifications.

3.14 INSULATION APPLICATION SCHEDULE, GENERAL

A. Refer to insulation application schedules for required insulation materials, vapor retarders, and field-applied jackets.

3.15 INTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic hot and recirculated hot water.

1. Operating Temperature: 60 to 140 deg F.
2. Insulation Material: Mineral fiber, cellular glass, with jacket, flexible elastomeric, polyolefin, or closed-cell phenolic foam.
3. Insulation Thickness: Apply the following insulation thicknesses:
   a. Copper Pipe, 1/2 inch to 4 inch: 1-1/2 inch thick.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

B. Service: Rainwater piping above ceiling.

1. Operating Temperature: 35 to 80 deg F.

2. Insulation Material: Mineral fiber, cellular glass, with jacket, flexible elastomeric, polyolefin, or closed-cell phenolic foam.

3. Insulation Thickness: Apply the following insulation thicknesses:

   a. Cast Iron Pipe, 2" to 6": 1 inch thick,

4. Field-Applied Jacket: Foil and paper.

5. Vapor Retarder Required: Yes.

C. Service: Condensate drain piping above ceiling.

1. Operating Temperature: 35 to 75 deg F.

2. Insulation Material: Flexible elastomeric or Pyolefin.

3. Insulation Thickness: 1 inch.

4. Field-Applied Jacket: Foil and Paper.

5. Vapor Retarder Required: Yes.

D. Service: Exposed sanitary drains and domestic water supplies and stops for fixtures for the disabled.

1. Operating Temperature: 35 to 120 deg F.

2. Insulation Material: Flexible elastomeric or Polyolefin.

3. Insulation Thickness: Minimum 1/2 inch.

4. Field-Applied Jacket: PVC P-trap and supply covers.

5. Vapor Retarder Required: No.

6. Finish: Per architectural requirements.

E. Service: Refrigerant suction and hot-gas piping.

1. Operating Temperature: 35 to 50 deg F.

2. Insulation Material: Mineral fiber, cellular glass, with jacket, cellular glass, without jacket, flexible elastomeric, polyolefin, closed-cell phenolic foam.

3. Insulation Thickness: Apply the following insulation thicknesses:

   a. Copper Pipe, 1/2 inch to 3 inch: 1-1/2 inch thick.

4. Field-Applied Jacket: Foil and paper.

5. Vapor Retarder Required: Yes.

3.16 EXTERIOR INSULATION APPLICATION SCHEDULE

A. This application schedule is for aboveground insulation outside the building. Loose-fill insulation, for below ground piping, is specified in Division 22 Piping Sections.

B. Service: Domestic hot and cold water.

1. Operating Temperature: 60 to 140 deg F.

2. Insulation Material: Mineral fiber, cellular glass, with jacket, flexible elastomeric, polyolefin, closed-cell phenolic foam.

3. Insulation Thickness: Apply the following insulation thicknesses:

   a. Copper Pipe, 1/2 inch to 6 inch: 1-1/2 inch thick.

4. Field-Applied Jacket: Aluminum, stainless steel.

5. Vapor Retarder Required: Yes.

C. Service: Refrigerant suction.

1. Operating Temperature: 35 to 50 deg F.

2. Insulation Material: Flexible elastomeric, polyolefin, closed-cell phenolic foam.

3. Insulation Thickness: Apply the following insulation thicknesses:

   a. Copper Pipe, 1/2 inch to 2-1/2 inch: 1-1/2 inch thick.

   b. Copper Pipe, 3 inch and larger: 2 inch thick.

4. Field-Applied Jacket: Stainless steel ONLY.

5. Vapor Retarder Required: Yes.

END OF SECTION

SECTION 22 07 17

LAVATORY PIPE SHIELD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Below-lavatory shield for concealing pipes, valves, and other appurtenances.

B. Related Sections include:
   1. Division 22 Sections for lavatory and piping.

1.3 REFERENCES

A. ASTM International:
   1. ASTM G 21: Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
   2. ASTM G 22: Standard Practice for Determining Resistance of Plastics to Bacteria.

B. California Building Code (CBC) – California Code of Regulations, Title 24, Part 2.

C. United States Department of Justice:
   1. 2010 ADA Standards for Accessible Design.

1.4 COORDINATION

A. Coordinate mounting location of instantaneous water heaters, electronic faucet components, and other related Work specified in other Sections to ensure that lavatory pipe shields can be installed.

B. Coordinate sizes and locations of concealed framing, blocking, backing, furring, reinforcements, and other related Work specified in other Sections to ensure that lavatory pipe shields can be supported and installed as indicated.

1.5 ACTION SUBMITTALS

A. Product Data: For lavatory pipe shields. Include material descriptions, dimensions, profiles, elevations, and installation details.

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B. Samples for Initial Selection: Submit manufacturer's full range of colors for selection by Architect.
   1. Minimum Number of Colors for Selection: 4.

C. Samples for Verification: For each color required for lavatory pipe shields, prepared on Samples of size indicated below.
   1. Size: 4 inches by 4 inches.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions for delivery, storage, and handling of lavatory pipe shields to prevent damage.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: Lavatory pipe shield shall comply with applicable provisions of the following:
   1. California Building Code (Title 24, Part 2), Chapters 11A and 11B.
   2. United States Department of Justice's 2010 ADA Standards for Accessible Design.

2.2 LAVATORY PIPE SHIELD

A. Lavatory Pipe Shield: Premolded one-piece shell with perimeter attachment flange, configured to enclose under-lavatory pipes and other appurtenances.
   1. Product: Subject to compliance with requirements, provide the following:
      a. Lav Shield, a Truebro Company; Model 2018-XX-X.
         i) Lavatory Model: Refer to Plumbing Drawings and Division 22 Section.
   2. Material: Impact- and chemical-resistant polyvinyl chloride.
   3. Wall Thickness: 0.093 inch.
   4. Finish Texture: Fine haircell.
   5. Color: China White.
   6. Fungal Resistance: No growth, per ASTM G 21.
   7. Bacterial Resistance: No growth, per ASTM G 22.

B. Fasteners: Manufacturer's standard stainless-steel fasteners for anchoring wall-mounted pipe shield to backing or substrate.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of lavatory pipe shields.

1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lavatory pipe shields in accordance with manufacturer's written instructions.

B. Install units level, plumb, and firmly anchored in locations and at heights indicated, using fasteners appropriate to substrate indicated and recommended by manufacturer.

3.3 ADJUSTING AND CLEANING

A. Clean lavatory pipe shield surfaces according to manufacturer's written instructions.

END OF SECTION 22 07 17

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SECTION 22 11 16

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes domestic water piping from locations indicated to fixtures and equipment inside the building and site water utility distribution piping.

1.03 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

1. Domestic Water Service Piping: 160 psig.
2. Domestic Water Distribution Piping: 125 psig.

1.04 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.
B. Water Samples: Specified in "Cleaning" Article in Part 3.
C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.05 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
B. Comply with NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.
B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
C. Transition Couplings for Underground PVC Pressure Piping: AWWA C219, metal, sleeve-type coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.02 COPPER TUBING AND PVC

A. Hard Copper Tube: ASTM B 88, Types K and L, water tube, annealed temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

B. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.

1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.

4. Copper, Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.

a. Copper-Tubing, Keyed Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

C. PVC Pipe: ASTM D1785, Schedule 40, ASTM D2241, SDR-26 for 160 psig pressure rating:

1. Fittings: ASTM D2466, PVC.
2. Joints: ASTM D2855, solvent weld.
3. Trace wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with “Water Service” in large letters.

2.03 VALVES

A. Refer to Section 23 05 23"Valves" for bronze and cast-iron, general-duty valves.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Refer to Division 31 Section “Utility Trenching" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
B. Flanges may be used on aboveground piping, unless otherwise indicated.
C. Grooved joints may be used on aboveground grooved-end piping.
D. Fitting Option: Mechanically formed tee-branch outlets and brazed joints may be used on aboveground copper tubing.
E. Underground Domestic Water Service Piping: Use the following piping materials for each size range:
    1. NPS 2 and Smaller: Hard copper tube, Type K; copper pressure fittings; and soldered joints.
    2. NPS 2-1/2 to NPS 3-1/2: Hard copper tube, Type K; copper pressure fittings; and soldered joints.
F. Aboveground Domestic Water Piping: Use the following piping materials for each size range:
    1. NPS 1-1/2 and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
    2. NPS 2: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
    3. NPS 2-1/2 to NPS 3-1/2: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
G. Underground Domestic Water Piping NPS 4 and Smaller: Hard copper tube, Type K; copper pressure fittings; and soldered joints.
H. Nonpotable-Water Piping: Use the following piping materials for each size range:
    1. NPS 3-1/2 and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

3.03 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
    1. Shutoff Duty: Use bronze ball or gate valves for piping NPS 2 and smaller.
    2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller.
    3. Hot-Water-Piping, Balancing Duty: Memory-stop balancing valves.
    4. Drain Duty: Hose-end drain valves.

3.04 PIPING INSTALLATION

A. Refer to Section 23 05 00"Basic Mechanical Materials and Methods" for basic piping installation.
B. Extend domestic water service piping to exterior water distribution piping in sizes and locations indicated.
C. Install underground copper tubing according to CDA's "Copper Tube Handbook."
D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links

required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.

E. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Section 23 05 00"Basic Mechanical Materials and Methods" for wall penetration systems.

F. Install shutoff valve and hose-end drain valve at each domestic water service.

G. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

H. Perform the following steps before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings, and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.

I. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

3.05 JOINT CONSTRUCTION

A. Refer to Division 23 "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.06 VALVE INSTALLATION

A. Install sectional valve close to water main on each branch and riser serving plumbing fixtures or equipment. Use ball or gate valves for piping NPS 2 and smaller.

B. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball or gate valves for piping NPS 2 and smaller.

C. Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

1. Install hose-end drain valves at low points in water mains, risers, and branches.
2. Install stop-and-waste drain valves where indicated.

D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller. Refer to Division 23 Section "Valves" for balancing valves.

E. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Refer to Division 23 Section "Valves" for calibrated balancing valves.

3.07 HANGER AND SUPPORT INSTALLATION

A. Refer to Section 23 05 33"Mechanical Vibration Controls and Seismic Restraints" for seismic-restraint devices.

B. Refer to Section 23 05 29"Hangers and Supports" for pipe hanger and support devices. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:
   a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
   c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Section 23 05 29"Hangers and Supports."

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.

F. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

G. Install supports for vertical copper tubing every 10 feet.

3.08 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to service piping with shutoff valve, and extend and connect to the following:

1. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."

3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.09 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Cap and subject piping to static water pressure of 100 psig Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.

5. Prepare reports for tests and required corrective action.

3.10 ADJUSTING

A. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

1. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.

2. Adjust calibrated balancing valves to flows indicated.

3.11 CLEANING

A. Clean and disinfect potable and nonpotable domestic water piping including all existing site domestic water system as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, installed or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:

(1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.

(2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes soil and waste, sanitary drainage and vent piping inside and outside the building and to locations indicated.

1.03 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
   1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

1.04 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.
B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.05 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.
B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.

2.02 CAST-IRON SOIL PIPING

A. Hubless Pipe and Fittings: ASTM A 888 or CISPI 301.
   1. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.
      a. Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.
         (1) NPS 1-1/2 to NPS 4 (DN 40 to DN 100): 3-inch- (76-mm-) wide shield with 4 bands.

(2) NPS 5 to NPS 10 (DN 125 to DN 250): 4-inch- (102-mm-) wide shield with 6 bands.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Refer to Division 31 Section "Utility Trenching".

3.02 PIPING APPLICATIONS

A. Aboveground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:
   1. NPS 1-1/4 and NPS 1-1/2 (DN 32 and DN 40): Use NPS 1-1/2 (DN 40) hubless, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 304, stainless steel.
   2. NPS 2 to NPS 4 (DN 50 to DN 100): Hubless, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 304, stainless steel.
   3. NPS 5 and NPS 6 (DN 125 and DN 150): Hubless, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 304, stainless steel.

B. Underground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:
   1. NPS 1-1/2 (DN 40): Hubless, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 304, stainless steel.
   2. NPS 2 to NPS 4 (DN 50 to DN 100): Hubless, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 304, stainless steel.
   3. NPS 5 and NPS 6 (DN 125 and DN 150): Hubless, cast-iron soil piping and one of the following:
      a. Couplings: Heavy-duty, Type 304, stainless steel.

3.03 PIPING INSTALLATION

A. Refer to Section 23 05 00 "Basic Mechanical Materials and Methods" for basic piping installation.

B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

C. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

D. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard

increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

E. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

F. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
   1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
   2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
   3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

G. Install engineered soil and waste drainage and vent piping systems in locations indicated and as follows:
   1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.

H. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

I. Do not install cleanouts at flooring transitions.

J. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.04 JOINT CONSTRUCTION

A. Refer to Section 23 05 00 "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
   1. Hubless Joints: Make with rubber gasket and sleeve or clamp.

3.05 HANGER AND SUPPORT INSTALLATION

A. Refer to Section 23 05 33 "Mechanical Vibration and Seismic Controls" for seismic-restraint devices.

B. Refer to Section 23 05 29 "Hangers and Supports" for pipe hanger and support devices. Install the following:
   1. Vertical Piping: MSS Type 8 or Type 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs: According to the following:
      a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
      b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Section 23 05 29 "Hangers and Supports."
D. Support vertical piping and tubing at base and at each floor.
E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.

3.06 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
C. Connect drainage and vent piping to the following:
1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

3.07 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.08 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Jet lateral lines to main sewer lines prior to final underground inspection.

END OF SECTION

SECTION 22 40 00

PLUMBING FIXTURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes plumbing fixtures and related components.

1.03 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.04 SUBMITTALS

A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.

B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For plumbing fixtures to include in maintenance manuals specified in Division 1.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in Public Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.

E. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
H. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
    1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
    2. Hand Sinks: NSF 2 construction.
    3. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
    4. Stainless-Steel Fixtures Other Than Service Sinks: ASME A112.19.3M.
    5. Vitreous-China Fixtures: ASME A112.19.2M.
    6. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
    7. Water-Closet, Flushometer Tank Trim: ASSE 1037.
    8. Whirlpool Bathtub Fittings: ASME A112.19.8M.
I. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
    1. Faucets: ASME A112.18.1M.
    2. Hose-Connection Vacuum Breakers: ASSE 1011.
    3. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
J. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
    1. Atmospheric Vacuum Breakers: ASSE 1001.
    2. Brass and Copper Supplies: ASME A112.18.1M.
    3. Manual-Operation Flushometers: ASSE 1037.
    4. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
    5. Tubular Brass Drainage Fittings and Piping: ASME A112.18.1M.
K. Comply with the following applicable standards and other requirements specified for miscellaneous components:
    1. Floor Drains: ASME A112.21.1M.

1.06 COORDINATION

A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

1.07 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
    1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
    2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
    3. Faucet, Laminar-Flow Fittings: Equal to 10 percent of amount of each type and size installed, but not less than 2 of each type and size.

4. Faucet, Flow-Control Fittings: Equal to 10 percent of amount of each type and size installed.
5. Supply, Flow-Control Fittings: Equal to 5 percent of amount of each type and size installed.
6. Shower, Flow-Control Fittings: Equal to 5 percent of amount of each type and size installed.
7. Flushometer Valve, Repair Kits: Equal to 10 percent of amount of each type installed, but not less than 12 of each type.
8. Provide hinged-top wood or metal box, or individual metal boxes, with separate compartments for each type and size of extra materials listed above.
9. Flushometer Tank, Repair Kits: Equal to 5 percent of amount of each type installed, but not less than 2 of each type.
10. Water-Closet Tank, Repair Kits: Equal to 5 percent of amount of each type installed.
11. Toilet Seats: Equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified in other Part 2 articles.

2.02 LAVATORY FAUCETS

A. Lavatory Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor. As scheduled on drawings or approved equal.
   1. Maximum Flow Rate: 0.5 gpm, unless otherwise indicated.
   2. Body Material: Cast brass.
   3. Finish: Polished chrome plate.

2.03 SINK FAUCETS

A. Sink Faucet: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor. As scheduled on drawings or approved equal.
   1. Maximum Flow Rate: 1.8 gpm, unless otherwise indicated.
   2. Body Material: Cast brass.
   3. Finish: Polished chrome plate.

2.04 FLUSHOMETERS

A. Flushometer: Cast-brass body with corrosion-resistant internal components, control stop with check valve, vacuum breaker, and copper or brass tubing, and polished chrome-plated finish on exposed parts. As scheduled on drawings or approved equal.
   1. Maximum Flow Rate for Toilet: 1.28 gpm, unless otherwise indicated.
   2. Maximum Flow Rate for Urinal: 0.125 gpm, unless otherwise indicated.
   3. Internal Design: Diaphragm operation.

4. Style: Exposed.

2.05 TOILET SEATS

A. Toilet Seat: Solid plastic.
   1. Configuration: Open front without cover.
   2. Color: White.

2.06 FIXTURE SUPPORTS

A. Water-Closet Support: Water-closet combination carrier designed for accessible or standard mounting height (see schedule). Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.
B. Urinal Support: Wall urinal support system with top and bottom plates. Complete with rectangular steel uprights with welded feet, adjustable support plates, and mounting fasteners.
C. Lavatory Support: Lavatory support system with concealed arms. Complete with rectangular steel uprights with feet, cast iron adjustable headers, concealed arms, steel sleeves, alignment truss, and mounting fasteners.

2.07 SINKS

A. Sinks, Per Schedules on Contract Documents.
   1. Style: Per Schedules on Contract Documents.

2.08 DRINKING FOUNTAIN

A. Drinking Fountain, Per Schedules on Contract Documents.
   1. Style: Per Schedules on Contract Documents.

PART 3 - EXECUTION

3.10 EXAMINATION

A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.
B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 FIXTURE INSTALLATION

A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.
B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.
   1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
   2. Use carrier supports without waste fitting for fixtures with tubular waste piping.

3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-hanging fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture. Refer to Section 23 05 23 "Valves" for general-duty valves.

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

N. Install toilet seats on water closets.

O. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

P. Install water-supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.

Q. Install faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

R. Install shower, flow-control fittings with specified maximum flow rates in shower arms.

S. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

T. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Section 23 05 00 "Basic Mechanical Materials and Methods" for escutcheons.

U. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Division 7 Section "Joint Sealants" for sealant and installation requirements.

3.03 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Connect water supplies from water distribution piping to fixtures.
C. Connect drain piping from fixtures to drainage piping.
D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.
E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.

3.04 FIELD QUALITY CONTROL

A. Verify that installed fixtures are categories and types specified for locations where installed.
B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.
C. Inspect installed fixtures for damage. Replace damaged fixtures and components.
D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
E. Install fresh batteries in sensor-operated mechanisms.

3.05 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
B. Adjust water pressure at faucets, shower valves, and flushometer valves to produce proper flow and stream.
C. Replace washers and seals of leaking and dripping faucets and stops.

3.06 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
    1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
    2. Remove sediment and debris from drains.

3.07 PROTECTION

A. Provide protective covering for installed fixtures and fittings.
B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 23 00 00

MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. Refer to the Drawings, General Conditions, Supplementary Conditions, and Division 01 General Requirements.

B. This Section 23 00 00, applies specifically to all other Sections of Division 23.

C. Where requirements of this Section exceed those in other contract documents, Contractor shall comply with the requirements of this Section.

1.2 SCOPE OF WORK

A. Provide all labor, apparatus and materials that are required to provide a complete installation as indicated on the drawings and in the specifications, including that reasonably inferred for proper execution of this Division.

B. Provide cutting and patching as required for execution of work performed under this Division and not provided under other sections.

C. Repair or replace any damage to work of this Division, damage caused by leaks or breaks in systems of this Division, and damage caused by work of this Division including that to landscaping, paving or other items which are to remain in use.

D. Valves and trim not specifically indicated but required for proper functioning of equipment shall be furnished and installed by the craft furnishing the equipment.

E. Coordinate all utility requirements for equipment furnished by the mechanical sections of this division. Rough-in required systems and make final connections.

1.3 DEFINITIONS

A. Above Grade: Not buried in ground and not embedded in concrete slab on ground.

B. Below Grade: Buried in ground or embedded in concrete slab on ground.

C. Concealed: Inside building, above grade and located within walls, furred spaces, crawl spaces, attics, above suspended ceilings, etc. In general any item not visible or directly accessible.

D. Connect: Complete hookup of item with required services.

E. Contractor: Mechanical Contractor unless stated otherwise.

F. Exposed: Either visible or subject to mechanical or weather damage, indoors or outdoors, including areas such as mechanical and storage rooms. In general any item that is directly accessible without removing panels, walls, ceilings or other parts of structure.

G. Furnish: Purchase and deliver to job site in new condition.

H. Install: Place, secure and connect as required to make fully operational.

I. Provide: Furnish and install as defined above; perform work.

J. Rough-in: Provide all indicated services in the necessary arrangement for making final connections to fixture or equipment.

K. Indoor: Enclosed within building structure, crawl spaces, etc.

L. Use (verb): Furnish and install as defined above.

M. Outdoor: Outside of building structure.

1.4 ABBREVIATIONS AND SYMBOLS

A. Abbreviations contained in various sections of the specifications and drawings refer to the following organizations, societies, associations standards, publications, terms, etc.:

AABC: Associated Air Balance Council

AMCA: Air Moving and Conditioning Association, Inc.

ANSI: American National Standards Institute, Inc.

ARI: Air-conditioning and Refrigeration Institute

ASHRAE: American Society of Heating, Refrigerating, and Air Conditioning Engineers

ASME: American Society of Mechanical Engineers

ASTM: American Society for Testing and Materials

AWS: American Welding Society

AWWA: American Water Works Association

NEBB: National Environmental Balancing Bureau

NEMA: National Electric Manufacturers Association

NFPA: National Fire Protection Association

OSHA: Occupational Safety and Health Act

SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

UL: Underwriters' Laboratories

B. Other abbreviations and symbols are scheduled on the drawings.

1.5 REGULATIONS AND STANDARDS

A. It is the Contractor's responsibility to install all work to meet or exceed minimum requirements stipulated in current issues of applicable standards, codes, or regulations. Where drawings or specifications prescribe requirements exceeding those minimums, the work shall be installed in accordance with the drawing or specification requirements. Particular attention is directed to the following. This list does not include all standards, codes, and regulations which may be applicable; other Federal, State, and local regulations may apply.

1. Occupational Safety and Health Administration (OSHA).
2. State Fire Marshal and Local Fire Marshal.
3. Local Building, Mechanical, Plumbing, & Fire Codes, all volumes.
4. National Fire Codes published by the National Fire Protection Association (NFPA).
5. Factory Mutual Insurers.
6. Sheet Metal & Air Conditioning Contractor's National Association, Inc. (SMACNA) - Guide Lines for Seismic Restraints for Mechanical Systems.
7. International Association of Plumbing and Mechanical Officials (IAPMO)
8. California Building Code (CBC), California Plumbing Code (CPC), California Mechanical Code, California Electrical Code (CEC), and California Fire Code (CFC).
9. Division of State Architects (DSA).
10. Any other applicable Federal, State and local laws and regulations.

Do not construct anything in these drawings and specifications to permit work not conforming to these requirements. The regulations shall govern where they require higher standards or are violated by the drawings and specifications. Consider rulings and interpretations of the enforcing agencies as part of these specifications. Comply with the drawings and specifications showing work exceeding minimum code requirements.

B. All regulations and standards shall be the latest issued unless the governing authority requires the use of an earlier issue. Provide all work required by the governing

authority, even if it is not indicated on drawings or in the specifications, at no additional cost or time to the project.

1.6 DRAWINGS AND SPECIFICATIONS

A. Consider all drawings and all divisions of these specifications as a whole and provide work of this section as shown anywhere therein. Absolute accuracy of the drawings and specifications cannot be guaranteed. While every effort has been made to coordinate the locations of equipment covered under other sections or divisions of these specifications, it is the responsibility of the Contractor to coordinate exact requirements governed by actual job conditions. Check all information and report any discrepancies before submitting bid or fabricating work.

B. Report discrepancies in time to avoid unnecessary work, and make changes as directed by the Architect. Do not make any changes or additions that are subject to additional compensation without written authorization, based upon an agreed price. Any changes made without the above mentioned authorization shall be at Contractor's own risk and expense. Follow manufacturers' directions where they cover points not specifically indicated; however, if they are in conflict with these drawings and specifications, obtain clarifications from the Architect before starting work.

1.7 ALTERATION PROJECT PROCEDURES

A. Materials: As specified in product Sections; match existing products and work for patching and extending work.

B. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.

C. Remove, cut, and patch work in a manner to minimize damage and to provide a means of restoring products and finishes to original and/or specified condition.

D. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.

E. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work to match existing adjacent work in texture and appearance.

F. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect/Engineer.

G. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

H. Finish surfaces as specified in individual product Sections.

1.8 CUTTING AND PATCHING

A. Refer to Division 1 section "Cutting and Patching".

1.9 START-UP AND COMMISSIONING SERVICES

A. Contractor shall be responsible for proper operation of all systems, minor subsystems, and services provided under this section. He shall coordinate startup and commissioning procedures, meetings, calibration, and system checkout with all subcontractors and trades involved. Any system operational problems shall be diagnosed and all correctional procedures shall be initiated with the various subcontractors as required to bring the system into compliance with the design intent.

B. The contractor shall be responsible for preparing a written commissioning and startup procedure including check off list and report format showing design conditions and blanks for indicating actual operating conditions. The report format shall include each piece of equipment and all items that require adjustment.

C. Personnel performing commissioning and startup services shall be fully qualified, experienced, and normally engaged in this type of work. If the contractor does not have such personnel available from their own company, they shall hire, at their own expense, subcontractors who are qualified personnel.

D. Construction Manager shall regularly communicate with commissioning team through memos and progress reports to apprise them of progress and scheduling changes.

E. Commissioning and startup meetings: Construction manager shall schedule and conduct the meetings with team members in attendance as needed. These will include general, mechanical, controls, electrical contractors and subcontractors as appropriate.

F. Functional performance testing will not begin until startup, pre-functional testing and balancing are completed for given system.

G. The contractor shall designate one field person who has the overall responsibility for startup procedures which includes testing and balancing. He shall directly supervise that startup and commissioning operations and be available for required coordination before, during, and after.

H. Prior to startup, ensure that the systems are ready, including but not limited to the following: Proper equipment rotation; the systems are flushed and are clean; proper wiring; auxiliary connections; lubrication, venting; controls; all filters and strainers installed; and properly set relief and safety valves.

I. All electrical testing must be complete and test results submitted before equipment startup to avoid power interruptions during mechanical equipment startup and testing.

J. Equipment or systems shall not be started until systems are completed and/or when other continuing work could possibly damage completed systems if they are in operation.

K. Start and operate all systems. Provide the services of factory trained technicians for startup of major equipment and systems including, but not limited to, chillers, air conditioning units variable frequency drives (VFD), temperature controls, pumps, boilers, etc.

L. The contractor shall provide all labor, materials and services necessary for the commissioning, startup and operation of all systems and equipment furnished and installed under this section. Contractor and commissioning team shall make every effort to expedite testing process and minimize unnecessary delays without compromising integrity of procedures.

M. The contractor and factory representative shall check all equipment during the initial startup to ensure correct rotation, proper lubrication, adequate fluids or air flows, non-overloading electrical characteristics, proper alignment, and vibration isolation. Systems shall be checked for air and/or water flows throughout without blockages. Air conditioning units and systems shall be checked for proper damper connections and positions, aligned and adjusted belt drives, proper lubrication, air filters installed, non-excessive electrical characteristics, and minimal vibration. Other miscellaneous equipment shall be started and operated as described above as applicable.

N. During initial operation of the system and unit substantial completion, qualified personnel shall be provided and designated for maintaining the equipment and systems in good running order. Failure of equipment during this period due to lack of proper supervision is the responsibility of the contractor and continued failures shall be grounds for the Owner to provide such services with back charges to the contractor.

O. Check all motor starters and verify that the heater sizing is correct, taking length of electrical feeders into consideration. Record amp readings on all motors.

P. Make sure all control systems are calibrated and functioning properly. Prepare a log to indicate the check, calibration, set point, etc. of each control device.

Q. Functional performance tests verify that components, equipment, systems, and interfaces between systems operate correctly. They include operating modes, interlocks, control sequences, and responses to emergency conditions.

R. Functional performance testing and verification may be achieved by direct manipulation of system inputs (i.e. heating or cooling sensors), manipulation of system inputs by building automation system (i.e. softwar4e override of sensor inputs), trend logs of system inputs and outputs using building automation system, or short term monitoring of system inputs and outputs using stand-alone data loggers.

S. If retesting is necessary because any equipment or system reported to have been successfully started up or pre-functionally tested is found during functional testing to be faulty, the additional cost of retest shall be the responsibility of the contractor.

T. Commissioning and Verification of control system:

1. The control systems shall be completely commissioned to ensure all aspects of the system are operating as intended and at optimum tuning.
2. All wiring connections shall be verified and traced from field device to panel to ensure proper connections.
3. All measured values shall be verified by a hand held calibrated device to validate that value indicated by the control system is in fact the actual measured value.
4. All loops shall be properly tuned to obtain the desired control value. Each loop shall be "upset" and put back in control to demonstrate its ability to stabilize quickly.
5. A final point-by-point report shall be submitted that indicates the date of each verification, the results, and shall be initialed on each page by the person performing the reading.

U. A final and complete commissioning, startup report shall be submitted prior to final acceptance and payment. This report shall be signed by each person doing the commissioning/startup task and by the responsible field person. Report shall include, but not be limited to, date of test; instrument used; date of last calibration; temperatures; set points; rpm; voltage; amperage; pressures; stability; etc.

1.10 DEMONSTRATION AND INSTRUCTIONS

A. Provide operation and maintenance of Products to Owner's personnel two (2) weeks prior to date of Training.

B. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.

C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at designated location.

D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

E. The amount of time required for training on each item of equipment and system is that specified in individual sections, or as noted below:

HVAC Equipment and Systems	Two sessions at 8 hours each
Temperature Control System	Two sessions at 8 hours each

Plumbing System 4 hours

1.11 TESTING, ADJUSTING, AND BALANCING

A. Mechanical Contractor will appoint and employ services of an independent firm to perform testing, adjusting and balancing.

B. The independent firm hired by the Mechanical Contractor will perform services specified in Section 23 05 93, "Testing, Adjusting and Balancing".

C. Reports will be submitted by the independent firm to the Architect/Engineer indicating observations and results of tests and indicating compliance or non-compliance with specified requirements and with the requirements of the Contract Documents.

1.12 CLOSEOUT PROCEDURES

A. Refer to Division 1 section "Closeout Procedures".

B. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's inspection.

C. Provide submittals to Architect/Engineer that are required by governing or other authorities.

1.13 FINAL CLEANING

A. Refer to Division 1 section "Closeout Procedures".

B. Execute final cleaning prior to final inspection.

C. Clean interior and exterior of all equipment; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum and clean all dust from air distribution system including ductwork and grilles.

D. Clean equipment and fixtures to a sanitary condition.

E. Replace filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, and drainage systems.

G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.14 PROJECT RECORD DOCUMENTS

A. Refer to Division 1 section "Project record Documents".

B. Maintain on site, one set of the following record documents; record actual revisions to the Work:
   1. Contract Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other Modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.

C. Store Record Documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and Modifications.

F. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish main floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract Drawings.

G. Delete Architect/Engineer title block and seal from all documents.

H. Submit documents to Architect/Engineer.

1.15 OPERATION AND MAINTENANCE DATA

A. Refer to Division 1 section "Operation and Maintenance Data".

1.16 WARRANTIES

A. Refer to Division 1 section "Operation and Maintenance Data".

B. Provide duplicate notarized copies.

C. Execute and assemble documents from Subcontractors, suppliers, and manufacturers.

D. Provide Table of Contents and assemble in three (3) D side ring binders with durable plastic cover.

E. Submit prior to final Application for Payment.

F. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.17 BUILDING CONTROL BOOKS

A. Refer to Division 1 section "Operation and Maintenance Data".

B. At the time Operation and Maintenance Data are submitted as specified, submit 3 loose, but bundled, sets of Building Control Information on 3 hole punched 8-1/2"X11" paper. The Building Control Information shall be organized as follows:

1. Table of contents with appropriate division tabs.
2. Contractors (Name, Address, Telephone and Contact).
3. Sub-Contractors (Name, Address, Telephone and Contact).
4. Material Suppliers (Name, Address, Telephone and Contact).
5. Warranties (Cards and Information Including Start Date, Duration, Company Name, Address, Telephone and Contact).

1.18 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

1.19 SITE VISIT

A. Visit the site before submitting a bid. No extra payment will be made for additional work that would have been made apparent by the site visit.

1.20 OBSERVATION BY ARCHITECT

A. Work may be observed at any time by the Architect or his representative. Work covered or concealed before being observed and accepted shall be opened and uncovered upon request, and replaced at no additional cost or time to the project.

1.21 INTERRUPTION OF EXISTING SERVICES AND UTILITIES

A. Coordinate with other Sections and schedule sequence of accomplishing the work covered by this division in such a manner as not to interrupt existing services and utilities at a time that will inconvenience the Owner.

1.22 FEES

A. Secure and pay fees for permits, licenses, inspections and royalties required for work of this Section.

1.23 OWNER-FURNISHED PRODUCTS

A. Products furnished to site and paid for by Owner.

B. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections and service.

C. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage, jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

1.24 SUBMITTAL PROCEDURES

A. Refer to Division 1 section "Submittal Procedures".

B. General:
   1. In addition to the procedures indicated below follow the procedures specified in Division 1 where they exceed the requirements of this section.
   2. Provide submittals of material or equipment in accordance with each specification section.
   3. Each item submitted shall be labeled or identified the same as on the drawings. (AC1, EF1, TB1.01, etc.)

C. Equipment, materials, and products specifically identified, described, and scheduled on the drawings are the basis of design. The other manufacturers or suppliers which may be named in the specification only indicate the general acceptability of the manufacturer or supplier and are considered alternates. It is the Contractor's responsibility to research, select, and prove, through the submittal process, that the specific model, size, or type of the alternate proposed manufacturer is equal and will perform equal to that which is the basis of the design. Operational characteristics for such items as outlet velocities, power input, sound levels, efficiencies, etc., shall be considered in addition to the overall performance, output, and physical constraints.

D. The Contractor assumes full responsibility that alternative items substituted for the scheduled manufacturer will meet the job requirements and is responsible for the cost of redesign and modifications necessary due to this substitution, for all trades. Revisions or additional work required by any trade due to the use of substitute materials and equipment shall be fully indicated on detailed drawings submitted with the shop drawings and all additional costs shall be accounted for in the final proposed substitution.

E. Mark submittal "Exactly as Specified" or accompanied by a letter from the supplier explaining in detail what differences, if any, exist between the submitted item and the scheduled item. Failure to point out the differences will be considered cause for disapproval. If differences are not indicated and/or not discovered during the submittal review process, the Contractor will still remain responsible for providing equipment and materials that meet the specifications.

F. Acceptable Manufacturers: Subject to compliance with the requirements of the individual specification sections, provide materials and equipment from the indicated manufacturers only. Submittals of material or equipment manufactured by other than those indicated may be returned, not reviewed. If no manufacturers are indicated, then any product or material which complies with the specification and for the intended application may be submitted.

G. The mechanical and electrical components, structural systems, service clearances, and controls for all equipment are selected and sized, based on the basis of design manufacturer and equipment scheduled. If substitutions and/or equivalent alternate equipment are furnished, it shall be the responsibility of all parties concerned, involved in, and furnishing the substitute and/or equivalent alternate equipment to verify and compare the characteristics (capacity, size, clearance, acoustics, etc.) and requirements of that submitted to that scheduled. If greater capacity or more materials or labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then it shall be the responsibility of the parties involved in providing the substitute and/or equivalent items of equipment to provide all compensation for additional charges made for the proper rough-in, circuitry, support, and connections for the equipment furnished for all trades affected. No additional charges shall be allowed for such revisions.

H. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals.

I. The Engineer and/or Architect will review submitted shop drawings and documents for general conformance with the design concept of the project and the information contained in the contract documents. The Engineer's and/or Architect's review is for the convenience of the Owner in following the work and does not relieve the Contractor of the responsibility of deviations from the requirements stated in this specification and contract documents.

J. The Engineer's and/or Architect's review shall not be construed as a complete or detailed check of the work submitted, nor shall it relieve the Manufacturer or Contractor of responsibility for errors or omissions of any sort in the shop drawings and samples, or from the necessity of furnishing any work required by the contract documents. The review of a separate item shall not indicate review of the complete assembly in which it functions. Nothing in the Engineer's and/or Architect's review of the shop drawings and samples shall be considered as authorizing 1) a departure from contract documents and specifications, or 2) additional cost to the owner, or 3) increased time for completion of the work.

K. Submittals are not reviewed for quantities, dimensions, weights, fabrication processes, construction methods, coordination with work of other trades, construction safety practices, service clearance, coil and motor location, location of control and electrical panels, and other layout constraints. These items shall remain the sole responsibility of the contractor.

L. The Engineer and/or Architect will review submittals with reasonable promptness and will return them to the Vendor/Supplier/Manufacturer stamped to indicate the appropriate action taken as follows:

1. No Exceptions Taken.
2. Exceptions Taken As Noted. No resubmittal required.
3. Exceptions As Noted. Resubmit.
4. Rejected. Resubmit.
5. Not Reviewed. Must Meet Plans, Specifications, and Codes.

M. Markings or comments or the lack thereof shall not be construed as relieving the Vendor/Supplier/Manufacturer/Contractor from complete compliance with the project drawings and specifications.

N. No part of the work shall be started in the shop or in the field until the Engineer and/or Architect have reviewed the shop drawings and samples for that respective portion of the work. Shop drawings and samples shall be submitted for review sufficiently in advance of the scheduled start of the work in the shop or in the field to allow ample time, in consideration of the number and complexity of the drawings in the submittal, for the Engineer and/or Architect to make an orderly review. No extension of time to complete the work will be granted to the Vendor/Supplier/Manufacturer by reason of failure to perform in this respect.

O. Each shop drawing and sample submitted for review shall be accompanied by a letter of transmittal, and shall be identified by the project title, Vendor's/Supplier's/Manufacturer's name, and a reference to the related part of the contract documents.

P. Product Data: For the following:
   1. Transition fittings.
   2. Dielectric fittings.
   3. Mechanical sleeve seals.
   4. Escutcheons.

Q. Welding certificates.

1.25 ESTABLISHED STANDARD MANUFACTURER/OTHER AACEPTABLE MANUFACTURERS

A. Refer to Division 1 section "Project Requirements and Substitutions".

1.26 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacturer, for similar components.

1.27 TRANSPORTATION AND HANDLING

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.28 STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.

B. For exterior storage of fabricated products, place on sloped supports, above ground.

C. Provide off-site storage and protection when site does not permit on-site storage or protection.

D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

E. Store loose granular materials on solid flat surfaces in a well-drained area. Provide mixing with foreign matter.

F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

1.29 SHOP DRAWINGS

A. Refer to "Submittal Procedures" above and Division-1for additional requirements.

B. Submit information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

C. Shop Drawings include fabrication and installation drawings and directions, setting diagrams, schedules, patterns, templates and similar drawings, and installation for metal and wood supports and anchorages. Include as a minimum the following information on drawings or diagrams:

1. Dimensions
2. Identification of products and materials included
3. Compliance with specified standards
4. Notation of coordination requirements
5. Allowance for expansion, contraction, and deflection/movement of support structures.

D. Notation of dimensions established by field measurement

E. Clearances for access and service

F. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

G. Upon contractor's request, engineer can make electronic data files available at contractor's expense in order to enable contractor to expedite the production of working/coordination/shop drawings for the project. Transfer of the electronic data files to Contractor is for informational purposes only and will only be completed after a waiver is signed by contractor and owner relieving engineer of all liability resulting from use of electronic files and all engineer costs to produce electronic files in a format suitable for distribution are paid by contractor.

1.30 MATERIAL AND EQUIPMENT

A. Place materials and equipment on order in time to avoid job delay or hindrance. Schedule deliveries to coincide, as nearly as possible, with the construction schedule.

B. Use only new, unused materials and equipment unless specifically noted otherwise.

C. All materials and equipment not conforming to the requirements of these specifications will be considered as defective. Items which have been accepted or approved at one time and place, but which subsequently fail to conform to the requirements of these specifications will also be considered as defective. All such defective materials, whether in place or not, will be rejected. Remove such materials and equipment immediately from the site of the work.

D. Prior to ordering materials or starting work, verify all measurements at the site. No extra compensation will be allowed for differences between actual dimensions and the measurements shown on the drawings.

E. Except as specifically noted otherwise, follow the installation and/or maintenance directions provided by the manufacturer for all materials and equipment.

F. For each part of the work furnish all materials and equipment of the same type by the same manufacturer.

1.31 PROTECTION OF BUILDING

A. Protect new and existing building structures and adjacent finished surfaces during construction. Patch, repair, and refinish existing work damaged by work under this Division to match adjacent undisturbed areas. Patching, repair, and refinishing is to be performed by workmen skilled in the Sections involved.

1.32 RECORD DRAWINGS

A. Refer to Division 1 section "Project Record Documentation".

B. Prepare record documents in accordance with the requirements in Division 1. In addition to the requirements specified in Division 1, indicate the following installed conditions:

1. Indicate actual inverts and horizontal locations of underground piping and conduits.
2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
3. Accepted substitutions, contract modifications, and actual equipment and materials installed. This includes updating all equipment schedules with actual equipment provided.
4. Indicate duct and pipe routing and locations.
5. Refer to division-1 for additional requirements.

C. Contractor shall maintain a complete set of documents on site that are marked-up during the construction process indicating all changes that have been made. These mark-ups shall be maintained on a regular basis so they are current as the construction is in process and available for inspection by the Architect/Engineer. Markups shall include changes to duct and pipe routing and sizing.

D. Upon completion of the construction, the contractor shall transfer all mark-ups into AutoCAD and update the contract documents into record documents and the shop/coordination drawings in to as-built documents.

1. Upon contractor's request, engineer can make electronic data files available at contractor's expense in order to enable contractor to expedite the production of record drawings for the project. Transfer of the electronic data files to Contractor is for informational purposes only and will only be completed after a waiver is signed by contractor and owner relieving engineer of all liability resulting from use of electronic files and all engineer costs to produce electronic files in a format suitable for distribution are paid by contractor.
2. Architect/engineer makes no representations as to the accuracy or completeness of electronic data files. They are provided to the contractor as a start point to upgrade to Record Drawings.
3. The contractor record documents shall be in the same CAD program, version, and operating system as the original Contract Drawings.
4. Delete architect/engineer title block and seal from all documents.

E. Record and as-built document updates shall include schedules where contractor has supplied alternate manufacturers to those scheduled or where submitted performance varies.

F. Contractor shall prepare an electronic CAD file of record and as-built drawings and the drawings shall be updated with the mark-up, RFI and change orders.

G. Provide a minimum of one copy of the markup documents, a hard copy set of prints of the record and as built documents, and one electronic copy (disk) of the CAD files.

1.33 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, contractor shall request clarification from Architect/Engineer before proceeding.

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.34 FIELD SAMPLES

A. Install field samples at the site as required by individual specifications Sections for review.

B. Acceptable samples represent a quality level for the Work.

C. Where field sample is specified in individual Sections to be removed, clear area after field sample has been accepted by Architect/Engineer.

1.35 MOCK-UPS

A. Tests will be performed under provisions identified in this section.

B. Assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Where mock-up is specified in individual Sections to be removed, clear area after mock-up has been accepted by Architect/Engineer.

1.36 INSPECTION AND TESTING LABORATORY SERVICES

A. Refer to Division 1 section "Quality Requirements".

1.37 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. Submit qualifications of observer to Architect/Engineer thirty (30) days in advance of required observations. Observer subject to approval of Architect/Engineer and/or Owner.

B. When specified in individual specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment and to initiate instructions when necessary.

C. Manufacturer's Field representative shall report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Submit report in duplicate within five (5) days of observation to Architect/Engineer for review.

1.38 SPECIFIC MANUFACTURER AND MODEL

A. Trade names are used to establish standards. Where more than one name is given, the first listed is the basis of the project design and will be described fully. Other names indicate product lines of generally comparable quality but are subject to the Architect's/Engineer's direction.

B. Where specifications call for an installation to be made in accordance with manufacturers recommendations, a copy of such recommendations shall at all times be kept in the job superintendent's office, and shall be available to the Owner's representative.

C. Follow manufacturer's instructions where they cover points not specifically indicated on the drawings and specifications. If they are in conflict with the drawings and specifications obtain clarification from the Architect before starting work.

1.39 NO SPECIFIC MANUFACTURER

A. Where no specific make of material or equipment is mentioned, an appropriate product of approved manufacturer may be used, provided it conforms to the requirements of system.

1.40 U.L. LABEL

A. Furnish UL labeled and listed materials and equipment except when equipment is of a type for which labeling or listing services are not available from UL.

1.41 CURRENT MODELS

A. Materials and equipment shall be new, current models by each manufacturer and shall bear complete identification by the manufacturer. Materials and equipment shall be guaranteed by the manufacturer to equal or exceed specified, submitted and published specifications, such as pressure ratings, capacities, etc.

1.42 SERVICE CAPABILITY

A. Provide materials and equipment of major and reputable manufacturers with ability to render competent and thorough technical services through local organizations, and to expeditiously furnish spare parts.

1.43 FINISHES AND PAINTING

A. Provide all equipment with a factory painted finish. All other painting will be done per the Architect's direction.

B. Touchup scratches in factory finished surfaces to match original. Obtain touch-up paint from the manufacturer of the piece of equipment.

1.44 COORDINATION

A. Coordinate with work performed by other sections/divisions in order to accommodate the requirements of this section and to ensure adequate space and proper location for all necessary work on this project whether or not work is under this section. Provide coordination drawings, as indicated. Coordination shall be done prior to order or manufacture of any systems or components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces.

E. Coordinate work with the Electrical Division. Furnish the Electrical Division with shop drawing information for indicating ratings and control circuits required for the actual equipment furnished. Coordinate voltage, phase, and load requirements, prior to ordering equipment, to insure mechanical and electrical matches. All equipment shall be provided and ordered to suit the power available.

F. Layout support pads, curbs, sleepers, anchor bolts, etc., for all mechanical equipment and materials so as to be in the proper location for the equipment actually ordered. These pads shall be of adequate dimension to provide for proper mounting of

equipment isolators and equipment mounting so that anchor bolts meet all seismic criteria. Contractor shall allow for proper service clearances.

G. Provide templates, information, and instructions to other divisions as necessary to properly locate holes and openings to be cut or provided for mechanical work.

H. Layout ducts, piping, and other mechanical systems and confirm all sizes of systems and components to be sure they fit the space available prior to ordering and manufacturing of components. Be certain to allow for proper pipe slopes.

I. Provide proper clearances for access to and service of all equipment and items requiring adjustment including shutoff valves.

J. Coordinate all disciplines to insure maximum point loads that can be attached to structural members are not exceeded. See other sections and structural contract documents for requirements. Provide intermediate supports between existing structural members (Unistrut, angle, etc.) as necessary to not exceed maximum point loads.

K. Lay out trench locations, do all excavation, shoring, laying, backfilling, and compacting for work performed under this division and not provided under other divisions. See other divisions for specification requirements.

1.45 COORDINATION DRAWINGS

A. Prepare and submit, for review, large scale (minimum 1/4" = 1'-0") coordination drawings showing location and elevations of all equipment, ducts, piping, cable trays, conduits, structural, and other items in the area. These shall be fully coordinated with all other trades and Owner supplied items. Check routing and elevations of all piping, ductwork, conduit and equipment before fabricating. Report any conflicts that cannot be solved in the field to the Architect/Engineer. Extra charges shall not be allowed due to lack of coordination prior to, or during, construction. These drawings shall be distributed to, and coordinated with, all other trades that are affected.

1. In addition to plan view, indicate heights to clarify clearances from structure and from other trades. Use partial sections where necessary.
2. Provide proper clearances for access to and service of all equipment and items requiring adjustment including shutoff valves.
3. Coordinate the location of access panels in the hard ceiling areas to insure all equipment and devices have proper access for servicing and adjusting.
4. The coordination drawings shall be reviewed and checked for completeness by the general contractor. Review by the architect and engineer is to assist the contractor and to attempt to point out obvious errors. Responsibility for proper coordination shall remain with the contractor.

B. Differences or disputes concerning coordination, interference, or extent of work between sections shall be decided by general contractor.

C. Extra charges shall not be allowed due to lack of coordination (or lack of coordination drawings) prior to or during construction.

D. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work. Indicate the proposed locations of ductwork, piping, conduit, equipment, and materials. Include the following:

1. Clearances for installing and maintaining insulation, including clearances for servicing and maintaining equipment, and space for equipment disassembly required for periodic maintenance.
2. Clearances for electrical and control components and panels.
3. Equipment connections and support details.
4. Exterior wall and foundation penetrations.
5. Interior floor penetrations
6. Fire-rated wall and floor penetrations.
7. Sizes and location of required concrete pads and bases.
8. Support, bracing and anchor locations for equipment and conduit.

E. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

F. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

G. Prepare reflected ceiling plans to coordinate and integrate installations, access panel and door locations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items where ceilings are to be installed.

1.46 STRUCTURAL MODIFICATION

A. Do not cut structural members except with written approval of the Architect and DSA.

1.47 WORKMANSHIP

A. Workmanship shall be first class throughout, performed only by competent and experienced workmen in a manner satisfactory to the Architect. Replace work falling below these standards as directed by the Architect. Constant supervision of the work either by the Contractor or his competent representative shall be maintained. Welding shall be done by certified pipe welders.

1.48 QUIETNESS

A. Quietness during construction is a requirement. Eliminate noise, other than that caused by specific equipment operating at optimum conditions as directed by the Architect.

1.49 GENERAL ELECTRICAL

A. All equipment shall be selected to suit power available; this requirement supersedes other portions of the specifications.

B. All equipment shall conform to the National Electrical Manufacturer's Association Standards, and shall bear the Underwriter Laboratories label unless such listing is not available.

C. Load and line voltage connections to equipment will be made by the Electrical Division unless specifically noted otherwise. Coordinate work with the Electrical Division. Furnish the Electrical Division with shop drawing information for indicating ratings and control circuits required for the actual equipment furnished.

D. Guard opening giving access to "live" or rotating parts to prevent accidental contact with such parts.

1.50 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturers' instructions and Contract Documents.

C. Follow Manufacturer's installation details except as specifically modified on the drawings, and provide any valves or special fittings or other specialty items called for by them as required in order to make the equipment perform as intended.

1.51 MANUFACTURER'S CERTIFICATES

A. When specified in individual specification Sections, submit manufacturers' certificate to Architect/Engineer for review, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.

1.52 SEISMIC RESTRAINTS

A. General: All equipment, piping, ductwork, and materials shall be fastened to the structure with properly sized and structurally engineered anchors, bolts, and restraints to prevent permanent displacement in any direction caused by lateral motion, overturning, or uplift.

B. Provide specifications of anchor bolt size and loads with installation instructions for each item.

C. All structural steel shall be ASTM A36 (Fy = 36,000 psi). All pipe steel shall be ASTM A501 (Fy = 36,000) or ASTM A53, type E or S, grade B (Fy = 35,000). All tubular steel shall be ASTM A500 grade B (Fy = 46,000 psi). All bolts shall be ASTM A307 or ASTM A325. Other ASTM specified materials to be used in the unit and support shall be submitted for approval. Latest American Institute of Steel Construction (AISC) and American Welding Society (AWS) codes shall apply.

D. All bolts, anchor bolts, expansion bolts, etc., shall be installed with steel washers. All high strength bolting shall be inspected by an independent testing laboratory. All welding shall be by welders holding valid certificates and have current experience in type of welds performed. Certificates shall be those issued by an accepted testing agency.

E. All welding shall be done by E70 series low hydrogen rods. All welding shall be per American Welding Society standards. Vendor may shop weld only the portions of unit and support which is factory preassembled. All field connections shall be bolted. Shop welds shall be shown on shop drawings. All full penetration welds shall be tested and certified by an independent testing laboratory.

F. Expansion Anchors in Hardened Concrete:

1. An expansion anchor is defined as a mechanical fastener designed to expand in a self-drilled or predrilled hole of a specified size, and to engage the sides of the hole in one or more locations to develop shear and/or withdrawal resistance to applied loads without the use of grout, epoxy, or dry pack.
2. Maximum Values: The shear and tension (pull-out) loads shall not exceed the values allowed in the latest International Code Council (ICC) Evaluation Report for the specific anchor in hard rock 3000 psi concrete.

G. All isolators shall be fastened to the structure and to the equipment.

H. The equipment Manufacturer shall furnish the weight of the equipment at each point of support.

I. The SMACNA "Guidelines for Seismic Restraints of mechanical Systems and Plumbing Piping Systems" may be used for reference.

J. Seismic Bracing for Hangers and Duct: All required seismic bracing shall be installed as per the State of California Code of Regulations, Title 24, Division T-22 modified to meet an importance factor (I) of 1.0.

K. Under California Code of Regulations Title 24, Division T-22, seismic restraints may be omitted from the following installation:

1. Gas piping less than 1" inside diameter.
2. Piping in boiler and mechanical equipment rooms less than 1 1/4" inside diameter.
3. All other piping less than 2 1/2" inside diameter.
4. All piping suspended by individual hangers 12" or less in length from the top of pipe to the bottom of the support for the hanger.
5. All rectangular air handling ducts less than 6 square feet in cross sectional area.
6. All round air handling ducts less than 28" in diameter.
7. All ducts suspended by hangers 12" or less in length from the top of the duct to the bottom of the support or the hanger connection point.

The Title 24 Division T-22 allowable omissions do not supersede any requirements indicated in NFPA or required by the Fire Marshal, ASCE Chapter 7, or building official. Contractor shall comply to the most stringent of these requirements.

L. Provide for attachment to portions of the building structure capable of bearing the loads imposed.

M. The Construction Manager shall coordinate the load requirements from all contractors so that no combination of loads exceeds the structural limitations.

N. Install all support systems to comply with the seismic zone 4 requirements of the California Building Code (CBC). Use an importance factor (I) of 1.0.

PART 2 - PRODUCTS (See Subsequent Sections)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation and Arrangement: Install all mechanical work to permit removal (without damage to other parts) of coils, heat exchange bundles, fan shafts and wheels, filters, belt guards, sheaves and drives, and all other parts requiring periodic replacement or maintenance. Arrange pipes, ducts, raceways and equipment to permit ready access to valves, cocks, traps, starters, motors, and control components. Doors and access panels shall be kept clear.

B. Ductwork: Change the cross-sectional dimensions of ductwork when required to meet job conditions but maintain at least the same equivalent cross-sectional area. Obtain the Architect's/Engineer's approval prior to fabrication of ductwork requiring such changes.

C. Access: Provide access panels in equipment, ducts, as required for inspection and for proper maintenance.

D. Location of pipes, ducts, equipment, fixtures, etc., shall be adjusted to accommodate the work and to avoid interferences anticipated or encountered. Determine the exact route and location of each pipe and duct prior to fabrication.

1. Right-of-Way: Lines which pitch shall have the right-of-way over those which do not pitch. For example, steam, condensate and plumbing drains shall normally have the right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.
2. Offsets, transitions and changes in directions in pipes and ducts shall be made to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. Furnish and install all traps, air vents, sanitary vents, etc., required to affect these offsets, transitions and changes in direction.

E. Location of valves, traps, strainers, motors, damper operators, etc., shall be such as to be easily accessible by a person standing on the floor. If any such items are not in the open they shall be accessible through access openings in the building construction. Valves in vertical risers shall be located not over 5 feet above the floor. If circumstances at a particular location make this accessibility difficult or inconvenient, the situation shall be discussed with the Architect before installing apparatus at reduced accessibility locations.

F. Manufacturers' Installation Details: Conform to manufacturer's instructions. Provide any valves or fittings recommended by manufacturers.

G. Openings in Pipes and Ducts: Keep closed during construction.

H. Ferrous metal work exposed to the weather, other than cast iron, shall be hot dip galvanized.

I. Nameplates: Provide for each fan and pump per the equipment schedules and its associated motor controller (if not in a motor control center); including any special instructions for fan or pump use; laminated black and white plastic with lettering cut through to white background. Submit list to the Architect for prior approval.

J. Items Exposed-to-View Entries, Hallways / Corridor Areas: Obtain acceptance by the Architect of the location of all equipment and materials before installation of work in these areas.

3.2 TESTING

A. Delayed Heating or Cooling Tests: If the work is completed during the heating season, perform final tests of cooling equipment the following summer; if completed during summer, perform test of heating system the following winter.

B. Test Procedures and Reports: The Contractor shall notify the Architect at least 48 hours before each system test, for mechanical work. Qualifications of people running tests should be established in writing. Monitor all tests. A written report shall be prepared by the Contractor and submitted to the Architect, showing the following as a minimum.

1. Who conducted test.
2. Test plan - times, pressures, etc.
3. Test results - times, pressures, a part of system that failed to meet test minimum and why. Corrective action recommended.

C. All Testing will be coordinated with the Commissioning Authority (CxA). For witnessing and testing the contractor shall utilize CxA system readiness and Functional Test Forms. Contractor shall refer to Commissioning Specification sections for further details.

END OF SECTION 23 00 00

SECTION 23 05 00

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Piping materials and installation instructions common to most piping systems.
   2. Transition fittings.
   3. Dielectric fittings.
   4. Mechanical sleeve seals.
   5. Sleeves.
   6. Escutcheons.
   7. Grout.
   8. Mechanical demolition.
   9. Equipment installation requirements common to equipment sections.
   10. Painting and finishing.
   11. Concrete bases.
   12. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:
1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:
1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified at no additional cost to the Owner. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate and provide the access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Coordinate with construction manager for Access panels, doors and requirements from other trades.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 and Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 15 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:
   1. ABS Piping: ASTM D 2235.
   2. CPVC Piping: ASTM F 493.
   3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
   4. PVC to ABS Piping Transition: ASTM D 3138.

I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.4 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
   1. Manufacturers:
      a. Cascade Waterworks Mfg. Co.
      b. Dresser Industries, Inc.; DMD Div.
      c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
      d. JCM Industries.
      e. Smith-Blair, Inc.
      f. Viking Johnson.
   2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
   3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
   4. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
   1. Manufacturers:
      a. Eslon Thermoplastics.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
   1. Manufacturers:
      a. Thompson Plastics, Inc.

D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.
   1. Manufacturers:

a. NIBCO INC.
b. NIBCO, Inc.; Chemtrol Div.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.
1. Manufacturers:
a. Cascade Waterworks Mfg. Co.
b. Fernco, Inc.
c. Mission Rubber Company.
d. Plastic Oddities, Inc.

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
1. Manufacturers:
a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Eclipse, Inc.
d. Epco Sales, Inc.
e. Hart Industries, International, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
1. Manufacturers:
a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
1. Manufacturers:
a. Advance Products & Systems, Inc.
b. Calpico, Inc.

c. Central Plastics Company.

d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:

a. Calpico, Inc.

b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:

a. Perfection Corp.

b. Precision Plumbing Products, Inc.

c. Sioux Chief Manufacturing Co., Inc.

d. Victaulic Co. of America.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

a. Advance Products & Systems, Inc.

b. Calpico, Inc.

c. Metraflex Co.

d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

3. Pressure Plates: Stainless steel. Include two for each sealing element.

4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.8 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

E. One-Piece, Stamped-Steel Type: With set screw and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.9 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

B. Refer to Division 3 Section, "Cast in Place Concrete".

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION

A. Refer to Division 1 Section for "Cutting and Patching" and Division 2 Section for "Selective Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are accepted on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:
    a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type and set screw.
    h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed hinge and set screw.
    j. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw.
    l. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
2. Existing Piping: Use the following:
    a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
    b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
    c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.

d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and spring clips.

e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.

f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and set screw.

g. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with polished chrome-plated finish.

h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge and set screw or spring clips.

i. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.

j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with set screw or spring clips.

k. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable plain-end sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.
   a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas minimum 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
   a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
   b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
   c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to minimum 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
      (1) Seal space outside of sleeve fittings with grout.
4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and

location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. Plain-End Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

A. Painting of mechanical systems, equipment, and components is specified in Division 9 Section, “Painting”.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel information and requirements.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.9 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Refer to Division 6 Section "Rough Carpentry" for wood supports and anchorages information and requirements.

B. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.

C. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

D. Attach to substrates as required to support applied loads.

3.10 GROUTING

A. Refer to Division 3 Section "Cast-in-Place Concrete" for grouting information and requirements.

B. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

C. Clean surfaces that will come into contact with grout.

D. Provide forms as required for placement of grout.

E. Avoid air entrapment during placement of grout.

F. Place grout, completely filling equipment bases.

G. Place grout on concrete bases and provide smooth bearing surface for equipment.

H. Place grout around anchors.

I. Cure placed grout.

END OF SECTION

SECTION 23 05 13

MOTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes basic requirements for factory-installed and field-installed motors.

B. Related Sections include the following:

1. Division 23 Section "Mechanical Vibration and Seismic Controls" for mounting motors and vibration isolation and seismic-control devices.
2. Division 23 Sections for application of motors and reference to specific motor requirements for motor-driven equipment.

1.3 DEFINITIONS

A. Factory-Installed Motor: A motor installed by motorized-equipment manufacturer as a component of equipment.

B. Field-Installed Motor: A motor installed at Project site and not factory installed as an integral component of motorized equipment.

1.4 SUBMITTALS

A. Product Data for Field-Installed Motors: For each type and size of motor, provide nameplate data and ratings; shipping, installed, and operating weights; mounting arrangements; size, type, and location of winding terminations; conduit entry and ground lug locations; and information on coatings or finishes.

B. Shop Drawings for Field-Installed Motors: Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Include the following:

1. Each installed unit's type and details.
2. Nameplate legends.
3. Diagrams of power and control wiring. Provide schematic wiring diagram for each type of motor and for each control scheme.

C. Coordination Drawings: Floor plans showing dimensioned layout, required working clearances, and required area above and around field-installed motors. Show motor layout, mechanical power transfer link, driven load, and relationship between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

D. Manufacturer Seismic Qualification Certification: Submit certification that motors, accessories, and components will withstand seismic forces defined in Division 15 Section "Mechanical Vibration and Seismic Controls." Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Motorized Equipment: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Qualification Data: For testing agency.

F. Test Reports: Written reports specified in Parts 2 and 3.

G. Operation and Maintenance Data: For field-installed motors to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations: Obtain field-installed motors of a single type through one source from a single manufacturer.

C. Product Options for Field-Installed Motors: Drawings indicate size, profiles, and dimensional requirements of motors and are based on the specific system indicated.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices. Provide motors that are:

1. Compatible with the following:
   a. Magnetic controllers.
   b. Multispeed controllers.
   c. Reduced-voltage controllers.
2. Designed and labeled for use with variable frequency controllers, and suitable for use throughout speed range without overheating.
3. Matched to torque and horsepower requirements of the load.
4. Matched to ratings and characteristics of supply circuit and required control sequence.

2.0 PRODUCTS

2.1 MOTOR REQUIREMENTS

A. Motor requirements apply to factory-installed and field-installed motors except as follows:

1. Different ratings, performance, or characteristics for a motor are specified in another Section.
2. Manufacturer for a factory-installed motor requires ratings, performance, or characteristics, other than those specified in this Section, to meet performance specified.

2.2 MOTOR CHARACTERISTICS

A. Motors 1/2 HP and Larger: Three phase except where scheduled otherwise.

B. Frequency Rating: 60 Hz.

C. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.

D. Service Factor: 1.15 for open drip-proof motors; 1.15 for totally enclosed motors.

E. Duty: Continuous duty at ambient temperature of 105 deg F and at altitude of 3300 feet above sea level.

F. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

G. Enclosure: Open drip-proof or totally enclosed fan cooled if indicated on drawings.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Premium efficiency.

C. Stator: Copper windings, unless otherwise indicated.

1. Multispeed motors shall have separate winding for each speed.

D. Rotor: Squirrel cage, unless otherwise indicated.

E. Bearings: Double-shielded, pre-lubricated ball bearings suitable for radial and thrust loading.

F. Temperature Rise: Match insulation rating, unless otherwise indicated.

G. Insulation: Class F, unless otherwise indicated.

H. Code Letter Designation:

1. Motors 10 HP and Larger: NEMA starting Code F or G.
2. Motors Smaller Than 10 HP: Manufacturer's standard starting characteistic.

I. Enclosure: Cast iron for motors 5 hp and larger; rolled steel for motors smaller than 5 hp.

1. Finish: Gray enamel or red enamel.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Inrush Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers (inverter duty): Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Designed with critical vibration frequencies outside operating range of controller output.
2. Temperature Rise: Matched to rating for Class B insulation.
3. Insulation: Class H.

4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Rugged-Duty Motors: Totally enclosed, with 1.25 minimum service factor, greased bearings, integral condensate drains, and capped relief vents. Windings insulated with non-hygroscopic material.

1. Finish: Chemical-resistant paint over corrosion-resistant primer.

D. Source Quality Control: Perform the following tests on each motor according to NEMA MG 1:

1. Measure winding resistance.
2. Read no-load current and speed at rated voltage and frequency.
3. Measure locked rotor current at rated frequency.
4. Perform high-potential test.

3.0 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive field-installed motors for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in of conduit systems to verify actual locations of conduit connections before motor installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 MOTOR INSTALLATION

A. Anchor each motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and align with load transfer link.

B. Install motors on concrete bases complying with the Architectural and Structural Contract documents.

C. Comply with mounting and anchoring requirements specified in Division 15 Section "Mechanical Vibration and Seismic Controls."

D. Motors installed outdoors shall be totally enclosed, fan cooled.

3.3 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Run each motor with its controller. Demonstrate correct rotation, alignment, and speed at motor design load.
2. Test interlocks and control features for proper operation.
3. Verify that current in each phase is within nameplate rating.

B. Testing: Engage a qualified testing agency to perform the following field quality-control testing:
1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.15.1. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Manufacturer's Field Service: Engage a factory-authorized service representative to perform the following:
1. Inspect field-assembled components, equipment installation, and piping and electrical connections for compliance with requirements.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Verify bearing lubrication.
4. Verify proper motor rotation.
5. Test Reports: Prepare a written report to record the following:
   a. Test procedures used.
   b. Test results that comply with requirements.
   c. Test results that do not comply with requirements and corrective action taken to achieve compliance.

3.4 ADJUSTING

A. Align motors, bases, shafts, pulleys and belts. Tension belts according to manufacturer's written instructions.

3.5 CLEANING

A. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean motors, on completion of installation, according to manufacturer's written instructions.

END OF SECTION 23 05 13

SECTION 23 05 23

GENERAL DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. The Drawings and the General Provisions of the Contract including the General Conditions, Supplementary Conditions and Division 01 General Requirements apply to work of this section as fully as if repeated herein.

1.2 SCOPE OF WORK

A. Provide all labor, equipment and materials that are required to provide a complete installation as indicated on the drawings and in the specifications including that reasonably inferred for proper execution of this Division.

B. Coordinate with work performed under other divisions. Coordinate work done to accommodate requirements of this Division to ensure adequacy of space and proper location, whether or not work is under this Division.

C. Repair or replace, to the satisfaction of the Owner, any damage to work of this Section, damage caused by leaks or breaks in systems of this Section, and damage caused by work of this Section including that to landscaping, paving or other items which are to remain in use

D. Provide carpentry, masonry, concrete and metal work required for work of this section, except where specifically called for under other Divisions.

E. Provide cutting and patching as required for execution of work performed under this section and not provided under other sections. Normal framing and blocking will be installed under another Division.

F. Valves and trim not specifically indicated, but required for proper functioning of equipment, shall be furnished and installed by the trade installing the equipment.

1.3 PROTECTION, STORAGE AND DELIVERY

A. Provide necessary storage and shop areas at the site for safe and proper storage and use of tools and materials in approved locations which do not interfere with the work. Remove these facilities and restore area(s) to original condition at completion of project.

B. Arrange delivery of products in timely fashion to coordinate with work progress.

C. Immediately upon delivery inspect shipment(s) to assure that products are undamaged and in accordance with specification requirements. Should the product be damaged or not in compliance with requirements, immediately repair as directed or approved or order replacement at no additional cost to the Owner.

D. Replace lost or damaged materials and equipment at no increase in Contract Sum.

E. Protect equipment and materials from physical damage, construction dirt and the elements, from the time they are shipped by the manufacturer to the time the building is accepted by the Owner.

F. Deliver products in the manufacturer's original packaging with identifying labels intact and legible. Legibly identify units or items as to installation location and/or drawing designations to permit check by Owner's representative against approved material list and shop drawings.

PART 2 - PRODUCTS

2.1 GENERAL USE VALVES & PIPING SPECIALTIES

A. These include valves manually operated with hand-wheels, levers or other handles.

B. Furnish tee handle operators to suit all valves which are installed below grade in access boxes and which are not fitted with integral handles.

C. Gate Valves:
   1. Shut-off Valves
      a. Class 125, solid wedge gate, Stockham, Milwaukee or Nibco.
      b. Sizes 2½" and smaller: Fig. B-105; bronze body, threaded ends, union bonnet, rising stem.
      c. Sizes 3" and larger: Fig. G-612; iron body, brass mounted, flanged ends, bolted bonnet, non-rising stem.

D. General Use Valves (Plumbing and HVAC): Use manufacturer shown:
   1. Hand: Through 2" Apollo ball valve; 82-100 or Hammond.
   2. Hand: 2½" and larger Demco Series NE-C, Stockham or Keystone butterfly valve, lug body with 416 SS stem, bronze disc. Butterfly valves shall conform to all applicable requirements of AWWA Specification C504 for Class 150 valves, except for face-to-face dimensions. Except where automatic operators are shown on drawings, butterfly valves 4" and smaller shall have lever operator with locking bolt and shall be rated as end of line type valve, valves 6" and larger shall have enclosed, self-locking gear or screw operator and ductile iron disc with nickel plating and shall be rated as an end of line service valve.
   3. Balance: B & G circuit setters where shown or equivalent, Armstrong Series CB and RDB. Provide with pre-formed insulating jacket.
   4. Flanged iron body OS&Y gate valve for systems up to 150 PSI operating pressure. Nibco F637-31 or equal Stockman for valves 2½" and larger.
   5. Check Valves: Milwaukee, Watts or Apollo:
      a. 2" and smaller - Model 509, bronze body threaded ends and cap.
      b. 2½" and larger - Model F2974, iron body, bronze mounted, flanged ends, bolted cap.
   6. Check Valves for water systems 4" and larger: Metraflex Series 900 or Grinnell Series 500 globe style silent check valve, semisteel body with bronze trim, flanged, 150 PSI.

E. Pressure Regulating and Relief Valves:
   1. Pressure Reducing: Bronze Body, Bailey, Cash Acme, or B & G.

2. Back Pressure Regulating: Bailey #428, 20-60# range, unless noted otherwise; bronze body, Cash Acme or B & G.
3. Relief Valves: Sarco, Sprague, A.W. Cash, Fisher Controls, or Kunkle as shown on drawings ASME code.

F. Air Vent: Bell & Gossett where automatic type is shown. Install with shut-off valves and drain to a floor sink or drain. Provide 3/8" ball valve for manual air vent at coils and at each high point in piping systems, pipe drain to floor sink or floor drain. Provide 11 in. x 3/8" copper vent with gooseneck.

G. Strainers: Keckley or equal with magnetic screen assembly, "Y" pattern, 250 psi W.P. 40 square mesh screen for sizes 2" and smaller; 1/16" perforated screen for sizes 2½" through 4", and 1/8" perforated screen for sizes 5" and larger.

H. Install all strainers with a blow-off valve (ball type, Apollo 77-100 or equal). Strainer shall have gasketed cover with straight thread.

I. Natural Gas:
1. Sizes 3" and smaller: Jomar System 4, Model T-100, or Milwaukee, AGA approved, 500 lb. WOG, forged brass body with threaded ends, chrome plated full port brass ball, and stainless steel handle.
2. Size 4": DeZurik Fig. 425; 175 psi shut-off pressure differential; semi-steel body, threaded ends, eccentric plug with RS-49 facing, Fig. 483 lever handle.

PART 3 - EXECUTION

3.1 COORDINATION

A. Cutting and Repairing: Include in the work all cutting and repairing necessary and required for the installation. Repairing shall be performed by workmen skilled in the trade involved, in a manner satisfactory to the Owner.

B. Congested Areas:
1. All conditions involving work under this Division and work and other sections shall be worked out in advance of installation. Before work proceeds, prepare supplementary drawings under this Division for approval, showing all work, especially in tight areas. Provide supplementary drawings for additional work necessary to overcome "tight" conditions at no increase in the Contract Sum.
2. Differences or disputes concerning coordination, interference or extent of work between Sections shall be decided by Owner/General Contractor/Construction Manager.

C. Coordination with other Divisions: Coordinate electrical interlocks of mechanical equipment with the Electrical Division.

D. Provide, to cause no delay, all required sleeves, chases, concrete inserts, anchor bolts, etc., before concrete is poured. Be responsible for correct location and installation of same.

E. Information to Other Divisions: Provide templates, information and instructions to other Divisions to properly locate holes and openings to be cut or provided for Mechanical

Work.

3.2 INSTALLATION – VALVES

A. Valves and Strainers:
   1. If no shut-off is indicated, provide a valve at the outlet and the inlet connections to all equipment. Provide the proper valve trim for service intended.
   2. Do not use solder end valves unless noted otherwise; provide threaded or flanged adapters in copper tubing systems.
   3. Provide all valves and strainers, full pipe size unless indicated otherwise.
   4. Provide valves and strainers of the same size as the pipe in which they are mounted unless specifically shown otherwise.
   5. Connect valves and strainers in copper piping systems with solder-to-threaded brass adapters.
   6. Provide valves with trim proper to the service on which they are applied.
   7. Locate above-grade valves
      a. With stems above the horizontal plane of the pipe.
      b. Within six feet of floor where possible and reasonable.
      c. Out from under equipment.
      d. Readily accessible with adequate clearance around operating wheel or lever handle.
      e. Provide chain operator for any valve located at 8' centerline or higher above floor.
   8. Position below-grade valves in access boxes.
      a. With stem horizontal if fitted with integral operating handle; provide adequate clearance for operation.
      b. With stem upright if fitted for operation by tee handle.
   9. Provide shut-off valves at all inlet connections of fixtures, coils and equipment; on multiple coil banks, provide shut-off valve at the inlet of each coil.
   10. Provide balance valves at all outlet connections of fixtures, coils and equipment in hydronic systems; on multiple coil banks, provide a balance valve at the outlet of each coil.
   11. Fit each strainer with globe or ball type blowdown valve sized to match blowdown tapping in screen retainer; run discharge pipe to nearest floor drain or other appropriate discharge point as shown or direct.

B. Instrumentation:
   1. Install all instrumentation items in a location where they are readily viewable and serviceable.
   2. Install gauge cock at all pressure gauges.

END OF SECTION

SECTION 23 05 29

HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes hangers and supports for mechanical system piping and equipment.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for materials for attaching hangers and supports to building structure.
2. Division 23 Section "Mechanical Vibration and Seismic Controls" for vibration isolation and seismic restraint devices.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

C. Design seismic restraint hangers and supports for piping and equipment.

D. Design and obtain approval from authorities having jurisdiction for seismic restraint hangers and supports for piping and equipment.

1.5 SUBMITTALS

A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details.

C. Welding Certificates: Copies of certificates for welding procedures and operators.

D. All attachments to building structure shall be made in accordance with the Owners structural engineers requirements and weight limitations.

E. Submit shop drawings and calculations for review and approval by Owners structural engineer before installation.

1.6 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for equipment, duct and pipe support, trapeze, and seismic restraint by a qualified professional engineer, licensed in the State of California.

1. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of hangers and supports that are similar to those indicated for this Project in material, design, and extent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pipe Hangers:
   a. B-Line Systems, Inc.
   b. Carpenter & Patterson, Inc.
   c. Grinnell Corp.
   d. Michigan Hanger Co., Inc.
   e. National Pipe Hanger Corp.
   f. Piping Technology & Products, Inc.
2. Channel Support Systems:
   a. B-Line Systems, Inc.
   b. Grinnell Corp.; Power-Strut Unit.
   c. GS Metals Corp.
   d. Michigan Hanger Co., Inc.; O-Strut Div.
   e. National Pipe Hanger Corp.

f. Unistrut Corp.

3. Thermal-Hanger Shield Inserts:
   a. Carpenter & Patterson, Inc.
   b. Michigan Hanger Co., Inc.
   c. Pipe Shields, Inc.
   d. Rilco Manufacturing Co., Inc.
4. Powder-Actuated Fastener Systems:
   a. Gunnebo Fastening Corp.
   b. Hilti, Inc.
   c. ITW Ramset/Red Head.
   d. Masterset Fastening Systems, Inc.

2.2 MANUFACTURED UNITS

A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.
   1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
   2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
   1. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
   2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

C. Thermal-Hanger Shield Inserts: 100-psi minimum compressive-strength insulation, encased in sheet metal shield.
   1. Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
   2. Material for Cold Piping: ASTM C 552, Type I cellular glass with vapor barrier.
   3. Material for Cold Piping: Water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
   4. Material for Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.
   5. Material for Hot Piping: ASTM C 552, Type I cellular glass.
   6. Material for Hot Piping: Water-repellent-treated, ASTM C 533, Type I calcium silicate.
   7. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
   8. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.

9. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.3 MISCELLANEOUS MATERIALS

A. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

C. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

D. Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.

1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
2. Properties: Nonstaining, noncorrosive, and nongaseous.
3. Design Mix: 5000-psi, 28-day compressive strength.
4. Refer to Division 3 Section "Cast-in-Place Concrete" for additional information and requirements"

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in Sections specifying equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.

C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.

6. Adjustable Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
7. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
9. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipe, NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

F. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape where allowed by seismic codes.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles where allowed by seismic codes.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge where allowed by structural codes.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams where allowed by structural codes.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where head room is limited.

G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
   1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
   2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
   3. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100-psi minimum compressive-strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.

H. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
   1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
   2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
   3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
   4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
   5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
   6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
   7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
   8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
      a. Horizontal (MSS Type 54): Mounted horizontally.
      b. Vertical (MSS Type 55): Mounted vertically.
      c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

I. Space hangers for horizontal piping with the maximum distance between hangers as follows:
   1. copper 2" and smaller – 6'-0"

2. steel 1¼" and smaller – 6'-0"
3. copper 2½" and larger – 10'-0"
4. steel 1½" and larger – 10'-0"
5. cast iron soil – locate hangers within 18" of each joint at a maximum of 10'-0" for Bell & Spigot and 5'-0" for hubless.

3.2 HANGER AND SUPPORT INSTALLATION

A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.
   1. Field assemble and install according to manufacturer's written instructions.

C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

E. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

F. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

K. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.
    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.9.
2. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.

B. Grouting: Place grout under supports for equipment as indicated on the drawings.

3.4 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.

B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 9 Section "Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 23 05 33

MECHANICAL VIBRATION AND SEISMIC CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Elastomeric isolation pads and mounts.
   2. Restrained elastomeric isolation mounts.
   3. Freestanding and restrained spring isolators.
   4. Housed spring mounts.
   5. Elastomeric hangers.
   6. Spring hangers.
   7. Spring hangers with vertical-limit stops.
   8. Thrust limits.
   9. Pipe riser resilient supports.
   10. Resilient pipe guides.
   11. Freestanding and restrained air spring isolators.
   12. Restrained vibration isolation roof-curb rails.
   13. Seismic snubbers.
   14. Restraining cables.
   15. Steel and inertia, vibration isolation equipment bases.

1.3 DEFINITIONS

A. A_V: Effective peak velocity related acceleration coefficient.

B. OSHPD: Office of Statewide Health Planning & Development for the State of California. OSHPD assigns a unique anchorage pre approval OPA number to each seismic restraint it tests. The number describes a specific device applied as tested.

1.4 PERFORMANCE REQUIREMENTS

A. All mechanical equipment shall be braced or anchored to resist horizontal force acting in any direction using the following criteria:
   1. The total design lateral seismic force shall be determined from Section 1615A.1.12 and 1615A.1.22, California Building Code (CBC) 2010 and ASCE

7-05 Chp. 6 & 13. Forces shall be applied in the horizontal directions, which result in the most critical loading for design.

1.5 SUBMITTALS

A. Product Data: Include load deflection curves for each vibration isolation device.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Include the following:

1. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
4. Seismic-Restraint Details: Detail fabrication and attachment of seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.
5. Submittals for Interlocking Snubbers: Include load deflection curves up to 1/2-inch deflection in x, y, and z planes.

C. Welding certificates.

D. Manufacturer Seismic Qualification Certification: Submit certification that all specified equipment will withstand seismic forces identified in "Performance Requirements" Article above. Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.
   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
   b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 QUALITY ASSURANCE

A. Seismic-restraint devices shall have horizontal and vertical load testing and analysis performed according to OSHPD and shall bear anchorage pre-approval OPA number, from OSHPD or another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If pre-approved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer. Testing and calculations must include both shear and tensile loads and 1 test or analysis at 45 degrees to the weakest mode.

B. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into base. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Seismic Snubber Units: Furnish replacement neoprene inserts for all snubbers.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 VIBRATION ISOLATORS

A. Manufacturers:

1. Amber/Booth Company, Inc.
2. California Dynamics Corp.
3. Kinetics Noise Control, Inc.

4. Mason Industries, Inc.
5. Vibration Isolation Co., Inc.
6. Vibrex

B. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
   1. Material: Bridge-bearing neoprene, complying with AASHTO M 251.
   2. Durometer Rating: 60.
   3. Number of Layers: 1.

C. Elastomeric Mounts: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.
   1. Durometer Rating: 60.

D. Restrained Elastomeric Mounts: All-directional elastomeric mountings with seismic restraint.
   1. Materials: Cast-ductile-iron housing containing two separate and opposing, molded, bridge-bearing neoprene elements that prevent central threaded sleeve and attachment bolt from contacting the casting during normal operation.
   2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge bearing neoprene as defined by AASHTO.

E. Spring Isolators: Freestanding, laterally stable, open-spring isolators.
   1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   3. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
   4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 100 psig.
   6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

F. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.
   1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch thick, elastomeric isolator pad attached to baseplate underside; and

adjustable equipment mounting and leveling bolt that acts as blocking during installation.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

G. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.

1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
2. Base: Factory drilled for bolting to structure.
3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch travel before contacting a resilient collar.

H. Elastomeric Hangers: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

I. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.

J. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.

5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.

K. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression and with a load stop. Include rod and angle-iron brackets for attaching to equipment.
1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

L. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch thick, 60-durometer neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.

M. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes separated by a minimum of 1/2-inch thick, 60-durometer neoprene. Factory set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.3 SEISMIC-RESTRAINT DEVICES

A. Manufacturers:
1. Amber/Booth Company, Inc.
2. California Dynamics Corp.
3. Kinetics Noise Control, Inc.
4. Mason Industries, Inc.
5. Unistrut Diversified Products Co.; Wayne Manufacturing Division.
6. Vibration Isolation Co., Inc.
7. Vibrex.

B. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer of 40, plus or minus 5, with a flat washer face.

C. Seismic Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer of 60, plus or minus 5.

D. Restraining Cables: Galvanized steel aircraft cables with end connections made of steel assemblies that swivel to final installation angle and utilize two clamping bolts for cable engagement.

E. Anchor Bolts: Seismic-rated, drill-in, and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488/E 488M.

2.4 VIBRATION ISOLATION EQUIPMENT BASES

A. Manufacturers:

1. Amber/Booth Company, Inc.
2. California Dynamics Corp.
3. Kinetics Noise Control, Inc.
4. Mason Industries, Inc.
5. Vibration Isolation Co., Inc.
6. Vibrex.

B. Steel Base: Factory-fabricated, welded, structural-steel bases and rails.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails. Include supports for suction and discharge elbows for pumps.
2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel angles on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

C. Inertia Base: Factory-fabricated, welded, structural-steel bases and rails ready for field-applied, cast-in-place concrete.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel angles on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

2.5 FACTORY FINISHES

A. Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
1. Powder coating on springs and housings.
2. All hardware shall be electrogalvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install roof curbs, equipment supports, and roof penetrations as specified in Division 7 Section "Roof Accessories."

B. Install thrust limits at centerline of thrust, symmetrical on either side of equipment.

C. Install seismic snubbers on isolated equipment. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.

D. Install restraining cables at each trapeze and individual pipe hanger. At trapeze anchor locations, shackle piping to trapeze. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.

E. Install steel angles or channel, sized to prevent buckling, clamped with ductile-iron clamps to hanger rods for trapeze and individual pipe hangers. At trapeze anchor locations, shackle piping to trapeze. Requirements apply equally to hanging equipment. Do not weld angles to rods.

F. Install resilient bolt isolation washers on equipment anchor bolts.

3.3 EQUIPMENT BASES

A. Concrete Bases: Anchor equipment to concrete base according to supported equipment manufacturer's written instructions for seismic codes at Project site.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
2. Place and secure anchorage devices. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
3. Install anchor bolts to elevations required for proper attachment to supported equipment.
4. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
5. Cast-in-place concrete materials and placement requirements are specified in Division 3.

3.4 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified testing agency to perform the following field quality-control testing:

B. Testing: Engage a qualified testing agency to perform the following field quality-control testing:

C. Testing: Perform the following field quality-control testing:

1. Isolator seismic-restraint clearance.
2. Isolator deflection.
3. Snubber minimum clearances.
4. Air-Mounting System Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
5. Air-Mounting System Operational Test: Test the compressed-air leveling system. Remove malfunctioning units, replace with new units, and retest.
6. Test and adjust air-mounting system controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

A. Adjust isolators after piping systems have been filled and equipment is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop.

D. Adjust air spring leveling mechanism.

E. Adjust active height of spring isolators.

F. Adjust snubbers according to manufacturer's written recommendations.

G. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.

H. Torque anchor bolts according to equipment manufacturer's written recommendations to resist seismic forces.

3.6 CLEANING

A. After completing equipment installation, inspect vibration isolation and seismic-control devices. Remove paint splatters and other spots, dirt, and debris.

END OF SECTION

SECTION 23 05 53

MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:
   1. Equipment nameplates.
   2. Equipment markers.
   3. Equipment signs.
   4. Access panel and door markers.
   5. Pipe markers.
   6. Duct markers.
   7. Stencils.
   8. Valve tags.
   9. Valve schedules.
   10. Warning tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Valve numbering scheme.

D. Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.
   1. Data:
      a. Manufacturer, product name, model number, and serial number.
      b. Capacity, operating and power characteristics, and essential data.
      c. Labels of tested compliances.
   2. Location: Accessible and visible.
   3. Fasteners: As required to mount on equipment.

B. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
   1. Terminology: Match schedules as closely as possible.
   2. Data:
      a. Name and plan number.
      b. Equipment service.
      c. Design capacity.
      d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
   3. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

C. Equipment Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
   1. Data: Instructions for operation of equipment and for safety procedures.
   2. Engraving: Manufacturer's standard letter style, of sizes and with terms to match equipment identification.
   3. Thickness: 1/16 inch for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
   4. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

D. Access Panel and Door Markers: 1/16-inch - thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8-inch center hole for attachment.

1. Fasteners: Self-tapping, stainless-steel screws.

2.2 PIPING IDENTIFICATION DEVICES

A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
   1. Colors: Comply with ASME A13.1, unless otherwise indicated.
   2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
   3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
   4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
   5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.

D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.

E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils thick with pressure-sensitive, permanent-type, self-adhesive back.
   1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
   2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

2.3 DUCT IDENTIFICATION DEVICES

A. Duct Markers: Engraved, color-coded laminated plastic. Include direction and quantity of airflow and duct service (such as supply, return, and exhaust). Include contact-type, permanent adhesive.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door markers, equipment markers, equipment signs, and similar operational instructions.
   1. Stencil Material: Aluminum or Brass.
   2. Stencil Paint: Exterior, gloss, acrylic enamel black, unless otherwise indicated. Paint may be in pressurized spray-can form.

3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1, unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers, with numbering scheme approved by Architect. Provide 5/32-inch hole for fastener.

1. Material: 0.032-inch- thick brass or aluminum.
2. Material: 0.0375-inch- thick stainless steel.
3. Material: 3/32-inch- thick laminated plastic with 2 black surfaces and white inner layer.
4. Valve-Tag Fasteners: Brass wire-link or beaded chain.

2.6 VALVE SCHEDULES

A. Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.
2. Frame: Extruded aluminum.
3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

2.7 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Division 15 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:

1. Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
2. Pumps, compressors, chillers, condensers, and similar motor-driven units.
3. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
4. Fans, blowers, primary balancing dampers, and mixing boxes.
5. Packaged HVAC central-station and zone-type units. Provide identification label on each door to indicate service section, i.e. supply fan, return/exhaust fan, filters, electrical, controls, cooling coils, heating/reheat coil, humidifier and similar items.
6. Expansion tanks, air separators and similar equipment.

B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.

1. Letter Size: Minimum ¼ inch for name of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
2. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
    a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
    b. Fire department hose valves and hose stations.
    c. Meters, gages, thermometers, and similar units.
    d. Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
    e. Pumps, compressors, chillers, condensers, and similar motor-driven units.
    f. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
    g. Fans, blowers, primary balancing dampers, and mixing boxes.
    h. Packaged HVAC central-station and zone-type units.
    i. Tanks and pressure vessels.
    j. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

C. Stenciled Equipment Marker Option: Stenciled markers may be provided instead of laminated-plastic equipment markers, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.

D. Install equipment signs with screws or permanent adhesive on or near each major item of mechanical equipment. Locate signs where accessible and visible.

1. Identify mechanical equipment with equipment markers in the following color codes:
   a. Green: For cooling equipment and components.
   b. Yellow: For heating equipment and components.
   c. Green and Yellow: For combination cooling and heating equipment and components.
   d. Brown: For energy-reclamation equipment and components.
2. Letter Size: Minimum ¼ inch for name of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
3. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
4. Include signs for the following general categories of equipment:
   a. Main control and operating valves, including safety devices and hazardous units such as gas outlets.
   b. Fuel-burning units, including boilers, furnaces, heaters, stills, and absorption units.
   c. Pumps, compressors, chillers, condensers, and similar motor-driven units.
   d. Heat exchangers, coils, evaporators, cooling towers, heat recovery units, and similar equipment.
   e. Fans, blowers, primary balancing dampers, and mixing boxes.
   f. Packaged HVAC central-station and zone-type units.
   g. Tanks and pressure vessels.
   h. Strainers, filters, humidifiers, water-treatment systems, and similar equipment.

E. Stenciled Equipment Sign Option: Stenciled signs may be provided instead of laminated-plastic equipment signs, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.

F. Install access panel markers with screws on equipment access panels.

3.3 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pretensioned pipe markers. Use size to ensure a tight fit.
2. Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.
3. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.
4. Pipes with OD, Including Insulation, 6 Inches and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 3 inches at both ends of pipe marker, and covering full circumference of pipe.

B. Stenciled Pipe Marker Option: Stenciled markers may be provided instead of manufactured pipe markers, at Installer's option. Install stenciled pipe markers complying with ASME A13.1 on each piping system.

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

C. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.4 DUCT IDENTIFICATION

A. Install duct markers with permanent adhesive on air ducts in the following color codes:

1. Green: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
3. Blue: For exhaust-, outside-, relief-, return-, and mixed-air ducts.

4. ASME A13.1 Colors and Designs: For hazardous material exhaust.
5. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

B. Stenciled Duct Marker Option: Stenciled markers, showing service and direction of flow, may be provided instead of laminated-plastic duct markers, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.

C. Locate markers near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:
1. Valve-Tag Size and Shape:
   a. Cold Water: 1-1/2 inches, round.
   b. Hot Water: 1-1/2 inches, round.
   c. Fire Protection: 1-1/2 inches, round.
   d. Gas: 1-1/2 inches, round.
   e. Steam: 1-1/2 inches, round.
2. Valve-Tag Color:
   a. Cold Water: Green.
   b. Hot Water: Yellow.
   c. Fire Protection: Red.
   d. Gas: Yellow.
3. Letter Color:
   a. Cold Water: White.
   b. Hot Water: White.
   c. Fire Protection: White.
   d. Gas: White.

3.6 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

3.7 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

3.8 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.9 CLEANING

A. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:
   1. Balancing airflow including submains, branches, and terminals, to indicated quantities according to specified tolerances.
   2. Adjusting total HVAC systems to provide indicated quantities.
   3. Measuring electrical performance of HVAC equipment.
   4. Setting quantitative performance of HVAC equipment.
   5. Verifying that automatic control devices are functioning properly.
   6. Measuring sound and vibration.
   7. Reporting results of activities and procedures specified in this Section.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. AMCA: Air Movement and Control Association.

C. CTI: Cooling Tower Institute.

D. NEBB: National Environmental Balancing Bureau.

E. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.3 SUBMITTALS

A. Strategies and Procedures Plan: Testing, adjusting, and balancing strategies and step-by-step procedures. Include a complete set of report forms intended for use on this Project.

B. Certified Testing, Adjusting, and Balancing Reports: Prepared on approved forms certified by the testing, adjusting, and balancing Agent.

1.4 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by AABC or NEBB.

B. Certification of Testing, Adjusting, and Balancing Reports: Certify testing, adjusting, and balancing field data reports. This certification includes the following:
   1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.

2. Certify that testing, adjusting, and balancing team complied with approved testing, adjusting, and balancing plan and procedures specified and referenced in this Specification.

C. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing." or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

D. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification" as appropriate.

E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by the instrument manufacturer.

1.5 PROJECT CONDITIONS

A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire testing, adjusting, and balancing period. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.6 COORDINATION

A. Coordinate efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.7 WARRANTY

A. National Project Performance Guarantee: For AABC certified agents, provide a guarantee on AABC'S "National Standards" forms stating that AABC will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified Agent has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

B. Special Guarantee: For NEBB certified agents, provide a guarantee on NEBB forms stating that NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified Agent has tested and balanced systems according to the Contract Documents.

2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - **PRODUCTS (Not Applicable)**

PART 3 - **EXECUTION**

3.1 EXAMINATION

A. Prior to construction, examine the Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.

1. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 1 Section "Project Record Documentation."

D. Examine equipment performance data, including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with design data and installed conditions.

E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

F. Examine system and equipment test reports.

G. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, flow-control devices and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

H. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

I. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible and their controls are connected and functioning.

K. Examine plenum ceilings, utilized for supply air, to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

M. Examine equipment for installation and for properly operating safety interlocks and controls.

N. Examine automatic temperature system components to verify the following:
   1. Dampers and other controlled devices operate by the intended controller.
   2. Dampers and valves are in the position indicated by the controller.
   3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
   4. Automatic modulating and shutoff dampers are properly connected.
   5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
   6. Sensors are located to sense only intended conditions.
   7. Sequence of operation for control modes is according to the Contract Documents.
   8. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
   9. Interlocked systems are operating.
   10. Changeover from heating to cooling mode occurs according to design values.

O. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:
   1. Permanent electrical power wiring is complete.
   2. Automatic temperature-control systems are operational.
   3. Equipment and duct access doors are securely closed.
   4. Balance, smoke, and fire dampers are open.
   5. Isolating and balancing dampers are open and control dampers are operational.

6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
7. Windows and doors can be closed so design conditions for system operations can be met.

3.3 TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to procedures contained in AABC national standards or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: Plus 5 to minus 5 percent.

3.5 REPORTS

A. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

B. Final Report: Typewritten, or computer printout in letter-quality font, on standard bond paper, bound in three-ring, loose-leaf binder, and tabulated and divided into sections by tested and balanced systems.
1. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing agent.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Final Report Contents: In addition to certified field report data, include the following:
a. Fan curves.
b. Manufacturers' test data.
c. Field quality-control test reports prepared by system and equipment installers.
d. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

4. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
   a. Title page.
   b. Name and address of testing, adjusting, and balancing Agent.
   c. Project name.
   d. Project location.
   e. Architect's name and address.
   f. Engineer's name and address.
   g. Contractor's name and address.
   h. Report date.
   i. Signature of testing, adjusting, and balancing Agent who certifies the report.
   j. Summary of contents, including the following:
      (1) Design versus final performance.
      (2) Notable characteristics of systems.
      (3) Description of system operation sequence if it varies from the Contract Documents.
   k. Nomenclature sheets for each item of equipment.
   l. Data for terminal units, including manufacturer, type size, and fittings.
   m. Notes to explain why certain final data in the body of reports vary from design values.
   n. Test conditions for fan performance forms, including the following:
      (4) Settings for outside-, return-, and exhaust-air dampers.
      (5) Conditions of filters.
      (6) Fan drive settings, including settings and percentage of maximum pitch diameter.
      (7) Inlet vane settings for variable-air-volume systems.
      (8) Settings for supply-air, static-pressure controller.
      (9) Other system operating conditions that affect performance.
5. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present with single-line diagrams and include the following:
   a. Quantities of outside, supply, return, and exhaust airflows.
   b. Duct, outlet, and inlet sizes.
   c. Terminal units.
   d. Balancing stations.

3.6 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION

SECTION 23 07 00

DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes semirigid and flexible duct, plenum, and breeching insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:

1. Division 7 Section "Through Penetration Fire Stop Systems" for firestopping materials and requirements for penetrations through fire and smoke barriers.
2. Division 23 Section "Equipment Insulation" for insulation materials and application for pumps, tanks, hydronic specialties, and other equipment.
3. Division 22 Section "Pipe Insulation" for insulation for piping systems.
4. Division 23 Section "Metal Ducts" for duct liner.

1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for the following:

1. Removable insulation sections at access panels.
2. Application of field-applied jackets.
3. Applications at linkages for control devices.

C. Samples: For each type of insulation and field-applied jacket. Identify each Sample, describing product and intended use. Submit 12-inch square sections of each sample material.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.

E. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
   1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate clearance requirements with duct Installer for insulation application.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Mineral-Fiber Insulation:
      a. CertainTeed Manson.
      b. Knauf FiberGlass GmbH.
      c. Owens-Corning Fiberglas Corp.
      d. Schuller International, Inc.
   2. Flexible Elastomeric Thermal Insulation:
      a. Armstrong World Industries, Inc.
      b. Rubatex Corp.
   3. Closed-Cell Phenolic-Foam Insulation:
      a. Kooltherm Insulation Products, Ltd.

4. Calcium Silicate Insulation:
    a. Owens-Corning Fiberglas Corp.
    b. Pabco.
    c. Schuller International, Inc.

2.2 INSULATION MATERIALS

A. Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IB, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

B. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

C. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.
    1. Adhesive: As recommended by insulation material manufacturer.
    2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.

D. Closed-Cell Phenolic-Foam Insulation: Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.

E. Calcium Silicate Insulation: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a nonasbestos fibrous reinforcement. Comply with ASTM C 533, Type I.

2.3 FIELD-APPLIED JACKETS

A. General: ASTM C 921, Type 1, unless otherwise indicated.

B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant aluminum foil.

C. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming.
    1. Adhesive: As recommended by insulation material manufacturer.
    2. PVC Jacket Color: White.

D. Aluminum Jacket: Deep corrugated sheets manufactured from aluminum alloy complying with ASTM B 209, and having an integrally bonded moisture barrier over entire surface in contact with insulation. Metal thickness and corrugation dimensions are scheduled at the end of this Section.
    1. Finish: Smooth finish or cross-crimp corrugated finish.
    2. Moisture Barrier: 1-mil thick, heat-bonded polyethylene and kraft paper.

E. Stainless-Steel Jacket: Deep corrugated sheets of stainless steel complying with ASTM A 666, Type 304 or 316; 0.10 inch thick; and roll stock ready for shop or field cutting and forming to indicated sizes.

1. Moisture Barrier: Minimum 1-mil thick, heat-bonded polyethylene and kraft paper.
2. Jacket Bands: Stainless steel, Type 304, 3/4 inch wide.

2.4 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd.
   1. Tape Width: 4 inches.

B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:
   1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.
   2. Galvanized Steel: 0.005 inch thick.
   3. Aluminum: 0.007 inch thick.
   4. Brass: 0.010 inch thick.
   5. Nickel-Copper Alloy: 0.005 inch thick.

C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

D. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.
   1. Welded Pin Holding Capacity: 100 lb for direct pull perpendicular to the attached surface.

E. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.
   1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb for direct pull perpendicular to the adhered surface.

F. Self-Adhesive Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

2.5 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply multiple layers of insulation with longitudinal and end seams staggered.

E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

F. Keep insulation materials dry during application and finishing.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Apply insulation with integral jackets as follows:
   1. Pull jacket tight and smooth.
   2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
   3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.

M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

N. Install vapor-retarder mastic on ducts and plenums scheduled to receive vapor retarders.

1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.

O. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.
2. Apply insulation for exterior applications tightly joined to interior insulation ends.
3. Seal insulation to roof flashing with vapor-retarder mastic.

P. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

Q. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

R. Floor Penetrations: Terminate insulation at underside of floor assembly and at floor support at top of floor.

1. For insulation indicated to have vapor retarders, taper termination and seal insulation ends with vapor-retarder mastic.

3.4 MINERAL-FIBER INSULATION APPLICATION

A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    a. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches O.C.
    b. On duct sides with dimensions larger than 18 inches. Space 16 inches O.C. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.

c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.

4. Impale insulation over anchors and attach speed washers.

5. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

6. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1 inch O.C., and cover with pressure-sensitive tape having same facing as insulation.

7. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches O.C.

8. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

9. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches O.C.

10. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

B. Board Applications for Ducts and Plenums: Secure board insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.

2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Space anchor pins as follows:

a. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches O.C.

b. On duct sides with dimensions larger than 18 inches. Space 16 inches O.C. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.

c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.

4. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1 inch O.C., and cover with pressure-sensitive tape having same facing as insulation.
6. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches O.C.
8. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.5 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to ducts and plenums as follows:
   1. Follow the manufacturer's written instructions for applying insulation.
   2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the duct and plenum surface.

3.6 CLOSED-CELL PHENOLIC-FOAM INSULATION APPLICATION

A. Apply insulation as follows:
   1. Secure each layer of insulation to duct with stainless-steel bands at 12-inch intervals and tighten without deforming the insulation materials.
   2. Apply two-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch, soft-annealed, stainless-steel wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.
   3. On exposed applications, finish insulation with a skim coat of mineral-fiber, hydraulic-setting cement to surface of installed insulation. When dry, apply flood coat of lagging adhesive and press on one layer of glass cloth or tape. Overlap edges at least 1 inch. Apply finish coat of lagging adhesive over glass cloth or tape. Thin the finish coat to achieve smooth finish.

3.7 CALCIUM SILICATE INSULATION APPLICATION

A. Apply insulation according to the manufacturer's written instructions and as follows:
   1. Secure single layer of insulation to duct with stainless-steel bands. Tighten bands without deforming the insulation material.
   2. Apply two-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch, soft-annealed, stainless-steel wire. Secure outer layer with stainless-steel bands.
   3. On exposed applications, without metal jacket, finish insulation with a skim coat of mineral-fiber, hydraulic-setting cement to surface of installed insulation.

When dry, apply flood coat of lagging adhesive and press on one layer of glass cloth or tape. Overlap edges at least 1 inch. Apply finish coat of lagging adhesive over glass cloth or tape. Thin the finish coat to achieve smooth finish.

3.8 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.
   1. Apply jacket smooth and tight to surface with 2-inch overlap at seams and joints.
   2. Embed glass cloth between two 0.062-inch thick coats of jacket manufacturer's recommended adhesive.
   3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

3.9 FINISHES

A. Glass-Cloth Jacketed Insulation: Paint insulation finished with glass-cloth jacket as specified in Division 9 Section "Painting."

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

3.10 DUCT SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Insulate the following plenums and duct systems:
   1. Indoor concealed supply-, return-, and outside-air ductwork.
   2. Indoor exposed supply-, return-, and outside-air ductwork.
   3. Outdoor exposed supply and return ductwork.
   4. Indoor exposed range-hood exhaust ductwork.
   5. Indoor concealed range-hood exhaust ductwork.
   6. Indoor exposed oven and dishwasher exhaust ductwork.
   7. Indoor concealed oven and dishwasher ductwork.

C. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
   1. Fibrous-glass ducts.
   2. Metal ducts with duct liner.
   3. Factory-insulated flexible ducts.
   4. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.

5. Flexible connectors.
6. Vibration-control devices.
7. Testing agency labels and stamps.
8. Nameplates and data plates.
9. Access panels and doors in air-distribution systems.

3.11 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE

A. Service: Round, supply-air ducts, concealed.
   1. Material: Mineral-fiber board, mineral-fiber blanket, flexible elastomeric, and closed-cell phenolic foam.
   2. Thickness: 1 inch.
   3. Number of Layers: One.
   4. Field-Applied Jacket: Aluminum foil.
   5. Vapor Retarder Required: Perm rating not exceeding 0.5 perm.
   6. Minimum Thermal Resistance: R2.1.

B. Service: Round, return-air ducts, concealed.
   1. Material: Mineral-fiber board, mineral-fiber blanket, flexible elastomeric, and closed-cell phenolic foam.
   2. Thickness: 1 inch.
   3. Number of Layers: One.
   4. Field-Applied Jacket: Aluminum foil.
   5. Vapor Retarder Required: Perm. Rating not exceeding 0.5 perm.
   6. Minimum Thermal Resistance: R2.1.

C. Service: Round, outside-air ducts, concealed.
   1. Material: Mineral-fiber board, mineral-fiber blanket, flexible elastomeric, and closed-cell phenolic foam.
   2. Thickness: 1 inch.
   3. Number of Layers: One.
   4. Field-Applied Jacket: Aluminum foil.
   5. Vapor Retarder Required: Perm rating not exceeding 0.5 perm.
   6. Minimum Thermal Resistance: R2.1.

D. Service: Rectangular, supply-air ducts, concealed.
   1. Material: Mineral-fiber board, mineral-fiber blanket, flexible elastomeric, and closed-cell phenolic foam.
   2. Thickness: 1 inch.
   3. Number of Layers: One.
   4. Field-Applied Jacket: Aluminum foil.
   5. Vapor Retarder Required: Perm rating not exceeding 0.5 perm.

6. Minimum Thermal Resistance: R2.1.

E. Service: Rectangular, return-air ducts, concealed.
   1. Material: Mineral-fiber board, mineral-fiber blanket, flexible elastomeric, and closed-cell phenolic foam.
   2. Thickness: 1 inch.
   3. Number of Layers: One.
   4. Field-Applied Jacket: Aluminum foil.
   5. Vapor Retarder Required: Perm rating not exceeding 0.5 perm.
   6. Minimum Thermal Resistance: R2.1.

F. F. Service: Rectangular, outside-air ducts, concealed.
   1. Material: Mineral-fiber board, mineral-fiber blanket, flexible elastomeric, and closed-cell phenolic foam.
   2. Thickness: 1 inch.
   3. Number of Layers: One.
   4. Field-Applied Jacket: Aluminum foil.
   5. Vapor Retarder Required: Perm rating not exceeding 0.5 perm.
   6. Minimum Thermal Resistance: R2.1.

G. G. Service: Round, supply-air ducts, exposed.
   1. Material: Mineral-fiber board, mineral-fiber blanket, flexible elastomeric, and closed-cell phenolic foam.
   2. Thickness: 1 inch.
   3. Number of Layers: One.
   4. Field-Applied Jacket: Aluminum foil.
   5. Vapor Retarder Required: Perm rating not exceeding 0.5 perm.
   6. Minimum Thermal Resistance: R2.1.

H. Service: Round, return-air ducts, exposed.
   1. Material: Mineral-fiber board, mineral-fiber blanket, flexible elastomeric, and Closed-cell phenolic foam.
   2. Thickness: 1 inch.
   3. Number of Layers: One.
   4. Field-Applied Jacket: Aluminum foil.
   5. Vapor Retarder Required: Perm rating not exceeding 0.5 perm.
   6. Minimum Thermal Resistance: R2.1.

I. Service: Round, outside-air ducts, exposed.
   1. Material: Mineral-fiber board, mineral-fiber blanket, flexible elastomeric, and closed-cell phenolic foam.
   2. Thickness: 1 inch.
   3. Number of Layers: One.

4. Field-Applied Jacket: Aluminum foil.
5. Vapor Retarder Required: Perm rating not exceeding 0.5 perm.
6. Minimum Thermal Resistance: R2.1.

J. Service: Rectangular, supply-air ducts, exposed.
1. Material: Mineral-fiber board, mineral-fiber blanket, flexible elastomeric, and closed-cell phenolic foam.
2. Thickness: 1 inch.
3. Number of Layers: One.
4. Field-Applied Jacket: Aluminum foil.
5. Vapor Retarder Required: Perm rating not exceeding 0.5 perm.
6. Minimum Thermal Resistance: R2.1.

K. Service: Rectangular, return-air ducts, exposed.
1. Material: Mineral-fiber board, mineral-fiber blanket, flexible elastomeric, and closed-cell phenolic foam.
2. Thickness: 1 inch.
3. Number of Layers: One.
4. Field-Applied Jacket: Aluminum foil.
5. Vapor Retarder Required: Perm rating not exceeding 0.5 perm.
6. Minimum Thermal Resistance: R2.1.

L. Service: Rectangular, outside-air ducts, exposed.
1. Material: Mineral-fiber board, mineral-fiber blanket, flexible elastomeric, and closed-cell phenolic foam.
2. Thickness: 1 inch.
3. Number of Layers: One.
4. Field-Applied Jacket: Aluminum foil.
5. Vapor Retarder Required: Perm rating not exceeding 0.5 perm.
6. Minimum Thermal Resistance: R2.1.

M. M. Service: Rectangular, range-hood exhaust ducts, concealed.
1. Material: Mineral-fiber board, calcium silicate.
2. Thickness: 1 inch.
3. Number of Layers: One.
4. Field-Applied Jacket: Aluminum foil.
5. Vapor Retarder Required: Perm rating not exceeding 0.5 perm.
6. Minimum Thermal Resistance: R2.1.

N. Service: Rectangular, range-hood exhaust ducts, exposed.
1. Material: Mineral-fiber board, calcium silicate.
2. Thickness: 1 inch.

3. Number of Layers: One.
4. Field-Applied Jacket: Aluminum foil.
5. Vapor Retarder Required: Perm rating not exceeding 0.5 perm
6. Minimum Thermal Resistance: R2.1.

END OF SECTION

SECTION 23 09 00

BUILDING MANAGEMENT SYSTEM
(AUTOMATIC TEMPERATURE CONTROL)

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Temperature Control System (TCS) and Facility Management system (FMCS), utilizing Direct Digital Controls as shown on the drawings and as described herein. Drawings are diagrammatic only.

B. All labor, material, equipment and software not specifically referred to herein or on the plans, that is required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.

C. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). When submitting a proposal for consideration of the proposed control system, provide a binding licensing agreement for review proving the entire control system is open protocol to all levels of control.

D. This control system shall be interfaced with the existing City standard control. All levels of control shall be fully visible and controllable via the internet utilizing the existing, front end system without any modifications.

1.2 SYSTEM DESCRIPTION

A. The entire Temperature Control System (TCS) shall be comprised of a network of interoperable, stand-alone digital controllers communicating via LonMark™/LonTalk™ and/or BACnet™ communication protocols to a Network Area Controller (NAC). Temperature Control System products shall be by approved manufacturers. Equivalent LonWorks™ or BACnet™ products must be approved in writing by the consulting Engineer and be submitted for approval ten (10) days prior to the date of the bid submittal.

B. The Temperature Control Systems (TCS) consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and perform functions specified.

C. The Facility Management and Control System (FMCS) shall be comprised of Network Area Controller or Controllers (NAC) within each facility. The NAC shall connect to the owner's local or wide area network, depending on configuration. Access to the system, either locally in each building, or remotely from a central site or sites, shall be accomplished through standard Web browsers, via the Internet and/or local area network. Each NAC shall communicate to LonMark™/LonTalk™ (IDC) and/or BACnet™ (IBC) controllers and other open protocol systems/devices provided under Division 23 or Division 26.

D. The Facility Management and Control System (FMCS) as provided in this Division shall be based on a hierarchical architecture incorporating the Niagara AX Framework™. Equivalent products must be approved in writing by the consulting Engineer and be submitted for approval ten (10) days prior to the date of the bid submittal. Systems not developed on the Niagara AX Framework™ platform are unacceptable.

1. Temperature control and EMS shall be compatible, fully programmable and configurable with the Honeywell Webs-AX / Niagra AX supervisor and require no additional tools to service and/or maintain the system once installed.

E. The Facility Management and Control System (FMCS) shall monitor and control equipment as called for by the "Sequence of Operation" and points list.

F. The Facility Management and Control System (FMCS) shall provide full graphic software capable of complete system operation for up to 34 simultaneous Thin-Client workstations.

G. The Facility Management and Control System (FMCS) shall provide full graphic operator interface to include the following graphics as a minimum:

1. Home page to include a minimum of six critical points, i.e. Outside Air Temperature, Outside Air Relative Humidity, Enthalpy, KWH, KW etc.

2. Graphic floor plans accurately depicting rooms, walls, hallways, and showing accurate locations of space sensors and major mechanical equipment.

3. Detail graphics for each mechanical system to include; AHUs (Air Handling Units), ERUs (Energy Recovery Units), TUs (Terminal Units), EFs (Exhaust Fans), Chillers and associated controls, Boilers, and Converters as a minimum.

4. Access corresponding system drawings, technical literature, and sequences of operations directly from each system graphic.

H. The Facility Management and Control System (FMCS) shall provide the following data links to electronically formatted information for operator access and use.

1. Project control as-built documentation; to include all TCS drawings and diagrams converted to Adobe Acrobat .pdf filers.

2. TCS Bill of Material for each system, i.e. AHU, RTU, FCU, Boiler etc.

3. Technical literature specification data sheets for all components listed in the TCS Bill of Material.

4. Sequence of operation for all TCS provided systems.

I. The FMCS shall provide automated alarming software capable of sending messages to email compatible cellular telephones and pagers via the owner's e-mail service. The email alarm paging system shall be able to segregate users, time schedules, and equipment, and be capable of being programmed by the owner.

J. It is preferable that any dedicated configuration tool required for controller configuration have the capability to be launched from within the applicable Network Management Software. If the

configuration tool(s) cannot be launched from the Network Management Software, any software required for controller configuration shall be included as a leave-behind tool with enough license capability to support the installation.

K. The contractor shall provide the appropriate quantity of legal copies of all software tools, configuration tools, management tools, and utilities used during system commissioning and installation. All tools shall be generally available in the market. No closed and/or unavailable tools will be permitted. Contractor shall convey all software tools and their legal licenses at project close out.

1.3 SUBMITTAL

A. Eight copies of shop drawings of the components and devices for the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers catalog data sheets and installation instructions for all controllers, valves, dampers, sensors, routers, etc. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings. A complete written Sequence of Operation shall also be included with the submittal package. Division 16 contractors supplying products and systems, as part of their packages shall provide catalog data sheets, wiring diagrams and point lists to the Division 15 contractor for proper coordination of work.

1. Damper Schedule: Damper and actuator sizing shall be performed, and a schedule created by the manufacturer. The schedule shall include a separate line for each damper and a column for each of the damper attributes: Damper Identification Tag, Location, Damper Type, Damper Size, Duct Size, Arrangement, Blade Type, Velocity, Pressure Drop, Fail Position, Actuator Identification Tag, Actuator Type, and Mounting.

2. Valve Schedule: Valve sizing shall be performed, and a schedule created by the valve manufacturer. The schedule shall include a separate line for each valve and a column for each of the valve attributes: Valve Identification Tag, Location, Valve Type, Valve Size, Pipe Size, Configuration, Flow Characteristics, Capacity, Valve C_V, Calculated C_V, Design Pressure Drop, Actual Pressure Drop, Fail Position, Close off Pressure, Actuator Identification Tag, and Actuator Type.

B. Submittal shall also include a trunk cable schematic diagram depicting operator workstations, control panel locations and a description of the communication type, media, and protocol. Though the Division 15 and 16 contractors shall provide these diagrams for their portions of work, the Systems Integrator shall be responsible for integrating those diagrams into the overall trunk cable schematic diagrams for the entire Wide Area Network (WAN) and/or Local Area Network (LAN) utilized by the FMCS.

1. The network infrastructure shall conform to the published guidelines for wire type, length, number of nodes per channel, termination, and other relevant wiring and infrastructure criteria as published. The number of nodes per channel shall be no more than 80% of the defined segment (logical or physical) limit in order to provide future system expansion with minimal infrastructure modifications.

C. Submittal shall also include a complete point list of all points to be connected to the TCS and FMCS. Division 15 and 16 contractors shall provide necessary point lists, protocol documentation, and factory support information for systems provided in their respective divisions but integrated into the FMCS.

D. Submittal shall also include a copy of each of the graphics developed for the Graphic User Interface including a flowchart (site map) indicating how the graphics are to be linked to one another for system navigation. The graphics are intended to be 80% - 90% complete at this stage with the only remaining changes to be based on review comments from the A/E design team and/or Owner.

E. Upon completion of the work, provide a complete set of 'as-built' drawings and application software on compact disk. Drawings shall be provided as AutoCAD™ or Visio™ compatible files. Eight copies of the 'as-built' drawings shall be provided in addition to the documents on compact disk. Division 15 and 16 contractors shall provide as-builts for their portions of work. The Division 15 contractor shall be responsible for as-builts pertaining to overall TCS and FMCS architecture and network diagrams. All as-built drawings shall also be installed into the FMCS server in a dedicated directory.

1.4 SPECIFICATION NOMENCLATURE

A. Acronyms used in this specification are as follows:

DDC	Direct Digital Controls
FMCS	Facility Management and Control System
GUI	Graphical User Interface
IBC	Interoperable BACnet Controller
IDC	Interoperable Digital Controller
LAN	Local Area Network
NAC	Network Area Controller
OOT	Object Oriented Technology
PICS	Product Interoperability Compliance Statement
PMI	Power Measurement Interface
POT	Portable Operator's Terminal
TCS	Temperature Control System
WAN	Wide Area Network
WBI	Web Browser Interface

1.5 DIVISION OF WORK

A. The Division 23 and 26 (if applicable) contractors shall be responsible for all controllers (IDC and IBC), control devices, control panels, controller programming, controller programming software, controller input/output and power wiring and controller network wiring.

B. The Division 23 contractor shall be responsible for the Network Area Controller(s) (NAC), software and programming of the NAC, graphical user interface software (GUI), development of all graphical screens, Web browser pages, setup of schedules, logs and alarms, LonWorks network management and connection of the NAC to the local or wide area network.

1.6 RELATED WORK SPECIFIED ELSEWHERE

A. Division 26, Electrical:

1. Providing motor starters and disconnect switches (unless otherwise noted).
2. Power wiring and conduit (unless otherwise noted).
3. Provision, installation and wiring of smoke detectors (unless otherwise noted).
4. Other equipment and wiring as specified in Division 26.

1.7 AGENCY AND CODE APPROVALS

A. All products of the TCS and FMCS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided with the submittal package. Systems or products not currently offering the following approvals are not acceptable.

1. UL-916; Energy Management Systems
2. C-UL listed to Canadian Standards Association C22.2 No. 205-M1983 "signal Equipment"
3. CE
4. FCC, Part 15, Subpart J, Class A Computing Devices

1.8 SOFTWARE LICENSE AGREEMENT

A. The Owner shall agree to the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.

B. The Owner shall be the named license holder of all software associated with any and all incremental work on the project(s). In addition, the Owner shall receive ownership of all job specific configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and/or configured for use with the NAC, FMCS, and any related LAN / WAN / Intranet and Internet connected routers and devices. **Any and all** required **IDs** and **passwords** for access to any component or software program shall be provided to the owner.

C. The owner, or his appointed agent, shall receive ownership of all job specific software configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming that is generated for a given project and /or configured for use within Niagara AX Framework (Niagara) based controllers and/or servers and any related LAN / WAN / Intranet and all connected routers and devices.

1.9 DELIVERY, STORAGE AND HANDLING

A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.10 JOB CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

PART 2 MATERIALS

2.1 GENERAL

A. The Temperature Control System (TCS) and Facility Management Control System (FMCS) shall be comprised of a network of interoperable, stand-alone digital controllers, a computer system, graphical user interface software, printers, network devices, valves, dampers, sensors, and other devices as specified herein.

B. The installed system shall provide secure password access to all features, functions and data contained in the overall FMCS.

2.2 ACCEPTABLE PRODUCTS / MANUFACTURERS

A. Basis-of-Design: Honeywell WEBs-AX™./ Niagara AX. Subject to compliance with requirements, provide either the product named or an alternate product by one of the other manufacturers specified where product is equal in all functions. **All software versions to fully match existing system**.

Basis of design products:

1. Honeywell Spyder Family Fully Programmable Controllers.
2. Honeywell Stryker Configurable VAV Controllers.
3. Honeywell Configurable Thermostat (T7530H series) both DX or Valve control models.

Manufactures:

4. Honeywell International
5. Distech Controls
6. Johnson Controls
7. Vykon Systems

2.3 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate ANSI/ASHRAE Standard 135-2001 BACnet™,

LonWorks™ technology, MODBUS ™, OPC, and other open and proprietary communication protocols into one open, interoperable system.

B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI / ASHRAE™ Standard 135-2001, BACnet and LonMark to assure interoperability between all system components is required. For each LonWorks device that does not have LonMark certification, the device supplier must provide an XIF file and a resource file for the device. For each BACnet device, the device supplier must provide a PICS document showing the installed device's compliance level. Minimum compliance is Level 3; with the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet (BACnet Ethernet/IP,) and/or RS-485 (BACnet MSTP) as specified.

C. All components and controllers supplied under this Division shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.

D. The supplied system must incorporate the ability to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. Systems requiring proprietary database and user interface programs shall not be acceptable.

E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network. Systems employing a "flat" single tiered architecture shall not be acceptable.

1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for local network connected user interfaces.
2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.4 NETWORKS

A. The Local Area Network (LAN) shall be a 100 Megabit/sec Ethernet network supporting BACnet, Java, XML, HTTP, and SOAP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Area Controllers (NACs), user workstations and, if specified, a local server.

B. Local area network minimum physical and media access requirements:

1. Ethernet; IEEE standard 802.3
2. Cable; 100 Base-T, UTP-8 wire, category 5
3. Minimum throughput; 100 Mbps.

2.5 NETWORK ACCESS

A. Remote Access.

1. For Local Area Network installations, provide access to the LAN from a remote location, via the Internet. The Owner shall provide a connection to the Internet to enable this access via high speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1 Line or via the customer's Intranet to a corporate server providing access to an Internet Service Provider (ISP). Customer agrees to pay monthly access charges for connection and ISP.

2.6 NETWORK AREA CONTROLLER (NAC)

A. The BMS contractor shall supply one or more Network Area Controllers (NAC) as part of this contract. Number of area controllers required is dependent on the type and quantity of devices provided under Divisions 23 and 26. It is the responsibility of the BMS contractor to coordinate with the Division 23 and 26 contractors to determine the quantity and type of devices.

B. The Network Area Controller (NAC) shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the NAC. It shall be capable of executing application control programs to provide:

1. Calendar functions
2. Scheduling
3. Trending
4. Alarm monitoring and routing
5. Time synchronization
6. Integration of LonWorks controller data and BACnet controller data
7. Network Management functions for all LonWorks and/or BACnet based devices

C. The Network Area Controller shall provide the following hardware features as a minimum:

1. One Ethernet Port – 10/100 Mbps
2. One RS-232 port
3. One LonWorks Interface Port – 78KB FTT-10A if Lon controllers are used and/or One RS-485 port if BACnet controllers are used.
4. Battery Backup
5. Flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)
6. The NAC must be capable of operation over a temperature range of 32 to 122°F
7. The NAC must be capable of withstanding storage temperatures of between 0 and 158°F
8. The NAC must be capable of operation over a humidity range of 5 to 95% RH, non-condensing

D. The NAC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the NAC shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.

E. The NAC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 32 simultaneous users.

F. Event Alarm Notification and actions

1. The NAC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
2. The NAC shall be able to route any alarm condition to any defined user location whether connected to a local network, or remote via dial-up telephone connection or wide-area network.
3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including, but not limited to:
    a. In alarm
    b. Return to normal
    c. Fault condition
4. Provide for the creation of a minimum of eight alarm classes for the purpose of routing types and/or classes of alarms, i.e.: security, HVAC, Fire, etc.
5. Provide timed (schedule) routing of alarms by class, object, group, or node.
6. Provide alarm generation from binary object "runtime" and/or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.

G. Controller and network failures shall be treated as alarms and annunciated.

H. Alarms shall be annunciated in any of the following manners as defined by the user:

1. Screen message text
2. Email of the complete alarm message to multiple recipients via the owner's e-mail service. Provide the ability to route and email alarms based on:
    a. Day of week
    b. Time of day
    c. Recipient
3. Pagers via paging services that initiate a page on receipt of email message via the owner's e-mail service
4. Graphic with flashing alarm object(s)
5. Printed message, routed directly to a dedicated alarm printer

I. The following shall be recorded by the NAC for each alarm (at a minimum):

1. Time and date
2. Location (building, floor, zone, office number, etc.)
3. Equipment (air handler #, access way, etc.)
4. Acknowledge time, date, and user who issued acknowledgement.

5. Number of occurrences since last acknowledgement.

J. Alarm actions may be initiated by user defined programmable objects created for that purpose.

K. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.

L. A log of all alarms shall be maintained by the NAC and/or a server (if configured in the system) and shall be available for review by the user.

M. Provide a "query" feature to allow review of specific alarms by user defined parameters.

N. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.

O. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

2.7 Data Collection and Storage

A. The NAC shall have the ability to collect data for any property of any object and store this data for future use.

B. The data collection shall be performed by log objects, resident in the NAC that shall have, at a minimum, the following configurable properties:

1. Designating the log as interval or deviation.

2. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.

3. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.

4. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.

5. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.

C. All log data shall be stored in a relational database in the NAC and the data shall be accessed from a server (if the system is so configured) or a standard Web browser.

D. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.

E. All log data shall be available to the user in the following data formats:

1. HTML

2. XML

3. Plain Text

4. Comma or tab separated values

5. PDF

F. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.

G. The NAC shall have the ability to archive its log data either locally (to itself), or remotely to a server or other NAC on the network. Provide the ability to configure the following archiving properties, at a minimum:

1. Archive on time of day
2. Archive on user-defined number of data stores in the log (buffer size)
3. Archive when log has reached it's user-defined capacity of data stores
4. Provide ability to clear logs once archived

2.8 AUDIT LOG

A. Provide and maintain an Audit Log that tracks all activities performed on the NAC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the NAC), to another NAC on the network, or to a server. For each log entry, provide the following data:

1. Time and date
2. User ID
3. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

2.9 DATABASE BACKUP AND STORAGE

A. The NAC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.

B. Copies of the current database and, at the most recently saved database shall be stored in the NAC. The age of the most recently saved database is dependent on the user-defined database save interval.

C. The NAC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

2.10 ADVANCED UNITARY CONTROLLER

A. The controller platform shall be designed specifically to control HVAC – ventilation, filtration, heating, cooling, humidification, and distribution. Equipment includes: constant volume air handlers, packaged RTU, heat pumps, unit vents, fan coils, natural convection units, and radiant panels. The controller platform shall provide options and advanced system functions, configurable using Niagara AX Framework™, that allow standard control solutions required in executing the "Sequence of Operation" as outlined in Section 4.

B. Minimum Requirements:

1. The controller shall be capable of either integrating with other devices or stand-alone operation.
2. The controller shall have an FTT transformer-coupled communications port interface for common mode-noise rejection and DC isolation.

3. The controller shall have Significant Event Notification, Periodic Update capability, and Failure Detect when network inputs fail to be detected within their configurable time frame.
4. The controller shall have a visual indication (LED) of the status of the devise:
    a. Controller operating normally.
    b. Controller in process of download.
    c. Controller in manual mode under control of software tool.
    d. Controller lost its configuration.
    e. No power to controller, low voltage, or controller damage.
    f. Processor and/or controller are not operating.
5. The minimum controller Environmental ratings
    a. Operating Temperature Ambient Rating: -40° to 150° F (-40° to 65.5° C).
    b. Storage Temperature Ambient Rating: -40° to 150° F (-40° to 65.5° C).
    c. Relative Humidity: 5% to 95% non-condensing.
6. The controller shall have the additional approval requirements, listings, and approvals:
    a. UL/cUL (E87741) listed under UL916 (Standard for Open Energy Management Equipment) with plenum rating.
    b. CSA (LR95329-3) Listed
    c. Meets FCC Part 15, Subpart B, Class B (radiated emissions) requirements.
7. The controller housing shall be UL plenum rated mounting to either a panel or DIN rail (standard EN50022; 7.5mm x 35mm).
8. The controller shall have sufficient on-board inputs and outputs to support the application.
    a. Analog outputs (AO) shall be capable of being configured to support 0-10 V or 2-10 devices.
    b. Triac outputs shall be capable of switching 30 Volts at 500 mA.
9. The controller shall provide "continuous" automated loop tuning with an Adaptive Integral Algorithm Control Loop.
10. The controller platform shall have standard HVAC application programs that are modifiable to support both the traditional and specialized "sequence of operations" as outlined in Section 4.
    a. Discharge air control and low limit.
    b. Economizer with differential enthalpy.
    c. Minimum air flow coordinated with CO2.
    d. Unit ventilator cycle (1,2,3) 2-pipe.
    e. Unit ventilator cycle (1,2,3) 2-pipe with face/bypass.
    f. Unit ventilator cycle (1,2,3) 4-pipe.

g. Unit ventilator cycle (1,2,3) 4-pipe with EOC valve.

h. Unit ventilator cycle (1,2,3) 4-pipe.

i. Unit ventilator cycle (1,2,3) 4-pipe with EOC valve.

2.11 ADVANCED VARIABLE AIR VOLUME CONTROLLER

A. The controller platform shall be designed specifically for room-level VAV control – pressure-independent air flow control, pressure dependent damper control, supply and exhaust pressurization/de-pressurization control; temperature, humidity, complex CO2, occupancy, and emergency control. Equipment includes: VAV terminal unit, VAV terminal unit with reheat, Series fan powered terminal unit, Parallel fan powered terminal unit, Supply and Exhaust air volume terminals, and Constant volume dual-duct terminal unit. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara AX Framework™, that allow standard and customizable control solutions required in executing the "Sequence of Operation" as outlined in Section 4.

B. Minimum Requirements:

1. The controller shall be capable of either integrating with other devices or stand-alone room-level control operation.
2. The controller shall have an internal velocity pressure sensor.
   a. Sensor Type: Microbridge air flow sensor with dual integral restrictors.
   b. Operating Range: 0 to 1.5 in. H2O (0 to 374 Pa).
   c. Accuracy: ±2% of full scale at 32° to 122° F (0° to 50° C); ±1% of full scale at null pressure.
3. The controller shall have an FTT transformer-coupled communications port interface for common mode-noise rejection and DC isolation.
4. The controller shall have Significant Event Notification, Periodic Update capability, and Failure Detect when network inputs fail to be detected within their configurable time frame.
5. The controller shall have a visual indication (LED) of the status of the devise:
   a. Controller operating normally.
   b. Controller in process of download.
   c. Controller in manual mode under control of software tool.
   d. Controller lost its configuration.
   e. No power to controller, low voltage, or controller damage.
   f. Processor and/or controller are not operating.
6. The minimum controller Environmental ratings:
   a. Operating Temperature Ambient Rating: 32° to 122° F (0° to 50° C).
   b. Storage Temperature Ambient Rating: -40° to 122° F (-40° to 50° C).

c. Relative Humidity: 5% to 95% non-condensing.

7. The controller shall have the additional approval requirements, listings, and approvals:
   a. UL/cUL (E87741) listed under UL916 (Standard for Open Energy Management Equipment) with plenum rating.
   b. CSA (LR95329-3) Listed
   c. Meets FCC Part 15, Subpart B, Class B (radiated emissions) requirements.
8. The controller housing shall be UL plenum rated mounting to either a panel or DIN rail (standard EN50022; 7.5mm x 35mm).
9. The controller shall provide an integrated actuator option.
   a. Actuator type: Series 60 Floating.
   b. Rotation stroke: 95° ±3° for CW or CCW opening dampers.
   c. Torque rating: 44 lb-in. (5 Nm).
   d. Run time for 90° rotation: 90 seconds at 60 Hz.
10. The controller shall have sufficient on-board inputs and outputs to support the application.
   a. Analog outputs (AO) shall be capable of being configured to support 0-10 V or 2-10 V devices.
   b. Triac outputs shall be capable of switching 30 Volts at 500 mA.
11. The controller shall provide continuous automated loop tuning with an Adaptive Integral Algorithm Control Loop.
12. The controller shall have a loop execution response time of 1 second.
13. The controller platform shall have standard HVAC application programs that are configurable to support both the "sequence of operations" as outlined in Section 4.
   a. VAV terminal unit.
   b. VAV terminal unit fan speed control.
   c. Series fan.
   d. Parallel fan.
   e. Regulated air volume (room pressurization/de-pressurization).
   f. CV dual-duct
   g. TOD occupancy sensor stand-by setpoints

2.12 GRAPHICAL USER INTERFACE SOFTWARE

A. Add graphics to existing DGLux GUI software and increase capacity as required to project requirements.

B. Operating System:
   1. The Workstation with GUI shall run on Microsoft Windows XP Professional.

C. The GUI shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimal knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.

D. Real-Time Displays. The GUI, shall at a minimum, support the following graphical features and functions:

1. Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of, a graphic background the GUI shall support the use of scanned pictures.
2. Graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.
3. Graphics shall support layering and each graphic object shall be configurable for assignment to a layer. A minimum of six layers shall be supported.
4. Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner.
    a. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
    b. Holidays shall be set by using a graphical calendar without requiring any keyboard entry from the operator.
5. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No text entry shall be required.
6. Adjustments to analog objects, such as set points, shall be done by right-clicking the selected object and using a graphical slider to adjust the value. No text entry shall be required.

E. System Configuration. At a minimum, the GUI shall permit the operator to perform the following tasks, with proper password access:

    a. Create, delete, or modify control strategies.
    b. Add or delete objects to the system.
    c. Tune control loops through the adjustment of control loop parameters.
    d. Enable or disable control strategies.
    e. Generate hard copy records or control strategies on a printer.
    f. Select points to be alarmable and define the alarm state.
    g. Select points to be trended over a period of time and initiate the recording of values automatically.

F. On-Line Help. Provide a context sensitive on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for the currently displayed screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.

G. Security. Each operator shall be required to log on to the system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off the system if no keyboard or mouse activity is detected for a specified time. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.

H. System Diagnostics. The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.

I. Alarm Console

1. The system shall be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console may be enabled or disabled by the system administrator.

2. When the Alarm Console is enabled, a separate alarm notification window will supersede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and unacknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

2.13 WEB BROWSER CLIENTS

A. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™ or Netscape Navigator™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.

B. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the FMCS, shall not be acceptable.

C. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface (if used). Systems that require different graphic views, different means of graphic generation, or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.

D. The Web browser client shall support at a minimum, the following functions:

1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java

authentication and encryption techniques to prevent unauthorized access shall be implemented.

2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
3. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
4. Storage of the graphical screens shall be in the Network Area Controller (NAC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
5. Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.
6. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
    a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
        1. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
        2. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
    b. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No text entry shall be required.
    c. View logs and charts
    d. View and acknowledge alarms
    e. Setup and execute SQL queries on log and archive information
7. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to set a specific home page for each user. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
8. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

2.14 SYSTEM CONFIGURATION TOOL

A. The Workstation Graphical User Interface software (GUI) shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GUI shall be through password access as assigned by the system administrator.

B. A library of control, application, and graphic objects shall be provided to enable the creation of all applications and user interface screens. Applications are to be created by selecting the

desired control objects from the library, dragging or pasting them on the screen, and linking them together using a built in graphical connection tool. Completed applications may be stored in the library for future use. Graphical User Interface screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display objects to the application objects to provide "real-time" data updates. Any real-time data value or object property may be connected to display its current value on a user display. Systems requiring separate software tools or processes to create applications and user interface displays shall not be acceptable.

C. Programming Methods

1. Provide the capability to copy objects from the supplied libraries, or from a user-defined library to the user's application. Objects shall be linked by a graphical linking scheme by dragging a link from one object to another. Object links will support one-to-one, many-to-one, or one-to-many relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in color depending on the type of link; i.e., internal, external, hardware, etc.

2. Configuration of each object will be done through the object's property sheet using fill-in the blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration will not be accepted.

3. The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.

4. All programming shall be done in real-time. Systems requiring the uploading, editing, and downloading of database objects shall not be allowed.

5. The system shall support object duplication within a customer's database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

2.15 LonWorks NETWORK MANAGEMENT

A. The Graphical User Interface software (GUI) shall provide a complete set of integrated LonWorks network management tools for working with LonWorks networks. These tools shall manage a database for all LonWorks devices by type and revision, and shall provide a software mechanism for identifying each device on the network. These tools shall also be capable of defining network data connections between LonWorks devices, known as "binding". Systems requiring the use of third party LonWorks network management tools shall not be accepted.

B. Network management shall include the following services: device identification, device installation, device configuration, device diagnostics, device maintenance and network variable binding.

C. The network configuration tool shall also provide diagnostics to identify devices on the network, to reset devices, and to view health and status counters within devices.

D. These tools shall provide the ability to "learn" an existing LonWorks network, regardless of what network management tool(s) were used to install the existing network, so that existing LonWorks devices and newly added devices are part of a single network management database.

E. The network management database shall be resident in the Network Area Controller (NAC), ensuring that anyone with proper authorization has access to the network management database at all times. Systems employing network management databases that are not resident, at all times, within the control system, shall not be accepted.

2.16 LIBRARY

A. A standard library of objects shall be included for development and setup of application logic, user interface displays, system services, and communication networks.

B. The objects in this library shall be capable of being copied and pasted into the user's database and shall be organized according to their function. In addition, the user shall have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.

C. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) library, available to all registered users to provide new or updated objects and applications as they are developed.

D. All control objects shall conform to the control objects specified in the BACnet specification.

E. The library shall include applications or objects for the following functions, at a minimum:

1. Scheduling Object. The schedule must conform to the schedule object as defined in the BACnet specification, providing 7-day plus holiday & temporary scheduling features and a minimum of 10 on/off events per day. Data entry to be by graphical sliders to speed creation and selection of on-off events.

2. Calendar Object. . The calendar must conform to the calendar object as defined in the BACnet specification, providing 12-month calendar features to allow for holiday or special event data entry. Data entry to be by graphical "point-and-click" selection. This object must be "linkable" to any or all scheduling objects for effective event control.

3. Duty Cycling Object. Provide a universal duty cycle object to allow repetitive on/off time control of equipment as an energy conserving measure. Any number of these objects may be created to control equipment at varying intervals

4. Temperature Override Object. Provide a temperature override object that is capable of overriding equipment turned off by other energy saving programs (scheduling, duty cycling etc.) to maintain occupant comfort or for equipment freeze protection.

5. Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled un-occupancy time just far enough ahead to take advantage of the building's "flywheel" effect for energy savings. Provide automatic tuning of all start / stop time object properties based on the previous day's performance.

6. Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of

a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to effect the desired energy reduction. If the list of sheddable equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the users screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each sheddable object shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.

F. The library shall include control objects for the following functions. All control objects shall conform to the objects as specified in the BACnet specification.

1. Analog Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. Allow high, low and failure limits to be assigned for alarming. Also, provide a time delay filter property to prevent nuisance alarms caused by temporary excursions above or below the user defined alarm limits.
2. Analog Output Object - Minimum requirement is to comply with the BACnet standard for data sharing.
3. Binary Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. The user must be able to specify either input condition for alarming. This object must also include the capability to record equipment run-time by counting the amount of time the hardware input is in an "on" condition. The user must be able to specify either input condition as the "on" condition.
4. Binary Output Object - Minimum requirement is to comply with the BACnet standard for data sharing. Properties to enable minimum on and off times for equipment protection as well as interstart delay must be provided. The BACnet Command Prioritization priority scheme shall be incorporated to allow multiple control applications to execute commands on this object with the highest priority command being invoked. Provide sixteen levels of priority as a minimum. Systems not employing the BACnet method of contention resolution shall not be acceptable.
5. PID Control Loop Object - Minimum requirement is to comply with the BACnet standard for data sharing. Each individual property must be adjustable as well as to be disabled to allow proportional control only, or proportional with integral control, as well as proportional, integral and derivative control.
6. Comparison Object - Allow a minimum of two analog objects to be compared to select either the highest, lowest, or equality between the two linked inputs. Also, allow limits to be applied to the output value for alarm generation.
7. Math Object - Allow a minimum of four analog objects to be tested for the minimum or maximum, or the sum, difference, or average of linked objects. Also, allow limits to be applied to the output value for alarm generation.

8. Custom Programming Objects - Provide a blank object template for the creation of new custom objects to meet specific user application requirements. This object must provide a simple BASIC-like programming language that is used to define object behavior. Provide a library of functions including math and logic functions, string manipulation, and e-mail as a minimum. Also, provide a comprehensive on-line debug tool to allow complete testing of the new object. Allow new objects to be stored in the library for re-use.

9. Interlock Object - Provide an interlock object that provides a means of coordination of objects within a piece of equipment such as an Air Handler or other similar types of equipment. An example is to link the return fan to the supply fan such that when the supply fan is started, the return fan object is also started automatically without the user having to issue separate commands or to link each object to a schedule object. In addition, the control loops, damper objects, and alarm monitoring (such as return air, supply air, and mixed air temperature objects) will be inhibited from alarming during a user-defined period after startup to allow for stabilization. When the air handler is stopped, the interlocked return fan is also stopped, the outside air damper is closed, and other related objects within the air handler unit are inhibited from alarming thereby eliminating nuisance alarms during the off period.

10. Temperature Override Object - Provide an object whose purpose is to provide the capability of overriding a binary output to an "On" state in the event a user specified high or low limit value is exceeded. This object is to be linked to the desired binary output object as well as to an analog object for temperature monitoring, to cause the override to be enabled. This object will execute a Start command at the Temperature Override level of start/stop command priority unless changed by the user.

11. Composite Object - Provide a container object that allows a collection of objects representing an application to be encapsulated to protect the application from tampering, or to more easily represent large applications. This object must have the ability to allow the user to select the appropriate parameters of the "contained" application that are represented on the graphical shell of this container.

G. The object library shall include objects to support the integration of devices connected to the Network Area Controller (NAC). At a minimum, provide the following as part of the standard library included with the programming software:

1. LonMark/LonWorks devices. These devices shall include, but not be limited to, devices for control of HVAC, lighting, access, and metering. Provide LonMark manufacturer-specific objects to facilitate simple integration of these devices. All network variables defined in the LonMark profile shall be supported. Information (type and function) regarding network variables not defined in the LonMark profile shall be provided by the device manufacturer.

2. For devices not conforming to the LonMark standard, provide a dynamic object that can be assigned to the device based on network variable information provided by the device manufacturer. Device manufacturer shall provide an XIF file, resource file and documentation for the device to facilitate device integration.

3. For BACnet devices, provide the following objects at a minimum:

   a. Analog In

   b. Analog Out

c. Analog Value
d. Binary
e. Binary In
f. Binary Out
g. Binary Value
h. Multi-State In
i. Multi-State Out
j. Multi-State Value
k. Schedule Export
l. Calendar Export
m. Trend Export
n. Device

4. For each BACnet object, provide the ability to assign the object a BACnet device and object instance number.
5. For BACnet devices, provide the following support at a minimum
   a. Segmentation
   b. Segmented Request
   c. Segmented Response
   d. Application Services
   e. Read Property
   f. Read Property Multiple
   g. Write Property
   h. Who-has
   i. I-have
   j. Who-is
   k. I-am
   l. Media Types
   m. Ethernet
   n. BACnet IP Annex J
   o. MSTP
   p. BACnet Broadcast Management Device (BBMD) function
   q. Routing

Note to specifiers: Depending on the project configuration and requirements, it may be desired to integrate data from devices that are not LonMark or BACnet. These could include industrial or plant floor devices

such as PLC's. Because of the many drivers available, a common methods of providing this integration are: Dynamic Data Exchange (DDE), If this is desired, use Item 2.18; MODBUS (DDE), If this is desired, use Item 2.19; Ole for Process Control (OPC), If this is desired, use Item 2.20.

2.17 DDE DEVICE INTEGRATION

A. The Network Area Controller shall support the integration of device data via Dynamic Data Exchange (DDE), over the Ethernet Network. The Network Area Controller shall act as a DDE client to another software application that functions as a DDE server.

B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of these devices into the FMCS. Objects provided shall include at a minimum:

1. DDE Generic AI Object
2. DDE Generic AO Object
3. DDE Generic BO Object
4. DDE Generic BI Object

2.18 MODBUS SYSTEM INTEGRATION

A. The Network Area Controller shall support the integration of device data from Modbus RTU, ASCII, or TCP control system devices. The connection to the Modbus system shall be via an RS-232, RS485, or Ethernet IP as required by the device.

B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the Modbus system data into the FPMS. Objects provided shall include at a minimum:

1. Read/Write Modbus AI Registers
2. Read/Write Modbus AO Registers
3. Read/Write Modbus BI Registers
4. Read/Write Modbus BO Registers

C. All scheduling, alarming, logging and global supervisory control functions, of the Modbus system devices, shall be performed by the Network Area Controller.

D. The FMCS supplier shall provide a Modbus system communications driver. The equipment system vendor that provided the equipment utilizing Modbus shall provide documentation of the system's Modbus interface and shall provide factory support at no charge during system commissioning

2.19 OPC SYSTEM INTEGRATION

A. The Network Area Controller shall act as an OPC client and shall support the integration of device data from OPC servers. The connection to the OPC server shall be Ethernet IP as required by the device. The OPC client shall support third party OPC servers compatible with the Data Access 1.0 and 2.0 specifications.

B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of the OPC system data into the BAS. Objects provided shall include at a minimum:

1. Read/Write OPC AI Object
2. Read/Write OPC AO Object
3. Read/Write OPC BI Object
4. Read/Write OPC BO Object
5. Read/Write OPC Date/Time Input Object
6. Read/Write OPC Date/Time Output Object
7. Read/Write OPC String Input Object
8. Read/Write OPC String Output Object

C. All scheduling, alarming, logging and global supervisory control functions, of the OPC system devices, shall be performed by the Network Area Controller.

D. The FMCS supplier shall provide an OPC client communications driver. The equipment system vendor that provided the equipment utilizing OPC shall provide documentation of the system's OPC server interface and shall provide factory support at no charge during system commissioning.

2.3 OTHER CONTROL SYSTEM HARDWARE

A. Space Temperature Wall Module: Temperature sensing modules mounted on the wall in occupied spaces. Optional setpoint, indication, and override switches must be provided as specified.

1. Manufacturers: Subject to compliance with requirements. Provide products by one of the manufacturers specified.
   a. Alerton
   b. ACI
   c. Honeywell
   d. Johnson Controls
   e. Novar
   f. Siemens Building Technologies
   g. Trend

2. Wall module shall have a thermistor temperature sensor with operating range of 45 to 99 deg. F. under a locking cover/enclosure designed for mounting on a standard electrical switch box.
3. Space temperature sensors shall be accurate to plus or minus 0.5 deg. F at 77 deg. F.
4. Where specified, space temperature sensors shall have a setpoint knob calibrated for warmer-cooler adjustments calibrated to allow absolute setpoint change.

5. Where specified, wall module shall also have an after-hours override pushbutton and LED override indicator.

6. Where specified, the wall module shall have a fan coil unit fan control switch for ***(auto-off-on)(auto-off-low-med-hi)*** fan control. The wall module function is further specified in SECTION III Sequence of Operation.

7. Where specified, wall module shall have an LCD display with 2 level user access. Level one access shall be available for typical occupant adjustments, and level two access for system configuration. Level two access shall be accessible only via password or multi-key code input. Room temperature, room temperature setpoint, VAV balancing parameters and settings, occupancy override, and other control parameters for a total of at least 35 items shall be available via the keypad/display. Wall module screens shall be configurable for typical tenant and control contractor views.

B. Duct Mount, Pipe Mount, and Outside Air Temperature Sensors:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Alerton
   b. ACI
   c. Honeywell
   d. Johnson Controls
   e. Novar
   f. Siemens Building Technologies
   g. Trend

2. Outside air sensors shall include an integral sun shield.

3. Temperature sensors shall have an accuracy of plus or minus 1.0 deg. F. over operating range.

4. Duct sensors shall have sensor approximately in center of the duct, and shall have selectable lengths of 6, 12, and 18 inches.

5. Multipoint averaging element sensors shall be provided where specified, and shall have a minimum of one foot of sensor length for each square foot of duct area (provide multiple sensors if necessary).

6. Pipe mount sensors shall have copper, or stainless steel separable wells.

C. Current Switches: Solid state, split core, current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point shall be provided where specified. Current switches shall include an integral LED for indication of trip condition.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. ACI
   b. Honeywell
   c. RIB, Inc.
   d. Veris Industries
2. Sensing range 0.5 – 250 Amps.
3. Output 0.3 A @ 200 VAC/VDC / 0.15 A @ 300 VAC/VDC
4. Operating frequency 40 Hz -1 kHz.
5. Operating Temperature 5-104 deg. F (-15 – 40 deg. C), Operating Humidity 0-95% non-

condensing
6. Approvals CE, UL.

D. Current Sensors: Solid state, split core linear current sensors shall be provided where specified.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
      a. ACI
      b. Honeywell
      c. RIB, Inc.
      d. Veris Industries
   2. Linear output of 0-5 VDC, 0-10 VDC, or 4-20 mA.
   3. Scale sensors so that average operating current is between 20-80% full scale.
   4. Accuracy plus or minus 1.0% (5-100% full scale)
   5. Operating frequency 50-600 Hz.
   6. Operating Temperature 5-104 deg. F (-15 – 40 deg. C), Operating Humidity 0-95% non-condensing
   7. Approvals CE, UL.

E. Water Flow Meters: Water flow meters shall be axial turbine style flow meters which translate liquid motion into electronic output signals proportional to the flow sensed.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
      a. Fluid Components International
      b. Hersey Meters
      c. Onicon Meters
   2. Flow sensing turbine rotors shall be non-metallic and not impaired by magnetic drag.
   3. Flow meters shall be 'insertion' type complete with 'hot-tap' isolation valves to enable sensor removal without water supply system shutdown.
   4. Accuracy shall be $\pm$ 2% of actual reading from 0.4 to 20 feet per second flow velocities.

F. Low Temperature Limit Switches. Safety low limit shall be manual reset twenty foot limited fill type responsive to the coolest section of its length.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
      a. Honeywell
      b. Johnson Controls
      c. Siemens Building Technologies
      d. TAC
   2. Low Limit Setpoint shall be adjustable between 20 and 60 deg. F. (-5 and 15 deg. C.)
   3. Switch enclosure shall be dustproof and moisture-proof.
   4. Switch shall break control circuit on temperature fall. Contact ratings shall be 10.2 FLA at 120 VAC, and 6.5 FLA at 240 VAC.
   5. Ambient Temperature range -20 to 125 deg. F. (-11 to 52 deg. C.)
   6. Operating Temperature Range 20 to 60 deg. F. (-5 to 15 deg. C.)

G. High Temperature Limit Switches. Safety high limit (fire stats) shall be manual reset type.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Honeywell
   b. Johnson Controls
   c. Siemens Building Technologies
   d. TAC
2. High Limit Setpoint shall be adjustable between 100 and 240 deg. F. (38 and 116 deg. C.)
3. Switch enclosure shall be dustproof and moisture-proof.
4. Switch shall break control circuit on temperature fall. Contact ratings shall be 10 FLA at 120 VAC, and 5 FLA at 240 VAC.
5. Ambient Temperature range -20 to 190 deg. F. (-28 to 88 deg. C.) at case, and 350 deg. F (177 deg. C.) at the sensor.
6. Operating Temperature Range 100 to 240 deg. F. (38 to 116 deg. C.)

H. CO2 Sensors.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Honeywell
   b. TelAire
   c. Vaisala

2. Carbon Dioxide sensors shall be 0-10 Vdc, 2-10 Vdc, or 4-20 mA linear analog output type, with corrosion free gold-plated non-dispersive infrared sensing, designed for duct or wall mounting.
3. Sensor shall incorporate internal diagnostics for power, sensor, analog output checking, and automatic background calibration algorithm for reduced maintenance. Sensor range shall be 0-2000 PPM with +/- 75 PPM accuracy at full scale.
4. Where specified, sensor shall have an LCD display that displays the sensor reading and status.

I. Differential Pressure Sensors

1. Manufacturers:
   a. ACI
   b. Honeywell
   c. RIB, Inc.
   d. Veris Industries

2. Sensor shall have four field selectable ranges: 0.1, 0.24, 0.5, 1.0 in w.c. for low pressure models, and 1.0, 2.5, 5, 10 for high pressure models.
3. Sensor shall provide zero calibration via pushbutton or digital input.
4. Sensor shall have field selectable outputs of 0-5 VDC, 0-10 VDC, and 4-20 mA
5. Where specified, sensor shall have and LCD display that displays measured value.

6. Sensor overpressure rating shall be 3 PSID proof, and 5 PSID burst.
7. Sensor accuracy shall be plus or minus 1% FS selected range.

J. Humidity Sensors.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Honeywell
   b. Johnson Controls
   c. Siemens Building Technologies
   d. TAC
2. Humidity transducer shall be accurate to +/- 5% choose desired accuracy between 20-95% RH NIST traceable calibration.
3. Sensors shall have a field selectable output of 0-10 Vdc, 0-5 Vdc, or 4-20 mA.
4. Sensors shall provide field calibration option using non-interacting zero and span potentiometers, and/or toggle switches that increment or decrement the RH value in steps of 0.5% RH.
5. Accuracy of the sensor shall not be adversely affected by condensation.

K. Enthalpy Sensors.
Provide duct mounted sensor including solid state temperature and humidity sensors with electronics which shall output a 4-20 ma signal input to the controller upon a varying enthalpy (total heat) to enable economizer modes of operation when outside air enthalpy is suitable for free cooling .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Honeywell
   b. Siemens Building Technologies

L. Annular Pitot Tube Flow Meter. Annular pitot tube shall be averaging type differential pressure sensors with four total head pressure ports and one static port made of austenitic stainless steel.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Air Monitor Corporation
   b. Ultratech
   c. Wetmaster Co., Ltd.
   d. Johnson Controls

2. Sensor shall have an accuracy of ± .25% of full flow and a repeatability of ± .05% of measured value.
3. Transmitter shall be electronic and shall produce a linear output of 0-10 Vdc, 0-5 Vdc, or 4 to 20 mA dc corresponding to the required flow span.
4. The transmitter shall include non-interacting zero and span adjustments.

M. Standard Automatic Control Dampers. Provide all automatic control dampers not specified to be integral with other equipment.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Greenheck
   b. Honeywell
   c. Johnson Controls
   d. Ruskin

2. Frames shall be 5 inches wide and of no less than 16-gauge galvanized steel. Inter-blade linkage shall be within the frame and out of the air stream.

3. Blades shall not be over 8 inches wide or less than 16-gauge galvanized steel triple V type for rigidity.

4. Bearings shall be acetyl, oilite, nylon or ball-bearing with ½ inch diameter plated steel shafts.

5. Dampers shall be suitable for temperature ranges of -40 to 180F.

6. All proportional control dampers shall be opposed or parallel blade type as hereinafter specified and all two-position dampers shall be parallel blade types.

7. Dampers shall be sized to meet flow requirements of the application. The sheet metal contractor shall furnish and install baffles to fit the damper to duct size. Baffles shall not exceed 6". Dampers with dimensions of 24 inches and less shall be rated for 3,000 fpm velocity and shall withstand a maximum system pressure of 5.0 in. w.c. Dampers with dimensions of 36 inches and less shall be rated for 2,500 fpm velocity and shall withstand a maximum system pressure of 4.0 in. w.c. Dampers with dimensions of 48 inches and less shall be rated for 2,000 fpm velocity and shall withstand a maximum system pressure of 2.5 in. w.c. Damper blade width shall be no greater than 8 inches, and dampers over 48 inches wide by 74 inches high shall be sectionalized.

8. Maximum leakage for dampers in excess of sixteen inches square shall be 30 CFM per square foot at static pressure of 1 inch of WC. Testing and ratings to be in accordance with AMCA Standard 500.

N. Low Leakage Automatic Control Dampers. Provide all automatic control dampers not specified to be integral with other equipment.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Greenheck
   b. Honeywell
   c. Johnson Controls
   d. Ruskin

2. Frames shall be 5 inches wide and of no less than 16-gauge galvanized steel. Inter-blade linkage shall be within the frame and out of the air stream.

3. Blades shall not be over 8 inches wide or less than 16-gauge galvanized steel triple V type for rigidity.

4. Bearings shall be acetyl, oilite, nylon or ball-bearing with ½ inch diameter plated steel shafts.
5. Dampers shall be suitable for temperature ranges of -40 to 180F.
6. All proportional control dampers shall be opposed or parallel blade type as hereinafter specified and all two-position dampers shall be parallel blade types.
7. Dampers shall be sized to meet flow requirements of the application. The sheet metal contractor shall furnish and install baffles to fit the damper to duct size. Baffles shall not exceed 6". Dampers with dimensions of 24 inches and less shall be rated for 3,000 fpm velocity and shall withstand a maximum system pressure of 5.0 in. w.c. Dampers with dimensions of 36 inches and less shall be rated for 2,500 fpm velocity and shall withstand a maximum system pressure of 4.0 in. w.c. Dampers with dimensions of 48 inches and less shall be rated for 2,000 fpm velocity and shall withstand a maximum system pressure of 2.5 in. w.c.
8. Side seals shall be stainless steel of the tight-seal spring type.
9. Dampers shall be minimum leakage type to conserve energy and the temperature control manufacturer shall submit leakage data for all low leakage control dampers with the temperature control submittal.
10. Maximum leakage for low leakage dampers in excess of sixteen inches square shall be 8 CFM per square foot at static pressure of 1 inch of WC.
11. Low leakage damper blade edges shall be fitted with replaceable, snap-on, inflatable seals to limit damper leakage.
12. Testing and ratings shall be in accordance with AMCA Standard 500.
13. Damper blade width shall be no greater than 8 inches, and dampers over 48 inches wide by 74 inches high shall be sectionalized. Testing and ratings to be in accordance with AMCA Standard 500.

O. Round Motorized Dampers. Round dampers shall be provided where specified and shall be factory mounted in a section of round duct a minimum of 12 inches long, but no less than one inch longer than the duct diameter.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Greenheck
   b. Honeywell
   c. Johnson Controls
   d. Ruskin

2. Duct shall be sleeve type spiral duct crimped on the downstream end, 24 gage galvanized minimum except duct over 12 inches in diameter shall be 22 gage.
3. Duct shall have an integral galvanized steel actuator mounting plate and a ½ inch zinc-coated steel blade shaft extending a minimum of 2 inches beyond the actuator mounting plate.
4. Shaft bearings shall be flanged bronze oilite pressed into the frame.

5. The blade shall be a minimum 16 gage galvanized steel, and damper frame shall be provided with closed-cell neoprene seals with silicone rubber bead. Damper shall be designed for a 2500 ft/min approach velocity and a 4 inch minimum static pressure.
6. Damper shall be suitable for operation from 32 to 130F temperatures.
7. Damper and actuator combination shall be designed for leakage rates less than 13 cfm per square foot at one inch w.c. differential and 25 cfm at four inches w.c. Actuator shall have an external declutch lever to allow manual blade positioning during equipment and power malfunctions.

P. Control Valves: ***(Globe Type)*** Control valves shall be 2-way or 3-way pattern as shown constructed for tight shutoff and shall operate satisfactory against system pressures and differentials.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Honeywell
   b. Johnson Controls
   c. Siemens Building Technologies
   d. TAC
2. Two-position valves shall be line size.
3. Proportional control valves shall be sized for a nominal pressure drop of 5.0 psi at rated flow (except as may be noted on the drawings). Manufacturer's specified maximum differential pressure shall not be exceeded in order to prevent cavitation.
4. Two-way proportional valves shall have equal percentage flow characteristics. Three-way valves shall have equal percentage flow characteristics straight through, and linear through the bypass. Rangeability shall be 50:1 or greater.
5. Provide valve position indicator and a method to operate valves manually during system start-up, or actuator power loss or failure on all valves.
6. Leakage rate shall be no more than ANSI Class III (for heating) or ANSI Class IV (for cooling).
7. Valves 1/2 inch through 3 inches shall be screwed pattern except where solder connections are specified for valves 1/2 or 3/4 inches.
8. Three-way valve bypass ports shall be of Cv to provide constant flow through the control loop.
9. Two-way valves shall close off against the net differential pressure resulting from the maximum head pressure of the system pumps less all loop pressure losses. Three-way valves shall close off against the difference in head pressure between the controlled load and the bypass line.
10. Valves 2-1/2 inch and larger shall be flanged and ANSI/ASME-rated to withstand the pressures and temperatures specified.
11. Valves shall have stainless-steel stems and spring loaded Teflon packing with replaceable discs.

Q. Control Valves: ***(Characterized Ball Valves)*** Control valves 1/2 to 3 inches shall be 2-way or 3-way forged brass screwed pattern constructed for tight shutoff and shall operate satisfactory against system pressures and differentials.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Honeywell
   b. Johnson Controls
   c. Siemens Building Technologies
   d. TAC
   e. Griswold Controls

2. Two-position valves shall be line size.

3. Proportional control valves shall be sized for a nominal pressure drop of 5.0 psi at rated flow (except as may be noted on the drawings). Manufacturer's specified maximum differential pressure shall not be exceeded in order to prevent cavitation.

4. Two-way proportional valves shall have equal percentage flow characteristics. Three-way valves shall have equal percentage flow characteristics straight through and linear flow through the bypass.

5. Leakage rate shall be ANSI Class IV (no more than 0.01% of Cv).

6. Fluid temperature range shall be between -22 and +250 degrees F. water or glycol solutions up to 50%. Piping and valves shall be properly insulated to prevent formation of ice on moving parts.

7. Valves shall be rated for no less than 360 psig at 250 degrees F.

8. Provide a method to operate valves manually during system start-up, or actuator power loss or failure on all valves.

9. Two-way valves shall close off against 70 psi minimum, and three-way valves shall close off against 40 psi minimum.

10. Valves shall have stainless-steel or chemically nickel-plated brass stem and throttling port.

11. Actuator shall be available with NEMA 3R (IP54) rated enclosure suitable for outdoor installation.

12. Valves shall be tagged with Cv rating and model number.

R. Control Valves: ***(Characterized Ball Valves)*** Control valves 4 to 6 inches shall be 2-way or 3-way cast iron ANSI Class 125 flanged connections as shown constructed for tight shutoff and shall operate satisfactory against system pressures and differentials.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Honeywell
   b. Johnson Controls
   c. Siemens Building Technologies
   d. Griswold Controls

2. Two-position valves shall be line size.
3. Proportional control valves shall be sized for a nominal pressure drop of 5.0 psi at rated flow (except as may be noted on the drawings). Manufacturer's maximum differential pressure shall not be exceeded in order to prevent cavitation.
4. Two-way water valves shall have equal percentage flow characteristics. Three-way valves shall have equal percentage flow characteristics straight through and linear with 20% reduced flow through the bypass. Rangeability shall be 100:1 or greater.
5. A-port leakage rate shall be ANSI Class IV (no more than 0.01% of Cv) or better.
6. Fluid temperature range shall be between -22 and +250 degrees F. water or glycol solutions up to 50%. Piping and valves shall be properly insulated to prevent formation of ice on moving parts.
7. Valves shall be rated for no less than 240 psig at 250 degrees F.
8. Provide a method to operate valves manually during actuator power loss or failure.
9. Two-way valves shall close off against 70 psi minimum, and three-way valves shall close off against 40 psi minimum.
10. Valve ball and stem shall be 316 stainless-steel.
11. Actuator shall be available with NEMA 3R (IP54) rated enclosure suitable for outdoor installation.
12. Valves shall be tagged with Cv rating and model number.

S. Butterfly Control Valves: Where specified, butterfly control valves 2" to 20" in size shall be cast iron body type for 2-way applications and constructed for tight shutoff and shall operate satisfactorily against system pressures and differentials. Three-way applications shall consist of 2-way valves assembled to a "Tee" fitting with common actuators and operating linkage.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
      a. Bray
      b. Honeywell
      c. Johnson Controls
      d. Siemens Building Technologies
      e. Tyco International
   2. Valves shall have tapped lugs for standard flange connection, and meet ANSI/ASME requirements to withstand the pressures and temperatures encountered.
   3. Valve shall have a corrosion, ultra-violet, and wear-resistant coating for outdoor applications.
   4. Resilient-seated valves shall use food-grade elastomeric seats. Seat shall also function as the flange gaskets.
   5. Valves shall be designed for isolation and the absence of downstream piping at rated differential pressure.

6. All valves shall be line size.
7. Proportional control valves shall be sized for a nominal pressure drop of 5.0 psid at rated flow (except as may be noted on the drawings) up to a maximum stroke of 60° disk rotation. Manufacturer's maximum fluid velocity shall not be exceeded in order to prevent cavitation.
8. Valves shall be rated for bubble tight shutoff at no less than 150 psi differential pressure for full cut valves, or 50 psi for under cut valves.
9. Valve disc shall be of corrosion-resistant construction appropriate for the controlled media such as nylon-coasted cast iron, aluminum bronze, or stainless steel.
10. Valve stems shall be stainless steel, with inboard top and bottom bearings, and an external corrosion resistant top bearing to absorb actuator side thrust.
11. Actuator mounting flange shall conform to ISO 5211 for actuator interchangeability.
12. Actuator shall be available with NEMA 4X (IP65) rated enclosure suitable for outdoor installation.
13. Valves shall be tagged with Cv rating and model number.

T. Variable Frequency Drives.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. ABB
   b. Honeywell
   c. Siemens Building Technologies
2. Variable frequency drives shall be UL listed and sized for the power and loads applied.
3. Drives shall include built-in radio frequency interference (RFI) filters and be constructed to operate in equipment rooms and shall not be susceptible to electromagnetic disturbances typically encountered in such environments. Similarly, the drives must not excessively disturb the environment within which it is used.
4. All VFDs over 3 horsepower shall be provided with an AC choke.
5. VFDs shall be installed in strict conformance to the manufacturer's installation instructions, and shall be rated to operate over a temperature range of 14 to 104 F.
6. VFD automatic operation shall be suitable for an analog input signal compatible with the digital controller output.
7. Each VFD shall be fan cooled and have an integral keypad and alphanumeric display unit for user interface. The display shall indicate VFD status (RUN motor rotation, READY, STOP, ALARM, and FAULT), and shall indicate the VFD current control source (DDC input signal, keypad, or field bus control). In addition to the alphanumeric display, the display unit shall have three pilot lights to annunciate when the power is on (green), when the drive is running (green, blinks when stopping and ramping down), and when the drive was shut down due to a detected fault (red, fault condition presented on the alphanumeric display).

8. Three types of faults shall be monitored, "FAULT" shall shut the motor down, "FAULT Auto-reset" shall shut the motor down and try to restart it for a programmable number of tries, and "FAULT Trip" shall shut the motor down after a FAULT Auto-reset fails to restart the motor. Coded faults shall be automatically displayed for the following faults:

    Over current
    Over voltage
    Earth ground
    Emergency stop
    System (component failure)
    Under voltage
    Phase missing
    Heat sink under temperature
    Heat sink over temperature
    Motor stalled
    Motor over temperature
    Motor under load
    Cooling fan failure
    Inverter bridge over temperature
    Analog input control under current
    Keypad failure
    Other product unique monitored conditions

9. In addition to annunciating faults, at the time of fault occurrence the VFD shall capture and make available to the user certain system data for subsequent analysis during fault trouble shooting, including duration of operation (days, hours, minutes, seconds),output frequency, motor current, motor voltage, motor power, motor torque, DC voltage, unit temperature, run status, rotation direction, and any warnings. The last 30 fault occurrences shall be retained as well as the fault data listed in the previous sentence of each fault. New faults beyond 30 shall overwrite the oldest faults.

10. The display unit keypad shall allow setting operational parameters including minimum and maximum frequency, and acceleration and deceleration times. The display shall offer user monitoring of frequency, unit temperature, motor speed, current, torque, power, voltage, and temperature.

U. Actuators, General. All automatically controlled devices, unless specified otherwise elsewhere, shall be provided with actuators sized to operate their appropriate loads with sufficient reserve power to provide smooth modulating action or two-position action and tight close-off. Valves shall be provided with actuators suitable for floating or analog signal control as required to match the controller output. Actuators shall be power failure return type where valves or dampers are required to fail to a safe position and where specified.

V. Non-Spring Return Low Torque Direct Coupled 35 & 70 lb-in Actuators. Actuators shall be 35 or 70 lb-in. with strokes adjustable for 45, 60, or 90 degree rotation applications and designed for operation between 20 and 125 F.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
    a. Honeywell
    b. Johnson Controls
    c. Siemens Building Technologies

d. TAC

2. Each actuator shall also have a minimum position adjustable rotation of 0 to 30 degrees.
3. Actuators shall be for floating or two position (ML 6161 or ML6174) control, or for 4-20 mA or 2-10Vdc (ML7161 or ML7174) input signals.
4. Analog control actuators shall have a cover mounted direct/reverse acting switch.
5. Actuator motor shall be magnetically coupled or shall have limit switch stops to disengage power at the ends of the stroke.
6. Actuators shall be direct connected (no linkages) and provided with a manual declutch for manual positioning.
7. Actuators shall have NEMA 1 environmental protection rating and be 24 volt and UL listed with UL94-5V plenum requirement compliance.
8. Minimum design life of actuators shall be for 1,500,000 repositions and 35 lb-in. models shall be designed for 50,000 open-close cycles and 70 lb-in. models shall be designed for 40,000 open-close cycles.
9. Actuator options shall include 1) Auxiliary feedback potentiometers, 2) open-closed indicator switches, 3) actuator timings of 90 seconds, 3 minutes, or 7 minutes, one or two auxiliary switches, and 4) torque of 35 or 70 lb-in.

W. Non-Spring Return High Torque 177 and 300 lb-in Actuators. Actuators shall be UL listed 24 Vac in NEMA 2 enclosures designed for operation between -5 and 140 F.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
      a. Honeywell
      b. Johnson Controls
      c. Siemens Building Technologies
      d. TAC

   2. Rotation direction shall be switch selectable.
   3. Minimum design life of actuators shall be for 1,500,000 repositions and for 60,000 open-close cycles.
   4. Actuators shall be suitable for the controller output signals encountered, floating or analog, and shall have full cycle timing of 95 seconds.
   5. Actuators shall be direct connected (no linkages) and provided with a manual declutch for manual positioning.
      - Actuators shall have 300 lb-in. torque where specified.
      - Actuators shall have 177 lb-in. torque with adjustable stroke, 30 to 90 degrees, and shall auxiliary end switches to annunciate full open and full closed positions where specified.

X. Spring Return Direct Coupled Actuators. Actuators shall have torque ratings of 44lb-in., 88 lb-in., or 175 lb-in. Actuators shall be modulating 90 seconds nominal timing or two-position 45

seconds nominal timing types with strokes for 90 degree rotation applications and designed for operation between -40 and 140 F.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Honeywell
   b. Johnson Controls
   c. Siemens Building Technologies
   d. TAC

2. Each torque rating group shall have optionally selected control types, floating control, 2-position 24 Vac, 2-position line voltage, or analog input which is switch selectable as 0-10Vdc, 10-0 Vdc, 2-10 Vdc, or 10-2 Vdc.
3. Actuator spring return direction (open or closed) shall be easily reversed in the field, and actuators shall spring return in no greater than 20 seconds.
4. Actuators shall be direct connected (no linkages), and shall have integral position indication.
5. Actuators shall have NEMA 2 environmental protection rating, and UL approved and plenum rated per UL873.
6. Minimum design life of modulating actuators shall be for 1,500,000 repositions and 60,000 spring returns, except 2-position actuators shall be for 50,000 spring returns.
7. Each actuator shall be provided with a manual power-off positioning lever for manual positioning during power loss or system malfunctions, including a gear-train lock to prevent spring action.
8. Upon power restoration after gear lock, normal operation shall automatically recur.

Y. Fast Acting Two Position Fire & Smoke Actuators. Fire/smoke damper actuators shall be direct connected (no linkages) two-position spring return types with stroke for 90 degree nominal rotation applications and designed for 60,000 full stroke cycles and normal operation between 0 and 130 F.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   a. Honeywell
   b. Siemens Building Technologies

2. Actuators control shall be compatible with SPST control switch and with torque ratings of 30 lb-in.
3. Actuator timing shall be 25 seconds maximum in powered instances and shall spring-return in 15 seconds.
4. Actuators shall be UL listed with UL873 plenum rating with die-cast aluminum housing with integral junction box and conduit knockouts, and designed to operate reliably in smoke control systems requiring UL555S ratings up to 350F.
5. The actuator shall be designed to operate for 30 minutes during a one-time excursion to 350F.

6. Actuator shall require no special cycling during long-term holding, and shall "hold" with no audible noise at a power consumption of approximately half of the driving power.

7. Actuators shall be 24 volt or 120 volt with models for clockwise (add a B suffix) and counter-clockwise (add an A suffix) spring return.

Z. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. Control panels shall meet all requirements of Title 24, California Administrative Code. Provide engraved phenolic nameplates identifying all devices mounted on the face of control panels. A complete set of 'as-built' control drawings (relating to the controls within that panel) shall be furnished within each control panel.

PART 3 **EXECUTION**

3.1 INSTALLATION

A. All work described in this section shall be performed by system integrators or contractors that have a successful history in the design and installation of integrated control systems. The installing office shall have a minimum of five years of integration experience and shall provide documentation in the submittal package verifying the company's experience.

B. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.

C. Drawings of the TCS and FMCS network are diagrammatic only and any apparatus not shown, but required to make the system operative to the complete satisfaction of the Architect shall be furnished and installed without additional cost.

D. Line and low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by this contractor in accordance with these specifications.

E. Equipment furnished by the HVAC Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by this contractor.

3.2 WIRING

A. All electrical control wiring and power wiring to the control panels, NAC, computers and network components shall be the responsibility of the this contractor.

B. The electrical contractor (Div. 16) shall furnish all power wiring to electrical starters and motors.

C. All wiring shall be in accordance with the Project Electrical Specifications (Division 16), the National Electrical Code and any applicable local codes. All FMCS wiring shall be installed in the conduit types specified in the Project Electrical Specifications (Division 16) unless otherwise allowed by the National Electrical Code or applicable local codes. Where FMCS plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.

3.3 WARRANTY

A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.

B. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by this contractor at no expense to the Owner

3.4 WARRANTY ACCESS

A. The Owner shall grant to this contractor, reasonable access to the TCS and FMCS during the warranty period.

B. The owner shall allow the contractor to access the TCS and FMCS from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

3.5 ACCEPTANCE TESTING

A. Upon completion of the installation, this contractor shall load all system software and start-up the system. This contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.

B. This contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation.

C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.

D. System Acceptance: Satisfactory completion is when this contractor and the Division 16 contractor have performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.6 OPERATOR INSTRUCTION, TRAINING

A. During system commissioning and at such time acceptable performance of the TCS and FMCS hardware and software has been established this contractor shall provide on-site operator instruction to the owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.

B. This contractor shall provide 40 hours of instruction to the owner's designated personnel on the operation of the TCS and FMCS and describe its intended use with respect to the programmed functions specified. Operator orientation of the systems shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the System's operation.

C. The training shall be in three sessions as follows:

1. Initial Training: One day session (8 hours) after system is started up and at least one week before first acceptance test. Manual shall have been submitted at least two weeks prior to training so that the owners' personnel can start to familiarize themselves with the system before classroom instruction begins.

2. First Follow-Up Training: Two days (16 hours total) approximately two weeks after initial training, and before Formal Acceptance. These sessions will deal with more advanced topics and answer questions.
3. Warranty Follow Up: Two days (16 hours total) in no less than 4 hour increments, to be scheduled at the request of the owner during the one year warranty period. These sessions shall cover topics as requested by the owner such as; how to add additional points, create and gather data for trends, graphic screen generation or modification of control routines.

PART 4 SEQUENCES OF OPERATION

4.1 SUMMARY

A. This contractor shall coordinate control functions, such as scheduling and supervisory-level global control, points list, and control sequences needed for this installation as listed below. Contractor shall provide written documentation to archive the system operation as accepted by the owner.

4.2 VARIABLE AIR VOLUME AIR HANDLING SYSTEMS

A. General:

1. System on/off status shall be based on schedule programmed into FMCS system.
2. Failure of system to start based on supply fan motor current sensor shall signal alarm.
3. Activation of duct smoke detector shall shut down system signal local control panel alarm and signal fire alarm system.
4. Manual reset pressure switches shall automatically shut down system and send alarm signal whenever a high suction or high discharge pressure condition occurs such as that caused by damper closure.
5. Minimum outside air damper and economizer outside air dampers shall close and recirculation damper shall open whenever system shuts down.
6. Upon activation, manual reset freeze stat shall close outside exhaust air dampers, open recirculation damper, stop supply fan and signal alarm.
7. Duct static pressure sensor (located near end of supply duct main) shall modulate AHU supply fan via variable frequency drive to maintain setpoint (adj.).
8. Building static pressure controller shall modulate AHU return fan via variable frequency drive to maintain 0.05" (adj.) positive building static pressure based on sensed differential pressure between lowest pressure sensed at either first or second floor and building exterior.
9. Upon receiving signal from fire alarm system, AHU shall shut down. FMS contractor shall provide contacts for receiving signal at AHU control panel and subsequent control wiring devices necessary to shut down system.
10. Differential static pressure sensor across filters shall indicate when filters are dirty.
11. Return air RH sensor with discharge air RH high limit sensor shall modulate humidifier valve to maintain setpoint (adj.).

B. Summer Occupied Operation:

1. AHU fans operate continuously.
2. Intake and exhaust dampers shall remain at minimum position.
3. Discharge temperature sensor shall operate chilled water valve to maintain setpoint.
4. Humidifier control valve shall be positively closed.

C. Summer Unoccupied Operation:

1. Fans shall be off.

D. Winter Occupied Operation:

1. Upon start-up, outside air, exhaust air and recirculation dampers shall move to their minimum position.
2. Discharge air temperature sensor shall modulate hot water control valve and dampers beyond minimum position in non-overlapping sequence to maintain setpoint.
3. If average space temperature, as sensed by return air temperature, sensor falls below 66 ° F. there shall be an automatic override sequence such that outdoor/return dampers maintain minimum position, all system VAV boxes are signaled to provide 100% reheat flow, all reheat valves are opened, and the AHU hot water coil valve is controlled to provide 90° F. discharge until such time as return air temperature rises to 72 ° F. At this time, supply air discharge stat shall again assume control as specified previously. This shall also act as a "warm-up" cycle.

E. Winter Unoccupied Operation:

1. Fans shall be off.
2. If system room thermostats sense a temperature below the night setback temperature setpoint,
system shall start in "warm-up" cycle until such time as thermostat is satisfied.

F. Input/Output Schedule (Minimum Points Required):

1. Supply fan start/stop	Digital Output (DO)
2. Return fan start/stop	DO
3. Blocking damper open/close	DO
4. Supply fan status	Digital Input (DI)
5. Return fan status	DI
6. High static limit	DI
7. Low static limit	DI
8. Smoke detectors	DI
9. Filter alarm	DI
10. Low Temp Alarm (freeze stat)	DI
11. Supply fan variable frequency drive (VFD)	Analog Output (AO)
12. Return fan variable frequency drive (VFD)	AO
13. Cooling coil valve	AO
14. OA/RA/EA Dampers	AO
15. Heating coil valve	AO
16. Humidifier	AO
17. Supply duct static pressure	Analog Input (AI)
18. Supply fan air flow	AI

19. Supply discharge temperature		AI
20. Supply air RH		AI
21. Building static pressure	AI	
22. Return fan air flow	AI	
23. Return air temperature		AI
24. Return air RH		AI
25. Mixed air temperature		AI
26. Outside air temperature	AI	
27. Outside air humidity	AI	

4.3 CONSTANT VOLUME AIR HANDLING SYSTEMS

A. General:

1. System on/off status shall be based on schedule programmed into FMCS system.
2. Failure of system to start based on supply fan motor current sensor shall signal alarm.
3. Activation of duct smoke detector shall shut down system signal local control panel alarm and signal fire alarm system.
4. Manual reset pressure switches shall automatically shut down system and send alarm signal whenever a high suction or high discharge pressure condition occurs such as that caused by damper closure.
5. Minimum outside air damper and economizer outside air dampers shall close and recirculation damper shall open whenever system shuts down.
6. Upon activation, manual reset freeze stat shall close outside exhaust air dampers, open recirculation damper, stop supply fan and signal alarm.
7. Upon receiving signal from fire alarm system, AHU shall shut down. FMS contractor shall provide contacts for receiving signal at AHU control panel and subsequent control wiring devices necessary to shut down system.
8. Differential static pressure sensor across filters shall indicate when filters are dirty.
9. Return air RH sensor with discharge air RH high limit sensor shall modulate humidifier valve to maintain setpoint (adj.).

B. Summer Occupied Operation:

1. AHU fans operate continuously.
2. Intake and exhaust dampers shall remain at minimum position.
3. Discharge temperature sensor shall operate chilled water valve to maintain setpoint.
4. Humidifier control valve shall be positively closed.

C. Summer Unoccupied Operation:

1. Fans shall be off.

D. Winter Occupied Operation:

1. Upon start-up, outside air, exhaust air and recirculation dampers shall move to their minimum position.
2. Discharge air temperature sensor shall modulate hot water control valve and dampers beyond minimum position in non-overlapping sequence to maintain setpoint.

3. If average space temperature, as sensed by return air temperature, sensor falls below 66 ° F. there shall be an automatic override sequence such that outdoor/return dampers maintain minimum position, and the AHU hot water coil valve is controlled to provide 90° F. discharge until such time as return air or average space temperature rises to 72 ° F. At this time, supply air discharge sensor shall again assume control as specified previously. This shall also act as a "warm-up" cycle.

E. Winter Unoccupied Operation:

1. Fans shall be off.
2. If system room sensors sense a temperature below the night setback temperature setpoint, the system shall start in "warm-up" cycle until such time as thermostat is satisfied.

F. Input/Output Schedule (Minimum Points Required):

1. Supply fan start/stop	Digital Output (DO)		
2. Return fan start/stop	DO		
3. Blocking damper open/close	DO		
4. Supply fan status	Digital Input (DI)		
5. Return fan status	DI		
8. Smoke detectors	DI		
9. Filter alarm	DI		
10. Low Temp Alarm (freeze stat)		DI	
11. Cooling coil valve	AO		
12. OA/RA/EA Dampers	AO		
13. Heating coil valve	AO		
14. Humidifier	AO		
15. Supply discharge temperature		AI	
16. Supply air RH		AI	
17. Return air temperature		AI	
18. Return air RH		AI	
19. Mixed air temperature		AI	
20. Outside air temperature	AI		
21. Outside air humidity	AI		

4.4 VARIABLE AIR VOLUME (VAV) BOXES

A. VAV Box, Cooling Only, Pressure Independent:

1. Temperature Control. Zone temperature cooling setpoint shall normally be placed in the occupied, standby, or unoccupied mode of operation and controlled via a system scheduler seven day schedule. Prior to scheduled occupied periods, the unoccupied temperature setpoint shall be ramped down to the occupied setpoint over a time period proportional to the temperature difference between the room temperature and the occupied temperature setpoint such that at occupancy time the occupied temperature is reached. During unoccupied and standby periods the unoccupied and standby temperature setpoints shall be maintained. The standby mode of operation is for periods of temporary vacancy such as the lunch hour, and shall use owner determined

temperature setpoints that fall between the unoccupied setpoint and the occupied setpoint.

VAV box controls shall be enabled anytime the respective VAV AHU fan operates. Each VAV box shall have unique design minimum and maximum primary air cfm setpoints. As the cooling load varies, a PID algorithm shall reset the box cfm setpoint between these min and max values to maintain the setpoint. An AIA algorithm shall modulate the box damper to maintain the cfm setpoint.

2. Occupant Schedule Override Control. When any room HVAC system is operating in a mode other than OCCUPIED, each temperature sensor wall module (where specified) shall provide the room occupant with ability to place the system in the occupied mode of operation for 60 (180 default, user programmable) minutes by pressing the wall module override button. Via the button, the occupant shall also have the ability to cancel the override command, or to place the system in the unoccupied mode when operating in the occupied mode. Via the module LED, the occupant shall have the ability to note the status of the system overrides as being in the override mode, override unoccupied mode, continuously occupied mode via a network command, or in the normal mode of operation (LED off).

3. Wall Sensor Module. Wall temperature sensor module shall be located where shown on the plans, and shall include the temperature sensor, the occupied/unoccupied override selection push button with override status LED (where specified), a warmer-cooler setpoint adjustment knob (where specified), and a jack for connecting to the LonWorks communication network. The system owner determines the normal heating and cooling room temperature setpoints for all wall module sensors (such as 73F & 77F). The warmer-cooler adjustment knob on the wall module shall give room occupants the ability to vary these values by an owner determined increment, such as two degrees, by rotating the setpoint knob. Setpoints in use when the room is unoccupied shall not be affected by the setpoint knob.

4. Input/Output Schedule (Minimum Points Required):

a. VAV box space temperature (each)	Analog Input (AI)
b. VAV box space temperature setpoint (each)	AI
c. VAV box primary air CFM (each)	AI
d. VAV box damper position (each)	Analog Output (AO)

B. VAV Box, Reheat and/or Radiation, Pressure Independent:

1. Temperature Control. Zone temperature setpoint shall normally be placed in the occupied, standby, or unoccupied mode of operation and controlled via a system scheduler seven day schedule. Prior to scheduled occupied periods, the unoccupied temperature setpoint shall be ramped to the occupied setpoint over a time period proportional to the temperature difference between the room temperature and the occupied temperature setpoint such that at occupancy time the occupied temperature is reached. During unoccupied and standby periods the unoccupied and standby temperature setpoints shall be maintained. The standby mode of operation is for periods of temporary vacancy such as the lunch hour, and shall use owner determined temperature setpoints that fall between the unoccupied setpoint and the occupied

setpoint. Occupied Heating, Occupied Cooling, Standby Heating, Standby Cooling, Unoccupied Heating and Unoccupied Cooling setpoint defaults shall be programmed in the controller.

VAV box controls shall be enabled anytime the respective VAV AHU fan operates. Each VAV box shall have unique design minimum and maximum primary air cfm setpoints. As the cooling load varies, a PID algorithm shall reset the box cfm setpoint between these min and max values to maintain the setpoint. An AIA algorithm shall modulate the box damper to maintain the cfm setpoint.

2. Heating/Cooling Mode: Heating/cooling mode shall be determined by the heating/cooling demand in the space with respect to active setpoint. Heating mode shall be disabled when system heating is unavailable to eliminate overcooling the space. An adjustable deadband shall prevent the control from cycling between heating and cooling modes.

   Cooling mode: The VAV box damper shall modulate to provide airflow between the minimum and maximum cfm setpoints proportional to the cooling demand.

   Heating mode: The VAV box damper modulates to provide minimum air flow as the radiator valve (if present) opens. As the heating demand increases the reheat valve modulates open, and the VAV box damper modulates to provide airflow at the reheat cfm setpoint.

3. Warm-up mode: Warm-up mode is initiated via the NAC based on average temperatures in the building. The controller modulates the VAV box damper to control airflow at maximum flow setpoint, and disables the reheat/radiation controls until the command is received to return to normal control.

4. Occupant Schedule Override Control. When any room HVAC system is operating in a mode other than OCCUPIED, each temperature sensor wall module (where specified) shall provide the room occupant with ability to place the system in the occupied mode of operation for 60 (180 default, user programmable) minutes by pressing the wall module override button. Via the button, the occupant shall also have the ability to cancel the override command, or to place the system in the unoccupied mode when operating in the occupied mode. Via the module LED, the occupant shall have the ability to note the status of the system overrides as being in the override mode, override unoccupied mode, continuously occupied mode via a network command, or in the normal mode of operation (LED off).

5. Wall Sensor Module. Wall temperature sensor module shall be located where shown on the plans, and shall include the temperature sensor, the occupied/unoccupied override selection push button with override status LED (where specified), a warmer-cooler setpoint adjustment knob (where specified), and a jack for connecting to the LonWorks communication network. The system owner determines the normal heating and cooling room temperature setpoints for all wall module sensors (such as 73F & 77F). The warmer-cooler adjustment knob on the wall module shall give room occupants the ability to vary these values by an owner determined increment, such as two degrees, by rotating the setpoint knob. Setpoints in use when the room is unoccupied shall not be affected by the setpoint knob.

6. Input/Output Schedule (Minimum Points Required):

a. VAV box space temperature (each)	Analog Input (AI)
b. VAV box space active setpoint (each)	AI
c. VAV box primary air CFM (each)	AI
d. VAV box discharge temperature (each)	AI
e. VAV box damper position (each)	Analog Output (AO)
f. Radiation Valve position (each)	AO
g. Reheat Valve position (each)	AO

PART 5 GRAPHICAL REPRESENTATION POINT LISTS

5.1 SUMMARY

A. The points in the following table shall be accessible from the Graphical User Interface (GUI) and/or the Web browser interface (WBI). The supplier of the IDC and IBC devices shall ensure that the points listed in this table are accessible on their respective networks, by the Network Area Controller (NAC).

B. The graphics shall provide detailed 2-dimensional building site, 2-dimensional floor plans; and 3-dimentional equipment illustrations with fan, pump, damper, and valve animation for system operation. Each graphic shall be provided with a tabular "hot button" navigational structure enabling a "one-mouse click" access to other building systems and the return, without the use of the browser "back button".

C. The graphics shall provide a real-time continuous display of critical points; Outside Air Temperature, Outside Air Relative Humidity, Enthalpy, KWH, and KW visible within the HTML frame on all graphic screens.

5.2 GRAPHIC DESCRIPTION

A. Home Page:

1. The graphic shall provide a geographical overview of the multiple-site enterprise or campus buildings. Each building image shall be a "hot button" to access the building floor plans. The image "hot button" is indicated by a "mouse over" function highlighting the building and changing curser icon, enabling a "one-mouse click" access the building floor plans.

B. Floor Plans:

1. The graphic shall provide an accurate dimensional layout of the building floor(s); including all rooms, room numbers, walls, elevators, doors, entrances, hallways, and stairwells. Room numbering and naming conventions shall be provided by the architect/engineer.

2. All space sensors shall be placed on the Floor Plan graphic accurately depicting their location. Each sensor image shall be a "hot button" to access the associated equipment. The image "hot button" is indicated by a "mouse over" function changing curser icon, enabling a "one-mouse click" access to the equipment. The sensors shall be tagged with a real-time continuous display of their value.

3. Building floor layout with large area or high density of sensors. The graphic shall provide an accurate dimensional layout of the building floor(s) divided into logical sections or areas. Each section or area shall be a "hot button" to access an expanded view. The section or area "hot button" is indicated by a "mouse over" function highlighting the section or area and changing curser icon, enabling a "one-mouse click" access to the expanded view. Expanded view; all space sensors shall be placed on the graphic accurately depicting their location. Each sensor image shall be a "hot button" to access the associated equipment. The image "hot button" is indicated by a "mouse over" function changing curser icon, enabling a "one-mouse click" access to the equipment. The sensors shall be tagged with a real-time continuous display of their value.

C. Mechanical Systems:

1. The graphic shall provide an accurate 3-dimensional representation of the system being controlled; including all sensors, heat exchangers, heating and cooling coils, dampers, CW/HW piping and pumps, humidifiers, flow directions, safety devices, actuators, and limit devices with fan, pump, damper, and valve animation for real-time system operation.
2. All data point components shall be placed on the system graphic accurately depicting their location. Each component image shall be a "hot button" to access their respective schedule, set-points, and trend logs. The image "hot button" is indicated by a "mouse over" function changing curser icon, enabling a "one-mouse click" access to the parameters. All analog and digital components shall be tagged with a real-time continuous display of their value.
3. The terminal unit graphic shall also include a reduced image of the associated AHU with animated fan status and tagged with a real-time continuous display of discharge air temperature and system static pressure.

5.3 GRAPHIC POINT TABLE

A. The following abbreviations apply to the point table to indicate what level of functionality must be provided:

1. D = Display only
2. M = Modify value
3. A = Alarm
4. L = Log
5. S = Schedule
6. GC = Global supervisory control routine such as demand limiting

System	VAV AHU					
Point	D	M	A	L	S	GC
Supply Fan Start/Stop		X			X	
Return Fan Start/Stop		X			X	
Blocking Damper		X		X		
Supply Fan Status	X		X	X		
Return Fan Status	X		X	X		
High Static Limit	X		X			
Low Static Limit	X		X			
Smoke Detectors	X		X			
Low Temperature Limit	X		X			
Filter Alarm	X		X	X		
Supply Fan VFD	X			X		
Return Fan VFD	X			X		
Cooling Coil	X			X		
OA/RAEA Dampers		X		X		
Humidifier		X		X		
Supply Duct Pressure	X		X	X		
Supply Air Flow	X			X		
Supply Discharge Temperature	X		X	X		
Supply Air Relative Humidity	X		X	X		
Master Building Pressure	X		X	X		
Return Air Flow	X			X		
Return Air Temperature	X		X	X		
Return Air Relative Humidity	X		X	X		
Mixed Air Temperature	X		X	X		
Outside Air Temperature	X			X		

System	CV AHU					
Point	D	M	A	L	S	GC
Supply Fan Start/Stop		X			X	
Return Fan Start/Stop		X			X	
Blocking Damper		X		X		
Supply Fan Status	X		X	X		
Return Fan Status	X		X	X		
Smoke Detectors	X		X			
Low Temperature Limit	X		X			
Filter Alarm	X		X	X		
Cooling Coil	X			X		
OA/RAEA Dampers		X		X		
Humidifier		X		X		
Supply Discharge Temperature	X		X	X		
Supply Air Relative Humidity	X		X	X		
Return Air Temperature	X		X	X		
Return Air Relative Humidity	X		X	X		
Mixed Air Temperature	X		X	X		
Outside Air Temperature	X			X		

System	VAV BOX					
Point	**D**	**M**	**A**	**L**	**S**	**GC**
Space Temperature	X		X	X		
Effective Temperature Setpoint	X			X		
Occupied Temperature Setpoint		X			X	
Unoccupied Temperature Setpoint		X			X	
Stand-by Temperature Setpoint		X			X	
Primary air CFM	X		X	X		
Effective CFM Setpoint				X		
Minimum CFM Setpoint	X					
Maximum CFM Setpoint	X					
Damper Position	X			X		
Low Air Flow Alarm	X		X	X		
Mode	X			X		

System	VAV BOX w/ Radiation and Reheat					
Point	**D**	**M**	**A**	**L**	**S**	**GC**
Space Temperature	X		X	X		
Effective Temperature Setpoint	X			X		
Occupied Cooling Temperature Setpoint		X			X	
Unoccupied Cooling Temperature Setpoint		X			X	
Stand-by Cooling Temperature Setpoint		X			X	
Occupied Heating Temperature Setpoint		X			X	
Unoccupied Heating Temperature Setpoint		X			X	
Stand-by Heating Temperature Setpoint		X			X	
Primary air CFM	X		X	X		
Effective CFM Setpoint				X		
Minimum CFM Setpoint	X					
Maximum CFM Setpoint	X					
Damper Position	X			X		

Radiator Valve Position	X			X		
Reheat Valve Position	X			X		
Low Air Flow Alarm	X		X	X		
Mode	X			X		

END OF SECTION

SECTION 23 11 00

FACILITY FUEL PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fuel gas piping, specialties, and accessories within and outside the building.

1.3 PROJECT CONDITIONS

A. Gas System Pressures: 0.25 psig to 5 psig.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Specialty valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.

B. Shop Drawings: For fuel gas piping. Include plans and attachments to other Work.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

D. Maintenance Data: For natural gas specialties and accessories to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. ANSI Standard: Comply with ANSI Z223.1, "National Fuel Gas Code."

B. FM Standard: Provide components listed in FM's "Fire Protection Approval Guide" if specified to be FM approved.

C. IAS Standard: Provide components listed in IAS's "Directory of A. G. A. and C. G. A. Certified Appliances and Accessories" if specified to be IAS listed.

D. UL Standard: Provide components listed in UL's "Gas and Oil Equipment Directory" if specified to be UL listed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify fuel gas

supplier. Handle flammable liquids used by Installer with proper precautions and do not leave on premises from end of one day to beginning of next day.

1.7 COORDINATION

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Construction Manager not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Appliance Connector Valves:
      a. Conbraco Industries, Inc.; Apollo Div.
      b. Jomar International, Ltd.
      c. Mueller Co.; Mueller Gas Products Div.
      d. Watts Industries, Inc.; Water Products Div.
   2. Gas Valves, NPS 2 and Smaller:
      a. Jomar International, Ltd.
      b. Milwaukee Valve Co., Inc.
      c. Mueller Co.; Mueller Gas Products Div.
      d. Watts Industries, Inc.; Water Products Div.
   3. Plug Valves, NPS 2-1/2 and Larger:
      a. Flow Control Equipment, Inc.
      b. Nordstrom Valves, Inc.
      c. Olson Technologies, Inc.; Homestead Valve Div.
      d. Walworth Co.
   4. FM-Listed Earthquake Valves:
      a. Quakemaster Seismic Safety Systems.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 PIPES, TUBES, FITTINGS, AND JOINING MATERIALS

A. Galvanized-Steel Pipe: ASTM A 53; Type E ; Grade B; Standard Weight.
   1. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern with threaded ends according to ASME B1.20.1.
   2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends according to ASME B1.20.1.
   3. Joint Compound and Tape: Suitable for natural gas.
   4. Gasket Material: Thickness, material and type suitable for natural gas.

B. Underground Gas Piping: Site distribution piping located below grade shall be schedule 40 SDR-11 Polyethylene PE2406 (Yellow) as manufactured by Plexco. Fittings shall be socket fusion welded Polyethylene as manufactured by Plexco or Central, PE2406 (Yellow) complying with ASTM D2513. Provide "Lyco" or double "O" seal transition fittings between steel and polyethylene as manufactured by Central, all identified and approved for gas service. A 14 gauge tracer wire shall be installed with and attached to PVC piping and shall terminate above grade at each end. Underground polyethylene piping shall be installed by personnel certified by the pipe manufacturer's field representative. Contractors not having certified personnel will be required to have a factory representative of the pipe manufacturers visit the site at the time of underground installation and provide the necessary training and certification.

C. Transition Fittings: Type, material, and end connections to match piping being joined.

D. Common Joining Materials: Refer to Division 23 Section "Basic Mechanical Materials and Methods" for joining materials not in this Section.

2.4 PROTECTIVE COATING

A. Furnish pipe and fittings with factory-applied, corrosion-resistant polyethylene coating for use in corrosive atmosphere.

2.5 PIPING SPECIALTIES

A. Flexible Connectors: ANSI Z21.24, copper alloy, AGA listed.

2.6 SPECIALTY VALVES

A. Valves, NPS 2 and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.

B. Valves, NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

C. Gas Stops: Bronze body with AGA stamp, plug type with bronze plug and flat or square head, ball type with chrome-plated brass ball and lever handle, or butterfly valve with stainless-steel disc and fluorocarbon elastomer seal and lever handle; 2-psig minimum pressure rating.

D. Gas Valves, NPS 2 and Smaller: ASME B16.33 and IAS-listed bronze body and 125-psig pressure rating.

1. Tamperproof Feature: Include design for locking.

E. Plug Valves, NPS 2-1/2 and Larger: ASME B16.38 and MSS SP-78 cast-iron, lubricated plug valves, with 125-psig pressure rating.

1. Tamperproof Feature: Include design for locking.

F. Earthquake Valves: FM approved, listed in IAS Directory as complying with ANSI Z21.70 and UL listed. Include mechanical operator.

2.7 CONCRETE BASES

A. Description: Precast, reinforced concrete base, made of 3000-psi- minimum, 28-day compressive strength concrete, and measuring 4 inches thick and 4 inches larger in each dimension than supported item, unless otherwise indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Close equipment shutoff valves before turning off fuel gas to premises or section of piping. Perform leakage test as specified in "Field Quality Control" Article to determine that all equipment is turned off in affected piping section.

B. Comply with ANSI Z223.1, "Prevention of Accidental Ignition" Paragraph.

3.2 SERVICE ENTRANCE PIPING

A. Extend fuel gas piping and connect to fuel gas distribution for service entrance to building.

1. Exterior fuel gas distribution system piping, service pressure regulator, and service meter will be provided by gas utility.

B. Install dielectric fitting downstream from and adjacent to each service meter unless meter is supported from service-meter bar with integral dielectric fitting. Install shutoff valve downstream from and adjacent to dielectric fitting. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for dielectric fittings.

3.3 CONCRETE BASE INSTALLATION

A. Locate bases at service meters and service regulators.

B. Excavate earth and make level beds to support bases. Set bases level with top surface projecting approximately 3 inches above grade.

3.4 PIPING APPLICATIONS

A. Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated.

B. Fuel Gas Piping, 0.5 psig or Less: Use the following:

1. NPS 1/2 and Smaller: NPS 3/4 Galvanized steel pipe, malleable-iron threaded fittings, and threaded joints.
2. NPS 3/4 and NPS 1: Galvanized steel pipe, malleable-iron threaded fittings, and threaded joints.
3. NPS 1-1/4 to NPS 2: Galvanized steel pipe, malleable-iron threaded fittings, and threaded joints.
4. NPS 2-1/2 to NPS 4: Galvanized steel pipe, malleable-iron threaded fittings, and threaded joints.

C. Underground Fuel Gas Piping: Steel pipe, steel welding fittings, and welded joints. Encase in containment conduit.

D. Containment Conduits: Steel pipe, steel welding fittings, and welded joints.

3.5 VALVE APPLICATIONS

A. Appliance Shutoff Valves for Pressure 0.5 psig or Less: Appliance connector valve or gas stop.

B. Piping Line Valves, NPS 2 and Smaller: Gas valve.

C. Piping Line Valves, NPS 2-1/2 and Larger: Plug valve or general-duty valve.

D. Valves at Service Meter, NPS 2 and Smaller: Gas valve.

E. Valves at Service Meter, NPS 2-1/2 and Larger: Plug valve.

3.6 PIPING INSTALLATION

A. Refer to Division 23 Section 23 05 00 "Basic Mechanical Materials and Methods" for basic piping installation requirements.

B. Concealed Locations: Except as specified below, install concealed gas piping in airtight conduit constructed of Schedule 40, seamless, black steel pipe with welded joints. Vent conduit to outside and terminate with screened vent cap.

1. Above-Ceiling Locations: Gas piping may be installed in accessible spaces, subject to approval of authorities having jurisdiction, whether or not such spaces are used as plenums. Do not locate valves above ceilings.
2. In Floors: Gas piping with welded joints and protective wrapping specified in "Protective Coating" Article in Part 2 may be installed in floors, subject to approval of authorities having jurisdiction. Surround piping cast in concrete slabs with minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically

neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.

C. Drips and Sediment Traps: Install drips at points where condensate may collect. Include outlets of service meters. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.

D. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels, unless indicated to be exposed to view.

E. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.

F. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

G. Connect branch piping from top or side of horizontal piping.

H. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

I. Install flanges on valves, specialties, and equipment having NPS 2-1/2 and larger connections.

J. Install vent piping for gas pressure regulators and gas trains, extend outside building, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.

K. Install containment conduits for gas piping below slabs, within building, in gastight conduits extending minimum of 4 inches outside building, and vented to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end. Prepare and paint outside of conduits with coal-tar, epoxy-polyamide paint according to SSPC-Paint 16.

3.7 JOINT CONSTRUCTION

A. Refer to Division 23 Section 23 05 00 "Basic Mechanical Materials and Methods" for basic piping joint construction.

3.8 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 23 Section 23 05 29 "Hangers and Supports" for pipe hanger and support devices.

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 1/2 inch.

2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 1/2 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 1/2 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.

B. Install piping adjacent to appliances to allow service and maintenance.

C. Connect piping to appliances using gas with shutoff valves and unions. Install valve upstream from and within 72 inches of each appliance. Install union downstream from valve.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.

3.10 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each service meter, pressure regulator, and specialty valve.
1. Text: In addition to name of identified unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
2. Refer to Division 23 Section "Mechanical Identification" for nameplates and signs.

3.11 PAINTING

A. Use materials and procedures in Division 9.

B. Paint exterior piping, service meters, pressure regulators, and specialty valves.
1. Color: Gray.

3.12 FIELD QUALITY CONTROL

A. Inspect, test, and purge piping according to ANSI Z223.1, Part 4 "Inspection, Testing, and Purging," and requirements of authorities having jurisdiction.

B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

C. Report test results promptly and in writing to Architect and authorities having jurisdiction.

D. Verify capacities and pressure ratings of service meters, pressure regulators, valves, and specialties.

E. Verify correct pressure settings for pressure regulators.

F. Verify that specified piping tests are complete.

3.13 ADJUSTING

A. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

END OF SECTION

SECTION 23 21 13

HYDRONIC PIPING

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. The Drawings and the General Provisions of the Contract including the General Conditions, Supplementary Conditions and Division 1 General Requirements apply to work of this section as fully as if repeated herein.

1.2 INDUSTRY STANDARDS

A. All equipment and materials furnished under this Section and the installation of same shall be in accordance with the rules and regulations of the following:
   1. ASME – American Society of Mechanical Engineers.
   2. ASTM – American Society for Testing and Materials.
   3. SMACNA – Sheet Metal and Air Conditioning Contractors National Association (Seismic Restraint Manual for Mechanical Systems)

1.3 SCOPE OF WORK

A. Provide all labor, equipment and materials that are required to provide a complete installation as indicated on the drawings and in the specifications including that reasonably inferred for proper execution of this Division.

B. Coordinate with work performed under other divisions. Coordinate work done to accommodate requirements of this Division to ensure adequacy of space and proper location, whether or not work is under this Division.

C. Repair or replace, to the satisfaction of the Owner, any damage to work of this Section, damage caused by leaks or breaks in systems of this Section, and damage caused by work of this Section including that to landscaping, paving or other items which are to remain in use

D. Provide carpentry, masonry, concrete and metal work required for work of this section, except where specifically called for under other Divisions.

E. Provide cutting and patching as required for execution of work performed under this section and not provided under other sections. Normal framing and blocking will be installed under another Division.

F. Valves and trim not specifically indicated, but required for proper functioning of equipment, shall be furnished and installed by the trade installing the equipment.

G. Related work performed under other Sections:
   1. Air Handling Equipment: Section 23 34 16.
   2. Heat Generation Equipment: Section 23 51 00.
   3. Testing, Adjusting, Balancing: Section 23 05 93.

1.4 PROTECTION, STORAGE AND DELIVERY

A. Provide necessary storage and shop areas at the site for safe and proper storage and use of tools and materials in approved locations which do not interfere with the work. Remove these facilities and restore area(s) to original condition at completion of project.

B. Arrange delivery of products in timely fashion to coordinate with work progress.

C. Immediately upon delivery inspect shipment(s) to assure that products are undamaged and in accordance with specification requirements. Should the product be damaged or not in compliance with requirements, immediately repair as directed or approved or order replacement at no additional cost to the Owner.

D. Replace lost or damaged materials and equipment at no increase in Contract Sum.

E. Protect equipment and materials from physical damage, construction dirt and the elements, from the time they are shipped by the manufacturer to the time the building is accepted by the Owner.

F. Deliver products in the manufacturer's original packaging with identifying labels intact and legible. Legibly identify units or items as to installation location and/or drawing designations to permit check by Owner's representative against approved material list and shop drawings.

1.05 QUALITY ASSURANCE

A. Employ only qualified and experienced personnel skilled in the trade(s) included in work of this division.

B. Perform all tests required on the systems. Prepare test reports as required, obtain proper approvals and submit final reports to the Owner's representative.

C. Coordinate all work specified herein with work of other sections and divisions.

PART 2 - PRODUCTS

2.1 PIPE PRESSURE

A. Copper: Seamless type K or L, hard drawn, conforming to ASTM Specification B-88.

B. Steel: Schedule 40, black or galvanized conforming to ASTM Specifications A-53.

C. Refrigerant: ACR - Manufactured in accordance with ASTM Standard B280.

2.2 PIPE FITTINGS – PRESSURE

A. Copper - Wrought copper solder type per ANSI Standard B16.22 or cast red bronze per ANSI Standard B16.18.

B. Threaded: AAR Class 300 malleable iron for unions and Class 150 malleable iron for all

other fittings. Material shall correspond to ASTM Specification A-197. Galvanized or black to match pipe.

C. Grooved: Class 150 malleable iron conforming to ASTM Specification A-47.

D. Flanged: ASTM Specification A-126, Class B, galvanized 125 lb. cast iron for galvanized steel pipe; ASTM Specification A-181, Grade I, 150 lb. forged steel welding flange with raised face for black steel pipe.

E. Welded: Standard weight black steel butt welding fittings, permanently marked, conforming to ASTM Specifications A-234. No miters are permitted.

F. Weldolets: Use only where main is at least three sizes larger than branch. Select Weldolet to suit main. Provide smooth beveled openings Bonney Forge or Tube-turns.

G. Refrigerant: Refrigerant piping shall be brazed with high temperature silver solder under a nitrogen purge.

2.3 PIPE JOINTS – PRESSURE

A. Soldered - Lead free - Silvabrite 100, Bridgit, or 95% tin, 5% antimony solder with non-corrosive flux for pipe sizes 2" and smaller, and 15% silver brazing alloy and silver brazing flux on pipe size 2½" and larger or below grade.

B. Gasketed - Neoprene compression gasket with lubricant installed per manufacturer's recommendations.

C. Screwed Metallic Pipe: Apply Rectorseal No. 5 lubricant and Permacel, P-412 ½" wide white Teflon pipe joint sealant tape to male pipe threads when making up joints.

D. Welded Piping: Use electric arc process. All welding shall conform to the ASME Code for Pressure Piping. Furnish current certification from an approved testing agency or National Certified Pipe Welding Bureau that the welders performing the work are qualified.

E. Flanged: Use factory cut 1/16" ring gaskets. General use, neoprene. Coat general use gaskets with mil-A-907. Use American National Standard regular galvanized hex head bolts and galvanized heavy cold pressed hex nuts.

F. Grooved: Malleable iron conforming to ASTM Specification A-47. Victaulic Style 77. Standard or Victaulic 07, or equal Gustin-Bacon, with Grade E synthetic gasket, cad plated or galvanized oval neck track bolts and nuts for special grooved end pipe. Use pipe grooving tool specifically designed for this system.

G. Unions:
1. Steel pipe: 250 lb. bronze to iron ground joint.
2. Copper tubing: Bronze IPS unions with copper to IPS adaptors.

2.4 PIPE MATERIAL APPLICATION

A. Chilled water, Hot water, ASTM A-53A ERW or seamless schedule 40 black steel pipe and fittings. Use threaded pipe and fittings thru 2"; 2 ½" and larger shall be welded.

Victaulic piping systems may be used at contractor's option for chilled water pipe 10" and smaller only. Victaulic piping shall not be used for hot water piping.

B. Cooling coil condensate drainage piping: Type DWV hard drawn copper with wrought copper fittings.

C. Air vents: Type "M" copper.

D. Non-Potable water: Type L hard-drawn copper tubing per ASTM B-88 plain ends with wrought copper solder fittings per ANSI STD B16.22. 20% silver brazing alloy joining materials. Non-Potable water to be soldered as per Section 22.05.00.

E. Refrigerant: ACR - Manufactured in accordance with ASTM Standard B280.

2.5 VALVE APPLICATION

A. See Section 23 05 23 for a complete description of the valves.
   1. Chilled Water and Hot Water:
      a. 2" and smaller: Ball valve, inline lift check.
      b. 2 ½" and larger: Lug style butterfly valve (drilled and tapped), inline lift check and globe style silent check valve.

B. Provide balancing valves where indicated on the drawings and where required to properly balance the systems as per Section 2305 93.

2.6 PIPE ACCESSORIES

Refer to Section 23 05 00 for a complete description.

2.7 AIR SEPARATOR: Bell & Gosset Rolairtrol

A. Furnish an air separator as described below. Air separator shall be external air separation units consisting of a tank which shall have flanged tangential inlet and outlet connections and internal perforated stainless steel air collector tube designed to direct released air into the air vent. Unit must be constructed in accordance with ASME boiler and pressure vessel code and stamped 125 PSIG design pressure. A blow-down connection shall be provided to facilitate routine cleaning of the unit.

2.8 EXPANSION TANKS

A. Furnish and install as scheduled on the drawings. Tanks shall be diaphragm-type expansion tank of welded steel construction, and shall be tested and stamped in accordance with Section VIII of the ASME Code for 125 psi. Tank shall be supported by steel legs or a base for vertical installation or steel saddles for horizontal installations.

2.9 CHEMICAL POT FEEDERS

A. Provide a bypass type chemical feeder (Wingert Model 5) and sight glass. Feeder shall have a 3½" quick opening access port for chemical insertion. Unit shall be adequately sized for volume of water in system, but in no case shall be less than 5 gallon capacity. Unit shall be complete with inlet, outlet and drain tappings.

PART 3 - EXECUTION

3.1 COORDINATION

A. Cutting and Repairing: Include in the work all cutting and repairing necessary and required for the installation. Repairing shall be performed by workmen skilled in the trade involved, in a manner satisfactory to the Owner.

B. Congested Areas:
   1. All conditions involving work under this Division and work and other sections shall be worked out in advance of installation. Before work proceeds, prepare supplementary drawings under this Division for approval, showing all work, especially in tight areas. Provide supplementary drawings for additional work necessary to overcome "tight" conditions at no increase in the Contract Sum.
   2. Differences or disputes concerning coordination, interference or extent of work between Sections shall be decided by Owner/General Contractor/Construction Manager.

C. Coordination with other Divisions: Coordinate electrical interlocks of mechanical equipment with the Electrical Division 26.

D. Provide, to cause no delay, all required sleeves, chases, concrete inserts, anchor bolts, etc., before concrete is poured. Be responsible for correct location and installation of same.

E. Information to Other Divisions: Provide templates, information and instructions to other Divisions to properly locate holes and openings to be cut or provided for Mechanical Work.

3.2 GENERAL PIPING REQUIREMENTS

A. Size any section of pipe for which the size is not indicated, or any intermediate section erroneously shown undersized, the same size as the largest pipe connecting to it. Sizes listed are nominal.

B. Cut piping accurately to job measurements and install it without springing or forcing, true to line and grade, generally square with building and adequately supported to prevent sagging or undue stress on pipe, fittings and accessories.

C. Install dielectric unions or flanges at points of connection between copper brass piping and steel or cast iron pipe or other dissimilar materials. Plastic insert in unions are not acceptable.

D. Provide unions at connections to the equipment, on both sides of control valves and elsewhere as required to facilitate maintenance.

E. Make changes in size or direction with manufactured fittings. The use of bushings, reducing flanges or bending of a pipe is not allowed.

F. Install piping full size through shut-off valves, balancing valves, etc. Change pipe size within three pipe size diameters of the final connection to fixtures and equipment.

G. Seal all pipes penetrating through roof with "Stoneman" Series 900 or 1100-4 at all other piping penetrations through the roof.

H. Provide appropriate manufactured adaptors when two different piping materials are connected.

I. Do not cover or enclose the piping work before it has been cleaned, tested, inspected and approved by the Architect.

J. Flush all pipes free from foreign substances before installing valves, stops or making final connections.

K. Use flexible connectors at connections to all vibrating equipment and where specifically called for on the drawings.

L. Provide chrome plated escutcheons for piping penetrations through walls or ceilings that are exposed to view. Split ring type escutcheons are not acceptable.

M. Arrange piping and hangers to allow for expansion, contraction and structural settlement. Do not install piping in contact with the building structure. Provide piping subject to expansion or contraction with anchors and expansion loops or joints as required. Provide adequate anchors and guides to prevent misalignment.

N. Where pipes pass through sleeves or core drilled holes, provide backer rod and fill outer 1/2" depth of the annular space with sealant.

O. Core drilling: Provide all equipment, labor and material for core drilling holes where piping penetrates existing concrete walls or floors. Drill holes 1" larger than O.D. of pipe, except where sizes are noted. Verify the location of every core drilled hole with the Owner. Protect all surrounding areas from damage by water or dust while core drilling. Where pipes pass through sleeves or core drilled holes, provide backer rod and fill outer ½" depth of the annular space with sealer.

P. Should structural conditions or other work such as ducts, conduits, lights, etc., prevent the installation of pipes or the setting of equipment at the points indicated on the drawings, changes as authorized by the Architect shall be made without additional cost to the Owner. All piping shall be concealed unless specifically indicated or directed otherwise. Install piping parallel to building surfaces with a minimum of fittings.

Q. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of the installation.

R. Pipe the discharge of each relief valve, air vent, and similar device to floor sink, floor drain, exterior or other acceptable location whether indicated or not on the drawings, except in attics and ceiling spaces. Install a union on discharge of each relief valve.

S. Provide swing joint at all hot water piping connections to equipment.

T. Install piping at heat exchangers, coils, etc., so that equipment can be removed and/or serviced with a minimum of pipe dislocation. All fittings, etc., shall be readily accessible. All service valves to equipment shall be located in such a manner to allow equipment

maintenance and tear down without having to remove service valves.

U. Use standard elbows, tees, etc. as specified for each system.

3.3 PIPE ACCESSORIES

A. Install valves, strainers, gauges, thermometers and other pipeline accessories where indicated on the drawings. Temperature control elements will be furnished by Instrumentation and controls herein. Refer to Section 23.09.00.

3.4 SYSTEM CLEANING FOR MECHANICAL PIPING

A. Mechanical Contractor:
   1. General: Prior to permanent installation, all pipes shall be cleaned of foreign objects, debris and dirt.
   2. Coordination: Coordinate all system flushing with cleaning contractor and Owner representative.
   3. Flushing: Thoroughly flush piping system with water just prior to the cleaning contractor chemical cleaning of a system, coordinate with cleaning contractor. Flushing of the system is to remove final objects and oils from piping after installation, but is not a substitute for cleaning a pipe prior to installing. Remove all strainers and clean prior to chemical cleaning. Assist the cleaning contractor in refilling the chemical cleaning. Assist the cleaning contractor in refilling the system with water to clean the system. Note that any time water is introduced into a system, it shall be kept full of water from that point on, with the exception of bleeding water off for testing purposes or flushing. Under no circumstances shall the system be left void of water for more that six hours. The mechanical contractor is to clean all strainers and hydro test the system after the cleaning contractor is done chemically and has flushed the system just prior to final chemical additives being introduced to the system. Repair any leaks found in the system and retest as needed until hydrostatic test holds.

B. Cleaning Contractor
   1. General: Provide all labor, materials and equipment, including pumps, tanks and water heaters as necessary to complete mechanical systems cleaning.
   2. Coordination: Coordinate with mechanical contractor all schedules and dates. Notify Owner of date and times.
   3. Chilled Water System & Hot Water.
      a. Chemical cleaning: Provide chemicals and thoroughly clean system. Flush system free of all cleaning chemicals. Use no solvents in system cleaning, use only normally accepted and environmentally safe and acceptable chemicals which would be introduced into any waste system, Use degreasing and deoiling agents in conjunction with passivating chemicals. Circulate cleaning agent for not less than twelve hours at not less than 3 feet per second. Treat all water as necessary to meet local/state/federal codes prior to putting the water to a waste system.
      b. System flushing and treating: Immediately after system cleaning, flush system. Coordinate with mechanical contractor, assist mechanical contractor with strainer cleaning and hydrostatic test of system. Assist in refilling system and add corrosion inhibitions to system and chemically balance system to 7.5 to 7.8 pH, or so that it is compatible with any other system with which it will operate.

Circulate chemical in system for not less than two hours to assure complete mixing.

3.5 PIPE TESTING

A. Test all piping as noted below with no leak or loss of pressure. Repair or replace defective piping until tests are accomplished successfully.

System	Test Pressure	Test Medium	Test Time
Condensate Drains	10 Ft.Hd.	water	4 hours
Chilled Water and Hot Water	150PSIG	water	8 hours

3.6 PIPE AND EQUIPMENT IDENTIFICATION

A. Refer to Section 23 05 53 for all requirements.

END OF SECTION

SECTION 23 21 23

HYDRONIC PUMPS

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. Refer to the General Conditions, Supplementary Conditions, Division 1 General Requirements, and Section 23.05.13.

1.2 INDUSTRY STANDARDS

A. All equipment and materials furnished under this Section and the installation of same shall be in accordance with the rules and regulations of the following:
   1. ASME – American Society of Mechanical Engineers.
   2. ASTM – American Society for Testing and Materials.
   3. SMACNA – Sheet Metal and Air Conditioning Contractors National Association (Seismic Restraint Manual for Mechanical Systems)

1.3 SCOPE OF WORK

A. Provide any incidental work not shown or specified that is necessary to provide a complete system

B. Related work performed under other Sections:
   1. Rooftop Air Handling Units: Section 23.34.16.
   2. Testing, Adjusting, Balancing: Section 23.05.93.
   3. Mechanical Vibration and Seismic Controls: Section 23.05.33.

1.4 MATERIAL HANDLING AND STORAGE

A. The contractor shall be responsible for the timely delivery of equipment and materials to meet the project and construction schedule. The contractor shall be responsible for but not limited to the following:
   1. The contractor shall receive all equipment and materials in undamaged factory packaging, store, protect, maintain, rig and install equipment in place.
   2. The contractor shall set the equipment in place and make all connections as required to provide a complete installation and functional system.

B. Store all equipment and materials on site in areas designated by the general contractor. Provide all means possible to protect equipment from intrusion of dirt or damage prior to, during and after installation.

1.5 QUALITY ASSURANCE

A. Employ only qualified and experienced personnel skilled in the trade(s) included in work of this division.

B. Perform all tests required on the systems. Prepare test reports as required, obtain proper approvals and submit final reports to the Owner's representative.

C. Coordinate all work specified herein with work of other sections and divisions.

PART 2 – PRODUCTS

2.1 PUMPS

A. General:
1. All rotating parts shall be statically and dynamically balanced to meet Table 46, Chapter 48 ASHRAE Applications 2011.
2. Provide flanged connections on all pumps. Pump connections shall be full size of specified pumps.
3. Pumps shall have ventilated bearing housing unless direct mounted to motor.
4. Flexible coupling shall have a guard to comply with OSHA.
5. Unless noted otherwise, pumps shall have mechanical seals suitable for the temperature and fluid handled.
6. The pumps shall be factory tested.

B. End Suction Pumps : B & G, PACO, TACO, or Equal.
1. Pumps shall be end suction, centrifugal type and shall have ball bearings, grease lubricated, mounted in housings, with a grease fitting on the bearing housing. Bearing housings shall be watertight with water deflectors or seals to prevent water from entering the bearing housing.
2. The pump volute shall be supplied with plugged vent, drain and gauge tappings.
3. The shaft shall be of 18-8 M stainless steel on standard mechanical seal models, and of alloy steel with replaceable 18-8 M stainless steel sleeves on stuffing box models.
4. A flexible non-lubricated coupling of the center drop-out type shall be furnished, capable of withstanding all types and combinations of shock, misalignment, and end float.
5. The pump and motor shall be mounted on a common baseplate of heavy structural steel design with securely welded crossmembers and open grouting area.
6. Pumps shall have a cast iron casing with smooth passageways, capable of withstanding a hydrostatic test pressure 150% of the maximum pumping pressure under which the pump could operate at design speed. Suction and discharge connections shall be located in the casing so as to allow removal of the rotating element without disturbing the piping connections. Provide bronze casing wearing rings locked to the casing to prevent movement.
7. The impeller shall be made of cast bronze, accurately keyed to the shaft and secured with a lock nut. The shaft shall be stainless steel. Impeller shall be trimmed to obtain the desired water flow.
8. Capacities and operating conditions shall be as indicated on the drawing schedules.

C. Inline Pumps: B & G, TACO, or equal
1. Pumps shall be close-coupled, single stage design, bronze fitted with standard mechanical seals.
2. Pump internals shall be capable of being serviced without disturbing piping connections.
3. Impeller shall be hydraulically and dynamically balanced and shall be keyed to the shaft and secured by a suitable locking capscrew.

2.2 SUCTION DIFFUSERS

A. Acceptable Manufacturers: B&G, Armstrong, TACO or equal.

B. Suction diffusers shall consist of an angle type cast iron body with straightening vanes and combination diffuser strainer/orifice cylinder with 3/16" openings for pump protection. A permanent magnet shall be located within the flow stream and shall be removable for cleaning. Orifice cylinder shall be designed to withstand 150 psig system working pressure. Provide unit with 16 mesh stainless steel strainer to be removed after system startup. Unit shall also be provided with adjustable support foot to carry weight of suction piping.

PART 3 – EXECUTION

3.1 PUMPS

A. Pump and motor shall be aligned by pump manufacturer.

B. Support all piping from the building structure to prevent any strain on the pump casings. Check alignment of the piping connections and motor coupling after pumps have been secured to their base.

C. Pumps shall have non-overloading characteristics. Motor shall not be operated above its nameplate horsepower rating, operation in service factor range will not be allowed under any operating conditions.

D. Increase piping immediately at pump suction and discharge using concentric reducers. Couplings and all valves shall be full line size.

E. The motor housing shall be cast iron with factory installed junction box and shall be NEMA labeled.

F. Provide temperature and pressure test plugs on the suction & discharge of each pump.

G. Provide pressure gauge with gauge cocks on the suction & discharge piping at each pump.

END OF SECTION

SECTION 23 31 13

METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections 01330 Submittal Procedures.

1.2 SUMMARY

A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch wg. Metal ducts include the following:
   1. Rectangular ducts and fittings.
   2. Single-wall, round and flat-oval spiral-seam ducts and formed fittings.
   3. Double-wall, round and flat-oval spiral-seam ducts and formed fittings.
   4. Duct liner.

B. Related Sections include the following:
   1. Division 23 Section 23 33 00 "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
   2. Division 23 Section "Duct Insulation" for duct insulation.

1.3 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select size and type of air-moving and -distribution equipment and other air system components. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.4 SUBMITTALS

A. Shop Drawings: Drawn to 1/4 inch equals 1 foot scale. Show fabrication and installation details for metal ducts.
   1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
   2. Duct layout indicating sizes and pressure classes.
   3. Elevations of top and bottom of ducts.
   4. Dimensions of main duct runs from building grid lines.
   5. Fittings.
   6. Reinforcement and spacing.

7. Seam and joint construction.
8. Penetrations through fire-rated and other partitions.
9. Equipment installation based on equipment being used on Project.
10. Duct accessories, including access doors and panels.
11. Hangers and supports, including methods for duct and building attachment, vibration isolation, and seismic restraints.

B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Ceiling suspension assembly members.
2. Other systems installed in same space as ducts.
3. Ceiling- and wall-mounting access doors and panels required to provide access to dampers and other operating devices.
4. Ceiling-mounting items, including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

1.5 QUALITY ASSURANCE

A. NFPA Compliance:
1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Ch. 3, "Duct System," for range hood ducts, unless otherwise indicated.

C. Engineering Responsibility: Design and preparation of shop drawings and calculations for duct support and seismic restraint by a qualified professional engineer, licensed in the State of California.
1. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installation of hangers and supports that are similar to those indicated for this project in material, design and extent.

D. All ductwork shall be cleaned and wiped down before delivery to job site. Ends of duct shall be sealed to prevent any dust and debris from getting in. Seals shall be removed after rigging into place for installation and downstream ends shall be kept sealed at all times. Upon attachment to diffuser and grille, provide visqueen over diffuser and grille.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Stainless Steel: ASTM A 480/A 480M, Type 304, and having a No. 2D finish for concealed ducts and No. 4 for exposed ducts.

D. Aluminum Sheets: ASTM B 209, alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 DUCT LINER

A. Fibrous-Glass Liner: Comply with NFPA 90A or NFPA 90B and with NAIMA AH124.

1. Manufacturers:

a. CertainTeed Corp.; Insulation Group.

b. Johns Manville International, Inc.

c. Knauf Fiber Glass GmbH.

d. Owens Corning.

2. Materials: ASTM C 1071; surfaces exposed to airstream shall be coated to prevent erosion of glass fibers.

a. Thickness: Minimum 1 inch, or thicker where specifically noted in Contract Documents.

b. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature for indoor use and 0.158 at 75 deg F mean temperature for outdoor use.

c. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.

d. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

e. Mechanical Fasteners: Galvanized steel suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.

(1) Tensile Strength: Indefinitely sustain a 50-lb tensile, dead-load test perpendicular to duct wall.

(2) Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into airstream.

(3) Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

B. Flexible Elastomeric Duct Liner: Comply with NFPA 90A or NFPA 90B.

1. Manufacturers:

a. Armstrong World Industries, Inc.

2. Materials: Unicellular polyethylene thermal plastic, preformed sheet insulation complying with ASTM C 534, Type II, except for density.

a. Thickness: Minimum 1 inch.

b. Thermal Conductivity (k-Value): 0.24 at 75 deg F mean temperature for indoor use and 0.158 at 75 deg F mean temperature for outdoor use.

c. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM C 411.

d. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

2.4 RANGE HOOD EXHAUST DUCTWORK:

A. Sheetmetal: Exhaust duct shall be min. 22 GA construction. Where exhaust ducts are exposed, provide 304 stainless steel duct construction.

B. Slope duct minimum ¼ inch per linear foot toward hood or approved grease collection device. When horizontal ducts exceed 75 feet in length, the slope shall be not less than 1 inch per linear foot.

2.5 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

B. Joint and Seam Tape: 2 inches wide; glass-fiber-reinforced fabric.

C. Tape Sealing System: Woven-fiber tape impregnated with gypsum mineral compound and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.

D. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.

E. Solvent-Based Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant formulated with a minimum of 75 percent solids.

F. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

G. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

2.6 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. All attachments to building structure shall be made in accordance with the Structural Engineers requirements and weight limitations.
2. Submit shop drawings and calculations for review and approval by Mechanical & Structural engineer before installation.

B. Hanger Materials: Galvanized sheet steel or threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
2. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for steel sheet width and thickness and for steel rod diameters.
3. Galvanized-steel straps attached to aluminum ducts shall have contact surfaces painted with zinc-chromate primer.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2.7 RECTANGULAR DUCT FABRICATION

A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.

1. Manufacturers:
   a. Ductmate Industries, Inc.
   b. Nexus Inc.
   c. Ward Industries, Inc.

C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.

1. Manufacturers:
   a. Ductmate Industries, Inc.
   b. Lockformer.
2. Duct Size: Maximum 30 inches wide and up to 2-inch wg pressure class.
3. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.

D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of nonbraced panel area unless ducts are lined.

2.8 APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.

B. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

E. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.

G. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

H. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

1. Fan discharges.

2. Intervals of lined duct preceding unlined duct.
3. Upstream edges of transverse joints in ducts where air velocities are greater than 2500 fpm or where indicated.

I. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
1. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.

J. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.9 ROUND AND FLAT-OVAL DUCT AND FITTING FABRICATION

A. Diameter as applied to flat-oval ducts in this Article is the diameter of a round duct with a circumference equal to the perimeter of a given size of flat-oval duct.

B. Round, Longitudinal- and Spiral Lock-Seam Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

C. Flat-Oval, Longitudinal- and Spiral Lock-Seam Ducts: Fabricate supply ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Fabricate ducts larger than 72 inches in diameter with butt-welded longitudinal seams.
1. Manufacturers:
a. McGill AirFlow Corporation.
b. SEMCO Incorporated.

D. Duct Joints:
1. Ducts up to 20 Inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
2. Ducts 21 to 72 Inches in Diameter: Three-piece, gasketed, flanged joint consisting of two internal flanges with sealant and one external closure band with gasket.
3. Ducts Larger Than 72 Inches in Diameter: Companion angle flanged joints per SMACNA "HVAC Duct Construction Standards--Metal and Flexible," Figure 3-2.
4. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.
a. Manufacturers:
(1) Lindab Inc.
5. Flat-Oval Ducts: Prefabricated connection system consisting of two flanges and one synthetic rubber gasket.

a. Manufacturers:
   (1) Ductmate Industries, Inc.
   (2) McGill AirFlow Corporation.
   (3) SEMCO Incorporated.

E. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.

F. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.

G. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Pleated elbows not allowed. Bend radius of die-formed and gored, and pleated elbows shall be 1-1/2 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg:
   a. Ducts 3 to 36 Inches in Diameter: 0.034 inch.
   b. Ducts 37 to 50 Inches in Diameter: 0.040 inch.
   c. Ducts 52 to 60 Inches in Diameter: 0.052 inch.
   d. Ducts 62 to 84 Inches in Diameter: 0.064 inch.
3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg:
   a. Ducts 3 to 26 Inches in Diameter: 0.034 inch.
   b. Ducts 27 to 50 Inches in Diameter: 0.040 inch.
   c. Ducts 52 to 60 Inches in Diameter: 0.052 inch.
   d. Ducts 62 to 84 Inches in Diameter: 0.064 inch.
4. Flat-Oval Mitered Elbows: Welded construction with same metal thickness as longitudinal-seam flat-oval duct.
5. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space restrictions do not permit using radius elbows. Fabricate with single-thickness turning vanes.
6. Round Elbows 8 Inches and Less in Diameter: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
7. Round Elbows 9 through 14 Inches in Diameter: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.

8. Round Elbows Larger Than 14 Inches in Diameter and All Flat-Oval Elbows: Fabricate gored elbows unless space restrictions require mitered elbows.
9. Die-Formed Elbows for Sizes through 8 Inches in Diameter and All Pressures 0.040 inch thick with 2-piece welded construction.
10. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
11. Flat-Oval Elbow Metal Thickness: Same as longitudinal-seam flat-oval duct specified above.

PART 3 - **EXECUTION**

3.1 DUCT APPLICATIONS

A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:
   1. Supply Ducts: 3-inch wg.
   2. Supply Ducts (before Air Terminal Units): 3-inch wg.
   3. Supply Ducts (after Air Terminal Units): 3-inch wg.
   4. Supply Ducts (in Mechanical Equipment Rooms): 4-inch wg.
   5. Return Ducts (Negative Pressure): 2-inch wg.
   6. Exhaust Ducts: 2-inch wg.

B. All ducts shall be galvanized steel.

3.2 DUCT INSTALLATION

A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.

B. Install round and flat-oval ducts in lengths not less than 12 feet unless interrupted by fittings.

C. Install ducts with fewest possible joints.

D. Install fabricated fittings for changes in directions, size, and shape and for connections.

E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches, with a minimum of 3 screws in each coupling.

F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.

J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

K. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.

L. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches.

N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated combination fire/smoke dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 23 Section 23 33 00 "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "Through-Penetration Firestop Systems."

O. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Refer to SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems" and NUSIG.

P. Protect all ductwork and duct interiors shall be clean and free from foreign materials until building is enclosed. Refer sections 3.07 and 3.08 for duct cleaning requirements.

Q. Paint interiors of metal ducts, that do not have duct liner, for 24 inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

3.3 RANGE HOOD EXHAUST DUCTS, SPECIAL INSTALLATION REQUIREMENTS

A. Install ducts so that grease cannot become pocketed in any portion thereof, and the duct shall slope not less than 1/4 unit vertical in 12 unit horizontal (2% slope) toward the hood or toward an approved grease reservoir. Where horizontal ducts exceed 75 feet in length the slope shall not be less than 1 unit vertical in 12 unit horizontal (8.3% slope).

B. Install ducts without dips or traps that may collect residues unless traps have continuous or automatic residue removal.

C. Install access openings at each change in direction and at 12 feet intervals as defined by NFPA 96; locate on sides of duct a minimum of 1-1/2 inches from bottom; and fit with grease-tight covers of same material as duct.

D. Do not penetrate fire-rated assemblies except as permitted by applicable building codes.

3.4 SEAM AND JOINT SEALING

A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.

1. For pressure classes lower than 2-inch wg, seal transverse joints.

B. Seal ducts before external insulation is applied.

3.5 HANGING AND SUPPORTING

A. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

B. Support vertical ducts at maximum intervals of 16 feet and at each floor.

C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors according to Division 23 Section "Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 CLEANING NEW SYSTEMS

A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.

B. Use service openings, as required, for physical and mechanical entry and for inspection.

1. Create other openings to comply with duct standards.
2. Disconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling sections to gain access during the cleaning process.

C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.

D. Clean the following metal duct systems by removing surface contaminants and deposits:

1. Air outlets and inlets registers, grilles, and diffusers.
2. Supply, return, and exhaust fans including fan housings, plenums, except ceiling supply and return plenums, scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.

3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. All ductwork shall be cleaned and wiped down before delivery to job site. Ends of duct shall be sealed to prevent any dust and debris from getting in. Seals shall be removed after rigging into place for installation and downstream ends shall be kept sealed at all times. Upon attachment to diffuser grille, provide visqueen over diffuser and grille.

E. Mechanical Cleaning Methodology:
1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.

F. Cleanliness Verification:
1. Visually inspect metal ducts for contaminants.
2. Where contaminants are discovered, re-clean and reinspect ducts.

3.8 CLEANING EXISTING SYSTEMS

A. Use service openings, as required, for physical and mechanical entry and for inspection.
1. Use existing service openings where possible.
2. Create other openings to comply with duct standards.
3. Disconnect flexible ducts as needed for cleaning and inspection.
4. Reseal rigid fiberglass duct systems according to NAIMA recommended practices.
5. Remove and reinstall ceiling sections to gain access during the cleaning process.

B. Mark position of dampers and air-directional mechanical devices before cleaning, and restore to their marked position on completion.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron size or larger particles.
2. When venting vacuuming system to the outside, use filtration to contain debris removed from HVAC system, and locate exhaust down wind and away from air intakes and other points of entry into building.

D. Clean the following metal duct systems by removing surface contaminants and deposits:

1. Air outlets and inlets registers, grilles, and diffusers.
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.
8. All ductwork shall be cleaned and wiped down before delivery to job site. Ends of duct shall be sealed to prevent any dust and debris from getting in. Seals shall be removed after rigging into place for installation and downstream ends shall be kept sealed at all times. Upon attachment to diffuser grille, provide visqueen over diffuser and grille.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide operative drainage system for washdown procedures.
7. Biocidal Agents and Coatings: Apply biocidal agents if fungus is present. Apply biocidal agents according to manufacturer's written instructions after removal of surface deposits and debris.

F. Cleanliness Verification:

1. Verify cleanliness after mechanical cleaning and before application of treatment, including biocidal agents and protective coatings.
2. Visually inspect metal ducts for contaminants.
3. Where contaminants are discovered, re-clean and reinspect ducts.

G. Gravimetric Analysis: At discretion and expense of Owner, sections of metal duct system, chosen randomly by Owner, may be tested for cleanliness according to NADCA vacuum test gravimetric analysis.

1. If analysis determines that levels of debris are equal to or lower than suitable levels, system shall have passed cleanliness verification.
2. If analysis determines that levels of debris exceed suitable levels, system cleanliness verification will have failed and metal duct system shall be re-cleaned and re-verified.

H. Verification of Coil Cleaning: Cleaning must restore coil pressure drop to within 10 percent of pressure drop measured when coil was first installed. If original pressure drop is not known, coil will be considered clean only if it is free of foreign matter and chemical residue, based on thorough visual inspection.

END OF SECTION

SECTION 23 33 00

DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Backdraft dampers.
   2. Volume dampers.
   3. Motorized control dampers.
   4. Fire dampers.
   5. Ceiling fire dampers.
   6. Smoke dampers.
   7. Combination fire and smoke dampers.
   8. Duct silencers.
   9. Turning vanes.
   10. Duct-mounting access doors.
   11. Flexible connectors.
   12. Flexible ducts.
   13. Duct accessory hardware.

B. Related Sections include the following:
   1. Division 28 Sections "Fire Alarm" for duct-mounting fire and smoke detectors.
   2. Division 23 Section "23 09 00 – Automatic Temperature Controls" for electric and pneumatic damper actuators.

1.3 SUBMITTALS

A. Product Data: For the following:
   1. Backdraft dampers.
   2. Volume dampers.
   3. Motorized control dampers.
   4. Fire dampers.
   5. Ceiling fire dampers.
   6. Smoke dampers.
   7. Combination fire and smoke dampers.

8. Duct silencers.
9. Turning vanes.
10. Duct-mounting access doors.
11. Flexible connectors.
12. Flexible ducts.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
1. Special fittings.
2. Manual-volume damper installations.
3. Motorized-control damper installations.
4. Fire-damper, smoke-damper, and combination fire- and smoke-damper installations, including sleeves and duct-mounting access doors.
5. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinating penetrations and ceiling-mounting items. Show ceiling-mounting access panels and access doors required for access to duct accessories.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - **PRODUCTS**

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G60 or G90 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Stainless Steel: ASTM A 480/A 480M.

D. Aluminum Sheets: ASTM B 209, alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Extruded Aluminum: ASTM B 221, alloy 6063, temper T6.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT DAMPERS

A. Manufacturers:
   1. Air Balance, Inc.
   2. American Warming and Ventilating.
   3. Duro Dyne Corp.
   4. Greenheck.
   5. Penn Ventilation Company, Inc.
   6. Prefco Products, Inc.
   7. Ruskin Company.

B. Description: Multiple-blade, parallel action gravity balanced, counter-balanced dampers where noted in Contract Documents, with center-pivoted blades of maximum 6-inch width, with sealed edges, assembled in rattle-free manner with 90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure.

C. Frame: 0.125-inch thick extruded aluminum, with welded corners and mounting flange.

D. Blades: 0.070-inch thick, extruded aluminum.

E. Blade Seals: Vinyl.

F. Blade Axles: Nonferrous or Galvanized steel.

G. Tie Bars and Brackets: Aluminum.

H. Return Spring: Adjustable tension.

2.4 VOLUME DAMPERS

A. Manufacturers:
   1. Air Balance, Inc.
   2. American Warming and Ventilating.
   3. Flexmaster U.S.A., Inc.
   4. McGill AirFlow Corporation.
   5. Nailor Industries Inc.
   6. Penn Ventilation Company, Inc.
   7. Ruskin Company.

B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
   1. Pressure Classes of 3-Inch wg or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

C. Standard Volume Dampers: Multiple or single-blade, opposed-blade design for multiple blades, standard leakage rating, and suitable for horizontal or vertical applications.
   1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
   2. Roll-Formed Steel Blades: 0.064-inch thick, galvanized sheet steel.
   3. Blade Axles: Galvanized steel or nonferrous.
   4. Bearings: Oil-impregnated bronze or Molded synthetic.
   5. Tie Bars and Brackets: Galvanized steel.

D. Low-Leakage Volume Dampers: Multiple or single-blade, opposed-blade design for multiple blades, low-leakage rating, and suitable for horizontal or vertical applications.
   1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
   2. Roll-Formed Steel Blades: 0.064-inch thick, galvanized sheet steel.
   3. Blade Axles: Galvanized steel or Nonferrous.
   4. Bearings: Oil-impregnated bronze, molded synthetic or stainless-steel sleeve thrust or ball.
   5. Blade Seals: Vinyl.
   6. Jamb Seals: Cambered stainless steel or aluminum.
   7. Tie Bars and Brackets: Galvanized steel.

E. Jackshaft: 1-inch diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.

F. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.5 MOTORIZED CONTROL DAMPERS

A. Manufacturers:

1. Air Balance, Inc.
2. American Warming and Ventilating.
3. Duro Dyne Corp.
4. Greenheck.
5. McGill AirFlow Corporation.
6. Nailor Industries Inc.
7. Penn Ventilation Company, Inc.
8. Ruskin Company.

B. General Description: AMCA-rated, opposed-blade design; minimum of 0.125-inch thick, extruded aluminum hat channel frames with holes for duct mounting; minimum of 0.070-inch thick, airfoil shape extruded aluminum damper blades with maximum blade width of 8 inches.

1. Secure blades to 1/2-inch diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200 deg F.
3. Provide opposed-blade design with replaceable rubber seals, rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inch wg when damper is being held by torque of 50 in. x lbf; when tested according to AMCA 500D.

2.6 COMBINATION FIRE / SMOKE DAMPERS

A. Combination fire smoke dampers shall be furnished to meet or exceed the following specifications. Frame shall be a minimum of 16-gauge galvanized steel formed into a structural hat channel shape with tabbed corners for reinforcement. Bearings shall be stainless steel sleeve turning in an extruded hole in the frame. The blades shall be 14-gauge airfoil shaped double skin construction. Blade edge seals shall be silicone rubber designed to withstand 450°F and jamb seals shall be stainless steel flexible metal compression type. Blade action must be parallel blade as shown on the drawings.

B. Each combination fire smoke damper shall be 1½-hour fire rated under UL Standard 555, and shall further be classified by Underwriters' Laboratories as a Class I (Class II horizontal mount) leakage rated damper for use in smoke control systems under the latest version of UL555S, and bear a UL label attesting to same.

C. In addition to the leakage ratings already specified herein, the combination fire smoke dampers and their actuators shall be qualified under UL555S to an elevated temperature of 350°F. A 120 VAC electric actuator shall be installed by the damper manufacturer at time of damper fabrication. Damper and actuator shall be supplied as a single product which meets all applicable UL555 and UL555S qualifications for both dampers and actuators. Manufacturer shall provide factory assembled sleeve of 16" minimum length. Factory supplied caulked sleeve shall be 20-gauge. Ruskin Model FSD60 DSD low leakage damper for mounting in the vertical position; Ruskin Model FSD-36 DSD for mounting in the horizontal position (both models with integral duct smoke detectors).

D. Each combination fire smoke damper shall be equipped with a UL Classified FireStat equal to Ruskin Model TS150. The FireStat shall electrically and mechanically lock damper in a closed position when duct temperatures exceed 165°F and still allow appropriate authority to override FireStat and operate damper as may be required for smoke control functions. Damper must be operable while temperature is above 250°F. FireStat package shall include two damper position indicator switches linked directly to damper blade to provide capability of remotely indicating damper position. One switch shall close when damper is fully open; the other switch shall close when damper is fully closed. FireStat and position indicator switches shall be capable of interfacing electrically with smoke detectors, building fire alarm systems, and remote indicating/control stations.

E. Each combination fire smoke damper shall be equipped with an EFL200 Electric Fuse Link which shall activate at 165°F causing damper to close and lock in a closed position. EFL200 can be reset when damper cools to 135°F.

1. Each combination fire smoke damper shall be equipped with Ruskin SP100 Switch Package. The Switch Package shall include two position indicator switches linked directly to the damper blade to provide the capability of remotely indicating damper blade position.

2. Each combination fire smoke damper shall be equipped with a fusible link which shall melt at 165°F causing damper to close and lock in a closed position.

3. Each combination fire smoke damper shall be equipped with an integral SMOKE detector and wired by Division 26.

2.7 DUCT SILENCERS

A. Vibro Acoustics, or approved equal.

B. Silencers shall be of the size, configuration, capacity and acoustic performance as scheduled on the drawings. All silencers shall be factory fabricated and supplied by the same manufacturer.

C. Transitions on inlet and outlet will not be accepted. Silencers shall fit the ducting system they are installed in without requiring duct fittings/transitions. Silencer inlet and outlet must match duct dimensions. See contract documents for silencer configuration. Non-basis of design suppliers must submit details of internal geometry of silencers to be supplied.

D. Silencer inlet and outlet connection dimensions must be equal to the duct sizes shown on the drawings. Duct transitions at silencers are not permitted unless shown on the contract drawings.

E. Silencers shall be constructed in accordance with ASHRAE and SMACNA standards for the pressure and velocity classification specified for the air distribution system in which it is installed. Material gauges noted in other sections are minimums. Material gauges shall be increased as required for the system pressure and velocity classification. The silencers shall not fail structurally when subjected to a differential air pressure of 8 inches water gauge.

F. All casing seams and joints shall be lock-formed and sealed or stitch welded and sealed except as noted in Section G below, to provide leakage-resistant construction. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the contractor at the jobsite.

G. All perforated steel shall be adequately stiffened to insure flatness and form.

H. Fire-Performance Characteristics: Silencer assemblies, sealants, and acoustical spacer, shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84, NFPA 255 or UL 723.

I. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.

J. Rectangular Silencers:

1. Outer casing shall be ASTM A 653/A 653M, G90 galvanized sheet steel.

2. Inner perforated metal liner: ASTM A 653/A 653M, G90 galvanized sheet steel.

K. Principal Sound-Absorbing Mechanism:

1. Dissipative silencers with acoustic media: Media shall be of acoustic quality, shot-free glass fiber insulation with long, resilient fibers bonded with a thermosetting resin. Glass fiber density and compression shall be as required to insure conformance with laboratory test data. Glass fiber shall be packed with a minimum of 15% compression during silencer assembly. Media shall be resilient such that it will not crumble or break, and conform to irregular surfaces. Media shall not cause or accelerate corrosion of aluminum or steel. Mineral wool will not be permitted as a substitute for glass fiber.

L. Media Protection: Dissipative silencers: Where indicated on the silencer schedule, media shall be encapsulated in glass fiber cloth to help prevent shedding, erosion and impregnation of the glass fiber.

M. HTL Casings: Where indicated on the silencer schedule, silencers shall have high transmission loss (HTL) walls externally applied and completely sealed to the silencer casing by the silencer manufacturer to assure quality controlled transmission loss. The HTL walls shall consist of media, airspace, mass and outer protective metal skin, as required, to obtain the specified room noise criteria. Standard acoustical panels will not be accepted as HTL walls. If requested by the Engineer, break-out noise calculations for each air handling and fan system shall be provided with the silencer submittal to insure compliance with the room noise criteria. Break-out noise calculations shall be based on the sound power levels of the specified equipment.

2.8 TURNING VANES

N. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.

O. Manufactured Turning Vanes: Fabricate 1-1/2-inch wide, double-vane, curved blades of galvanized sheet steel set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into vane runners suitable for duct mounting.

1. Manufacturers:
    a. Ductmate Industries, Inc.
    b. Duro Dyne Corp.
    c. METALAIRE, Inc.
    d. Ward Industries, Inc.

P. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.9 DUCT-MOUNTING ACCESS DOORS

A. General Description: Fabricate doors airtight and suitable for duct pressure class.

B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.

1. Manufacturers:
    a. American Warming and Ventilating.
    b. Ductmate Industries, Inc.
    c. Flexmaster U.S.A., Inc.
    d. Greenheck.
    e. McGill AirFlow Corporation.
    f. Nailor Industries Inc.
    g. Ventfabrics, Inc.
    h. Ward Industries, Inc.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

3. Provide number of hinges and locks as follows:
    a. Less Than 12 Inches Square: Secure with two sash locks.
    b. Up to 18 Inches Square: Two hinges and two sash locks.
    c. Up to 24 by 48 Inches: Three hinges and two compression latches.
    d. Sizes 24 by 48 Inches and Larger: One additional hinge.

C. Pressure Relief Access Door: Double wall and duct mounting; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated, latches, and retaining chain.
1. Manufacturers:
    a. American Warming and Ventilating.
    b. Ductmate Industries, Inc.
    c. Greenheck.
    d. McGill AirFlow Corporation.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch thick, fibrous-glass or polystyrene-foam board.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers:
1. Duro Dyne Corp.
2. Ventfabrics, Inc.
3. Ward Industries, Inc.

B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to two strips of 2-3/4-inch wide, 0.028-inch thick, galvanized sheet steel or 0.032-inch thick aluminum sheets. Select metal compatible with ducts.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
1. Minimum Weight: 24 oz./sq. yd.
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

2.11 FLEXIBLE DUCTS

A. Manufacturers:
   1. Ductmate Industries, Inc.
   2. Flexmaster U.S.A., Inc.
   3. Hart & Cooley, Inc.
   4. McGill AirFlow Corporation.
   5. Flexible Technologies, Automation Industries, Inc.

B. Insulated-Duct Connectors: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor barrier film. Meet NFPA Standards 90A and 90B.
   1. Pressure Rating: 6 inch wg positive and 1.0 inch wg negative.
   2. Maximum Air Velocity: 4000 fpm.
   3. Temperature Range: Minus 20 to plus 175 deg F.
   4. Thermal Conductance: 0.23 BTU/hr/sq. ft./deg F.
   5. Acoustical Performance per Air Diffusion Council Performance Standards and the ASTM-C518.

OCTAVE BAND

CENTER FREQ. DUCT DIAMETER VERSUS INSERTION LOSS (IL) IN DECIBELS

Hz	4"	6"	8"	10"	12"	14"	16"	20"
63	25	25	20	15	15	16	25	25
125	42	42	33	28	28	27	25	25
250	40	40	32	30	28	26	24	20
500	37	37	31	29	26	24	21	19
1000	33	38	32	29	27	26	28	24
2000	38	38	33	38	36	34	30	22
4000	35	33	37	22	18	14	14	9

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 through 20 inches to suit duct size.

2.12 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.

E. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.

F. Provide test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers, with fusible links, according to manufacturer's UL-approved written instructions.

H. Install duct silencers rigidly to ducts. For silencers before and after elbows, install silencer baffles parallel to the plane of the elbow.

I. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:
   1. On both sides of duct coils.
   2. On both sides of air measuring stations.
   3. Downstream from volume dampers and equipment.
   4. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.
   5. To interior of ducts for cleaning; before and after each change in direction, at maximum 50-foot spacing.
   6. On sides of ducts where adequate clearance is available.

J. Install the following sizes for duct-mounting, rectangular access doors:
   1. One-Hand or Inspection Access: 8 by 5 inches.
   2. Two-Hand Access: 12 by 6 inches.
   3. Head and Hand Access: 18 by 14 inches.
   4. Head and Shoulders Access: 21 by 14 inches.
   5. Body Access: 25 by 16 inches.
   6. Body Plus Ladder Access: 25 by 25 inches.

K. Install the following sizes for duct-mounting, round access doors:
   1. One-Hand or Inspection Access: 8 inches in diameter.
   2. Two-Hand Access: 10 inches in diameter.
   3. Head and Hand Access: 12 inches in diameter.
   4. Head and Shoulders Access: 18 inches in diameter.
   5. Body Access: 24 inches in diameter.

L. Install the following sizes for duct-mounting, pressure relief access doors:
   1. One-Hand or Inspection Access: 5 inches in diameter.
   2. Two-Hand Access: 10 inches in diameter.
   3. Head and Hand Access: 13 inches in diameter.
   4. Head and Shoulders Access: 19 inches in diameter.

M. Label access doors according to Division 23 05 53 Section "Mechanical Identification." Access to fired and fire smoke dampers shall be permanently labeled with letters not less than ½ inch in height reading “Smoke Damper” or “Fire Damper” per UMC.

N. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.

O. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

P. Connect terminal units and VAV boxes to supply ducts with minimum 36 inches of straight duct upstream of the box.

Q. Connect diffusers or light troffer boots to low-pressure ducts with maximum 72-inch lengths of flexible duct clamped or strapped in place.

R. Connect flexible ducts to metal ducts with sheet metal collars secured with screws and UL 181 FX tape.

S. Install duct test holes where indicated and required for testing and balancing purposes. Provide plugs for all test hole locations.

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire and smoke dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Division 23 Section 23 05 93 "Testing, Adjusting, and Balancing."

END OF SECTION

SECTION 23 34 16

ROOFTOP AIR HANDLING UNITS

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Manufacturer Qualifications:
Company specializing in manufacturing the products specified in this section with minimum of 5 years documented experience.

B. The management system governing the manufacture of this product is ISO (International Organization for Standardization) 9001:2008 certified.

C. Air-handling unit assembly shall have UL (Underwriters Laboratories) 1995 certification for safety, including use with electric heat.

D. Products requiring electric connection shall be listed and classified by ETL and CSA (Canadian Standards Association) as suitable for the purpose specified and indicated.

E. Coil performance shall be certified in accordance with AHRI (Air-Conditioning, Heating, and Refrigerating Institute) Standard 410, latest edition.

F. Unit performance shall be rated in accordance with AHRI Standard 430 for Central Air-Handling Units and subject to verification of rating accuracy by AHRI-sponsored, third party testing. Units shall meet NFPA (National Fire Protection Association) 90A requirements.

1.2 DELIVERY, STORAGE AND PROTECTION

A. All outdoor units shall be completely shrink-wrapped from the factory for protection during shipment. Tarping of bare units is unacceptable.

B. Inspect for transportation damage and store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.3 START-UP REQUIREMENTS

Do not operate units until ductwork is clean, filters are in place, bearings lubricated, condensate properly trapped, piping connections verified and leak tested, belts aligned

and tensioned, all shipping braces have been removed, and fan has been test run under observation.

1.4 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each model indicated, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection. Prepare the following by or under the supervision of a qualified professional engineer:

1. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
2. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.
3. Wiring Diagrams: Power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: Submit certification that rooftop air conditioners, accessories, and components will withstand seismic forces defined in Division 23 Section "Mechanical Vibration and Seismic Controls." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For rooftop air conditioners to include in emergency, operation, and maintenance manuals.

F. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of rooftop air conditioners and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations with Roofing contractor.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of rooftop air conditioners which fail in materials or workmanship within specified warranty period.

1. Warranty Period for Coils: Manufacturer's standard, but not less than ten (10) years from date of Substantial Completion.
2. Warranty Period for Control Boards: Manufacturer's standard, but not less than one (1) year from date of Substantial Completion.
3. Warranty Period for Variable-Speed Fan Motors: Manufacturer's standard, but not less than one (1) year from date of Substantial Completion.
4. Warranty Period for Electronic Thermostats: Manufacturer's standard, but not less than one (1) year from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Belts: One (1) set for each belt-drive fan.
2. Filters: One (1) set of filters for each unit.

PART 2 - PRODUCTS

2.01 GENERAL DESCRIPTION

A. Units shall ship assembled.

B. Unit shall be factory-supplied, factory-assembled, outdoor, curb-mounted central station air handler. The air-handling unit may consist of a fan with the following factory-installed components as indicated on the equipment schedule.

1. Mixing Box Section.
2. Exhaust Box Section.
3. Plenum Section:
4. Filter Section with 2" angle filters.
5. Coil Section with hot and chilled water coils.
6. Horizontal draw-thru Fan Section

2.2 CASING

A. Construction:

1. Unit shall be constructed of a complete frame with easily removable panels. Removal of any panel shall not affect the structural integrity of the unit.
2. All units shall be supplied with a perimeter, 14-gage or heavier, G-90 galvanized, high tensile steel base rail with a pocket to accommodate roof curb. Perimeter lifting lugs for overhead lifting shall be provided on each shipping section. Slinging units in place of lifting lugs shall not be acceptable.
3. Unit shall be thermally broken to minimize the conduction path from the inside of the casing to the outside.
4. Casing panels (top, sides, and bottom) shall be constructed of galvanized steel (18 gauge optional), and shall have one of the following exterior finishes as specified:
   a. Unpainted G-90 galvanized steel.
5. Casing panels (top, sides, and bottom) shall be constructed of galvanized or stainless steel (18 gauge optional), and shall have one of the following interior finishes as specified:
   a. Unpainted G-90 galvanized steel.
6. Roof shall be double-wall, pitched in four directions at a minimum roof slope of $^1/_4$-in. per foot across the width of the unit. No penetrations shall be made in pressure sensitive panels. Roof shall incorporate a standing top seam. All seams in the roof shall be gasketed and capped to prevent water infiltration into the unit.
7. Casing panels (top, sides, and bottom) shall be one piece double-wall construction with foam insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13.

8. Casing deflection shall not exceed an L/240 ratio when subject to an internal pressure of ±8-in. wg and shall exhibit no permanent deformation at ±9 in. wg L is defined as the longest linear panel or cabinet length (measured to AHRI 1350 Cd level 2).
9. Casing leakage rate shall be less than 1% at ±8 in. wg of nominal unit airflow or 50 cfm, whichever is greater. Leakage rate shall be tested and documented on a routine basis on random production units. Optionally, factory witness leak testing and/or test reports shall be available.
10. Side panels shall be easily removable for access to unit and shall seal against a full perimeter automotive style gasket to ensure a tight seal.
11. The panel retention system shall comply with UL 1995 which states all moving parts (for example, fan blades, blower wheels, pulleys, and belts) that, if accidentally contacted, could cause bodily injury, shall be guarded against accidental contact by an enclosure requiring tools for removal.
12. Base rail shall overhang the curb to facilitate water run-off and protection of the curb to base connection from water intrusion.
13. Accessibility options shall be as follows:
    a. Hinged, lockable double-wall access door on either side with removable access panel(s) on the other side.
    b. Hinged, lockable double-wall access doors on both sides.
    c. Removable double-wall access panels on both sides.
14. Depending on the options selected and the remaining available space inside each section, the following options may be available:
    a. Reinforced glass viewports shall be factory-installed on the access panel(s) or door(s) of this section.
    b. Marine lights shall be factory-installed with or without GCFI (ground fault circuit interrupter) convenience outlets.
15. Fan supports, structural members, panels, or flooring shall not be welded, unless aluminum, stainless steel, or other corrosion-resistant material is used. Painted welds on unit exterior steel or galvanized steel are not acceptable.
16. All coil sections shall be double-wall construction with foam insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13.
17. Blow-thru fan sections shall have a diffuser plate as an integral part of the fan section.

B. Access Doors:

Access doors shall be one piece, hinged, lockable, double-wall construction with foam insulation sealed between the inner and outer panels. Panel assemblies shall not carry an R-value of less than 13.

C. Drain Pans:

Drain pans shall be foam insulated double-wall galvanized or stainless steel construction (18 gauge optional). The pan shall be sloped toward the drain connection. Drain pan shall have $1^1/_2$-in. MPT connection exiting through the hand side or opposite side of the casing as specified. Drain connection shall be insulated from the drain pan to the point at which it exits the casing. One drain outlet shall be supplied for each cooling coil section. Drain pan shall allow no standing water and comply with ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) Standard 62.1-2010. Where 2 or more coils are stacked in a coil bank, intermediate drain pans shall be provided and the condensate shall be piped to the bottom drain pan. The bottom coil shall not serve as a drain path for the upper coil.

D. Hoods and Louvers:
   1. Outside Air Hoods:
      a. Outside air hoods shall be constructed of 20-gage galvanized G-90 steel and sized for 100% of unit nominal cfm.
      b. Hoods shall include easily accessible 1-in. moisture eliminators with a maximum velocity of no more than 500 fpm.
   2. Exhaust Air Hoods:
      a. Exhaust air hoods shall be constructed of 16-gage galvanized G-90 steel and shipped collapsed in place.
      b. Expanded metal bird screen shall be provided to prevent entry of unwanted materials into air handler.
   3. Power Exhaust Air Hood:
      a. Power exhaust air hoods shall be constructed of 18-gage galvanized G-90 pre-painted steel.
      b. Expanded metal bird screen shall be provided to prevent entry of unwanted materials into air handler.
      c. Optional backdraft damper blades shall be 6063-T5 extruded aluminum channel with galvanized steel braces and extruded vinyl blade seals. Blades shall be mechanically fastened to axle rods rotating in corrosion-resistant, synthetic bearings. Blades begin to open at 0.12 in. wg and are fully open at 0.2 in. wg.
   4. Side Intake Louvers:
      a. Frames and blades shall be 6063 alloy, 0.081 in. thick, mechanically fastened with stainless steel fasteners. Frame depth shall be 6 inches.
      b. Vertical blades shall be designed to collect and drain water to exterior at sill by means of a center rain hook and channels in jambs and mullions.
      c. Louvers shall have 1/2-in. mesh removable aluminum bird screen.
      d. Visible mullions required for louver widths greater than 96 inches.
      e. Provide sill-flashing pans 4 in. high by full depth formed from minimum 0.060 in. thick aluminum.

f. Louvers shall be designed to withstand a wind load of 25 lb per sq ft.

g. Water penetration shall be no more than 0.01 oz per sq ft of free area at 1250 fpm per AMCA publication 511. The AMCA test was unable to determine the beginning water penetration for this louver due to the fact that it lies above 1250 fpm through free area.

h. Louver shall have a mill finish.

2.3 FANS

A. General:

1. Forward-curved fan sections shall have one double-width double-inlet (DWDI) fan wheel and scroll. They shall be constructed of galvanized steel with baked enamel. They shall be designed for continuous operation at the maximum rated fan speed and motor horsepower. Fans shall have an AMCA class rating corresponding to the static pressure at which the fan is designed to operate (Class I or II). Completed fan assembly shall be dynamically balanced in accordance with AHRI Guideline G and ANSI S2.19 at design operating speed using contract drive and motor if ordered.

5. Fan assembly vibration shall not exceed 0.248 in. per second when mounted on active isolators. Vibration shall be measured in both vertical and horizontal directions at the specified fan operating speed using specified motor. For testing purposes, accelerometers shall be mounted on the motor near the bearing locations and removed before shipment.

6. All fan sled components shall provide corrosion protection to pass 100-hour salt spray test per ASTM B-117.

7. Fan wheels shall be keyed to the shaft and shall be designed for continuous operation at maximum rated fan speed and motor horsepower. Fan wheels and shafts shall be selected with a maximum operating speed 25% below the first critical.

8. Belt drive fan motor shall be mounted within the fan section casing on slide rails equipped with adjusting screws. Motor shall be premium efficiency, open drip-proof or totally enclosed fan cooled NEMA (National Electrical Manufacturers Association) Design A or B with size and electrical characteristics as shown on the equipment schedule. Motor shall be mounted on a horizontal flat surface and shall not be supported by the fan or its structural members. All three-phase motors shall have a ±10% voltage utilization range and a 1.15 minimum service factor. Motor shall be compliant with the Energy Independence and Security Act (EISA) of 2007 where applicable. Single-phase motors shall be available up to and including 5 hp.

B. Performance Ratings:

Fan performance shall be rated and certified in accordance with AHRI Standard 430.

C. Sound Ratings:

Manufacturer shall submit first through eighth octave sound power for fan discharge and casing radiated sound. Sound ratings shall be tested in accordance with AHRI

260.

D. Mounting:
Fan scroll, wheel, shaft, bearings, drives, and motor shall be mounted on a common base assembly. The base assembly is isolated from the outer casing with factory-installed isolators and vibration absorbent an discharge seal. A canvas style duct connection between fan discharge and cabinet is not acceptable. Units shall use 2-in. deflection spring isolators.

E. Fan Accessories:
1. Forward curved fans:
   a. Variable frequency drives without bypass.
   b. Magnetic motor starters.
   c. Motor disconnects.
   e. Piezo ring transducer.
   f. Motor shaft grounding ring.
   g. Belt guards.
   h. Inlet screen.

F. Flexible Connection:
The base assembly is isolated from the outer casing with factory-installed isolators and vibration absorbent fan discharge seal. A canvas style duct connection between fan discharge and cabinet is not acceptable.

2.4 BEARINGS AND DRIVES

A. Bearings:
Self-aligning, grease lubricated, anti-friction with lubrication fittings extended to drive side of fan section. Optional grease fittings extended to the exterior of the casing are available. All bearing life calculations shall be done in accordance with ABMA 9 for ball bearings and ABMA 11 for roller bearings.
1. Size 03 to 110 forward-curved fans: Cartridge type bearings for Class I fans. Heavy-duty pillow block type, self-aligning, regreasable ball or roller type bearings selected for a minimum average life (L50) of 200,000 hours.

B. Shafts:
Fan shafts shall be solid steel, turned, ground, polished and coated with a rust inhibitor.

C. V-Belt Drive:
Drive shall be designed for a minimum 1.2 service factor as standard with a 1.5

service factor option and/or a factory-supplied extra set of belts. Drives shall be fixed pitch with optional variable pitch for motors 15 hp and less. All drives shall be factory mounted, with sheaves aligned and belts properly tensioned.

2.5 COILS

A. All coils shall be provided to meet the scheduled performance. All coil performance shall be certified in accordance with AHRI Standard 410. All water coils shall be tested at 450 psig air pressure. Factory-supplied $^1/_2$-in. OD coils shall be covered under the standard product one-year limited warranty. All integral face and bypass coils and $^5/_8$-in. OD coils shall be warranted for a period not in excess of 12 months from their shipment from the manufacturer. General Fabrication:

1. All water and refrigerant coils shall have minimum $^1/_2$-in. OD copper tubes mechanically expanded into fins to ensure high thermal performance with lower total flow and pumping requirements. Minimum tube wall thickness shall be 0.016 inches. Optional tube wall thickness of 0.025 in. shall be supplied, if specified.
2.. Minimum tube wall thickness shall be 0.020 inches. Aluminum plate fin type with belled collars. . Fin type shall be sine wave construction.
3. Aluminum-finned coils shall be supplied with die-formed casing and tube sheets of mill galvanized steel or stainless steel as specified. Copper-finned coils shall be supplied with stainless steel casing and tube sheets.

C. Hydronic Heating and Cooling Coils:

1. Headers shall be constructed of steel with steel MPT connections. Headers shall have drain and vent connections accessible from the exterior of the unit. Optional non-ferrous headers and red brass MPT connections shall be supplied if specified.
2. Configuration: Coils shall be drainable, with non-trapping circuits. Coils will be suitable for a design working pressure of 300 psig at 200 F.

2.6 FILTER SECTIONS

Angle filter sections shall accept either 2-in. or 4-in. filters of standard sizes, arranged in a horizontal V formation.

2.7 DAMPERS

A. Factory-supplied dampers shall be warranted to be free from defects in material and workmanship for a period of 12 months after being installed or placed in service, but in no instance shall the period of warranty be longer than 18 months from the date of the original shipment by the manufacturer.

B. Mixing boxes, filter-mixing boxes, and exhaust boxes shall have parallel or opposed blades and interconnecting outside-air and return-air dampers. Bottom damper locations shall be optionally available with a tool screen to prevent most objects from falling through a bottom damper opening.

1. Standard Dampers:

   Damper blades shall be constructed of galvanized steel, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 4 cfm/ft^2 at 1 in. wg differential pressure.

2. Premium Dampers:

   Damper blades shall be constructed of galvanized steel with a double-skin airfoil design, with blade seals and stainless steel jamb seals. Blades shall be mechanically fastened to axle rods rotating in self-lubricating synthetic bearings. Maximum leakage rate shall be 2 cfm/ft^2 at 1 in. wg differential pressure.

3. Outside Air Measurement Dampers:

   a. Damper frame shall be nominal 4 in. x 1 in. x minimum 0.081 in. and constructed of 6063-T5 extruded aluminum.

   b. Airflow measuring blades shall be airfoil-shaped, heavy gage anodized 6063-T5 extruded aluminum and fixed in 10 in. x minimum 16 gage galvanized steel frame.

   c. Jamb seals shall be flexible metal compression type along control damper sides.

   d. Blade seals shall be neoprene along control damper blade edges.

   e. Bearings shall be molded synthetic.

   f. Linkage shall be galvanized steel, concealed in frame.

   g. Axles shall be minimum $^1/_2$-in. diameter plated steel, hex-shaped, mechanically attached to blade.

   h. Operating temperature shall be –22 to 140 F.

   i. Air straightener section shall be aluminum alloy honeycomb contained in 5 in. long, 16 gage galvanized steel sleeve attached to monitoring blade frame.

   j. Airflow range shall be 400 to 5,000 ft per minute face velocity.

   k. Maximum leakage rate shall be 2 cfm/ft^2 at 1 in. wg differential pressure.

1. Integral face and bypass (IFB) coils shall be capable of maintaining a constant air volume, within 5%, shall be capable of maintaining a constant leaving air temperature as entering air conditions vary, and shall be capable of producing mixed leaving air temperatures within 3 ft downstream with a maximum variance in air temperature of 5° F, regardless of damper position.
2. Coil casing, dampers and baffles shall be fabricated from galvanized steel with an option for stainless steel. Coils shall be tested at 300 psig.

3. Actuator connection point shall be mechanically attached to dampers via linkage mechanisms. Dampers shall be interconnected for operation simultaneously across each face of coil.

E. Power Exhaust Hood Dampers:

Backdraft damper blades shall be 6063-T5 extruded aluminum channel with galvanized steel braces and extruded vinyl blade seals. Blades shall be mechanically fastened to axle rods rotating in corrosion-resistant, synthetic bearings. Blades begin to open at 0.12 in. wg and are fully open at 0.2 in. wg.

2.8 VARIABLE FREQUENCY DRIVES:

A. Referenced Standards and Guidelines:

1. Institute of Electrical and Electronic Engineers (IEEE)
   a. IEEE 519-1992, Guide for Harmonic Content and Control.
2. Underwriters Laboratories (as appropriate)
   a. UL508
   2) UL508A
   3) UL508C

c. National Electrical Manufacturer's Association (NEMA)
   1) ICS 7.0, AC Adjustable Speed Drives

d. International Electrotechnical Commission (IEC)
   1) EN/IEC 61800-3

e. National Electric Code (NEC)
   1) NEC 430.120, Adjustable-Speed Drive Systems

f. International Building Code (IBC)
   1) IBC 2012 Seismic – referencing ASC 7-05 and ICC AC-156

B. Qualifications:

a. VFDs and options shall be UL508 listed as a complete assembly. The base VFD shall be UL listed for 100 kA SCCR without the need for external input fuses.

b. CE Mark – The base VFD shall conform to the European Union Electromagnetic Compatibility directive, a requirement for CE marking. The VFD shall meet product standard EN 61800-3 for the First Environment restricted level (Category C2). Base drives that only meet the Second Environment (Category C3, C4) shall be supplied with filters to bring the drive in compliance with the First Environment levels.

c. The entire VFD assembly, including the bypass (if specified), shall be seismically certified and labeled as such in accordance with the 2012 International Building Code (IBC):
   1) VFD manufacturer shall provide Seismic Certification and Installation requirements at time of submittal.

2) Seismic importance factor of 1.5 rating is required, and shall be based upon actual shake test data as defined by ICC AC-156.
3) Seismic ratings based upon calculations alone are not acceptable. Certification of Seismic rating must be based on testing done in all three axis of motion.
4) Special seismic certification of equipment and components shall be provided by OSHPD preapproval.

C. Factory-mounted variable frequency drives (VFDs) shall be wired to factory-supplied motors.

D. Factory-supplied VFDs are programmed and started up from the factory and qualify the VFD, through ABB, for a 24-month warranty from date of commissioning or 30 months from date of sale, whichever occurs first.

E. The VFD parameters are programmed into the controller and removable keypad. In the event that the VFD fails and needs replacement, the program can then be uploaded to the replacement VFD via the original keypad.

F. The VFD package as specified herein and defined on the VFD schedule shall be enclosed in a UL Type enclosure (enclosures with only NEMA ratings are not acceptable), completely assembled and tested by the manufacturer in a facility where the management system governing the manufacture of this product is ISO 9001:2008 certified.

G. The VFD shall provide full rated output from a line of ±10% of nominal voltage. The VFD shall continue to operate without faulting from a line of +30% to –35% of nominal voltage.

H. VFDs shall be capable of continuous full load operation under the following environmental operating conditions:
1. –15 to 40 C (5 to 104 F) ambient temperature. Operation to 50 C shall be allowed with a 10% reduction from VFD full load current.
2. Altitude 0 to 3300 feet above sea level. Operation to 6600 shall be allowed with a 10% reduction from VFD full load current.
3. Humidity less than 95%, non-condensing.

I. All VFDs shall have the following standard features:
1. All circuit boards shall be coated to protect against corrosion.

2. All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs.
3. The keypad shall include Hand-Off-Auto selections and manual speed control. The drive shall incorporate "bumpless transfer" of speed reference when switching between "Hand" and "Auto" modes. There shall be fault reset and "Help" buttons on the keypad. The Help button shall include "on-line" assistance for programming and troubleshooting.
4. There shall be a built-in time clock in the VFD keypad. The clock shall have a battery backup with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. VFD programming shall be held in non-volatile memory and is not dependent on battery power
5. The VFDs shall utilize pre-programmed application macros specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time. The VFD shall have two user macros to allow the end-user to create and save custom settings.
6. The VFD shall have cooling fans that are designed for easy replacement. The fans shall be designed for replacement without requiring removing the VFD from the wall or removal of circuit boards. The VFD cooling fans shall operate only when required, based on the temperature of and run command to the drive. VFD protection shall be based on thermal sensing and not cooling fan operation.
7. The VFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to set point without tripping or component damage (flying start).
8. The VFD shall have the ability to automatically restart after an over-current, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable.
9. The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds every minute. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430.250 for 4-pole motors.
10. VFDs through 200 HP shall have internal swinging (non-linear) chokes providing impedance equivalent to 5% to reduce the harmonics to the power line. Swinging choke shall be required resulting in superior partial load harmonic reduction. Linear chokes are not acceptable. 5% impedance may be from dual (positive and negative DC bus) chokes, or 5% swinging AC line chokes. VFD's with only one DC choke shall add an AC line choke.
11. The input current rating of the VFD shall not be greater than the output current rating. VFDs with higher input current ratings require the upstream wiring,

protection devices, and source transformers to be oversized per NEC 430.122. Input and output current ratings must be shown on the VFD nameplate.

12. The VFD shall include a coordinated AC transient surge protection system consisting of 4 MOVs (phase to phase and phase to ground), a capacitor clamp, 1600 PIV Diode Bridge and internal chokes. The MOVs shall have a minimum 125 joule rating per phase across the diode bridge. VFDs that do not include coordinated AC transient surge protection shall include an external TVSS (Transient Voltage Surge Suppressor).
13. The VFD shall provide a programmable loss-of-load (broken belt/broken coupling) Form-C relay output. The drive shall be programmable to signal the loss-of-load condition via a keypad warning, Form-C relay output, and/or over the serial communications bus. The loss-of-load condition sensing algorithm shall include a programmable time delay that will allow for motor acceleration from zero speed without signaling a false loss-of-load condition.
14. The VFD shall include multiple "two zone" PID algorithms that allow the VFD to maintain PID control from two separate feedback signals (4 to 20 mA, 0 to 10V, and/or serial communications). The two zone control PID algorithm will control motor speed based on a minimum, maximum, or average of the two feedback signals. All of the VFD PID controllers shall include the ability for "two zone" control.
15. If the input reference is lost, the VFD shall give the user the option of either (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, Form-C relay output and/or over the serial communication bus.
16. The VFD shall have programmable "Sleep" and "Wake up" functions to allow the drive to be started and stopped from the level of a process feedback signal.

J. All VFDs to have the following adjustments:

1. Three (3) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed. The lockout range must be fully adjustable, from 0 to full speed.
2. Two (2) PID Set point controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD, using the microprocessor in the VFD for the closed-loop control. The VFD shall have 250 mA of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. The PID set point shall be adjustable from the VFD keypad, analog inputs, or over the communications bus. There shall be two independent parameter sets for the PID controller and the capability to switch between the parameter sets via a digital input, serial communications or from the keypad. The independent parameter sets are typically used for night setback, switching between summer and winter set points, etc.

3. There shall be an independent, second PID loop that can utilize the second analog input and modulate one of the analog outputs to maintain the set point of an independent process (i.e. valves, dampers, etc.). All set points, process variables, etc. to be accessible from the serial communication network.
4. Two (2) programmable analog inputs shall accept current or voltage signals.
5. Two (2) programmable analog outputs (0 to 20 mA or 4 to 20 mA). The outputs may be programmed to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, Active Feedback, and other data.
6. Six (6) programmable digital inputs for maximum flexibility in interfacing with external devices. All digital inputs shall be programmable to initiate upon an application or removal of 24VDC.
7. Three (3) programmable, digital Form-C relay outputs. The relay outputs shall include programmable on and off delay times and adjustable hysteresis. The relays shall be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC; continuous current rating of 2 amps RMS. Outputs shall be true Form-C type contacts; open collector outputs are not acceptable. Drives that have only two (2) relay outputs must provide an option card that provides additional relay outputs.
8. Run permissive circuit - There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, input contact closure, time-clock control, or serial communications), the VFD shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD digital input and allows VFD motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop and the damper shall be commanded to close. The keypad shall display "start enable 1 (or 2) missing". The safety input status shall also be transmitted over the serial communications bus.
9. The VFD control shall include a programmable time delay for VFD start and a keypad indication that this time delay is active. A Form C relay output provides a contact closure to signal the VAV boxes open. This will allow VAV boxes to be driven open before the motor operates. The time delay shall be field programmable from 0 to 120 seconds. Start delay shall be active regardless of the start command source (keypad command, input contact closure, time-clock control, or serial communications), and when switching from drive to bypass.
10. Seven (7) programmable preset speeds.
11. Two independently adjustable accel and decel ramps with 1 to 1800 seconds

adjustable time ramps.

12. The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise. The VFD shall have selectable software for optimization of motor noise, energy consumption, and motor speed control.
13. The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows higher carrier frequency settings without derating the VFD.
14. The VFD shall include password protection against parameter changes.

K. The keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable). All VFD faults shall be displayed in English words. The keypad shall include a minimum of 14 assistants including:

1. Start-up assistant
2. Parameter assistants
   a. PID assistant
   b. Reference assistant
   c. I/O assistant
   d. Serial communications assistant
   e. Option module assistant
   f. Panel display assistant
   g. Low noise set-up assistant
3. Maintenance assistant
   a. Troubleshooting assistant
   b. .Drive optimizer assistants

L. All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of three operating values from the list below shall be capable of being displayed at all times. The display shall be in complete English words (alpha-numeric codes are not acceptable):

1. Output Frequency
2. Motor Speed (RPM, %, or Engineering units)
3. Motor Current
4. Motor Torque
5. Motor Power (kW)
6. DC Bus Voltage
7. Output Voltage

M. The VFD shall include a fireman's override input. Upon receipt of a contact closure from the fire/smoke control station, the VFD shall operate in one of two modes: 1) Operate at a programmed predetermined fixed speed ranging from -500Hz (reverse) to 500Hz (forward). 2) Operate in a specific fireman's override PID algorithm that automatically adjusts motor speed based on override set point and feedback. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlocks, and force the motor to run in one of the two modes above. "Override Mode" shall be displayed on the keypad. Upon removal of the override signal, the VFD shall resume normal operation, without the need to cycle the normal digital input run command.

N. Serial Communications

1. The VFD shall have an EIA-485 port as standard. The standard protocols shall be Modbus*, Johnson Controls N2, Siemens Building Technologies FLN, and BACnet†. [Optional protocols for LonWorks**, Profibus, EtherNet, BACnet IP, and DeviceNet shall be available.] Each individual drive shall have the protocol in the base VFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority (i.e. BTL Listing for BACnet). Use of non-certified protocols is not allowed.
2. The BACnet connection shall be an EIA-485, MS/TP interface operating at 9.6, 19.2, 38.4, or 76.8 Kbps. The connection shall be tested by the BACnet Testing Labs (BTL) and be BTL Listed. The BACnet interface shall conform to the BACnet standard device type of an Applications Specific Controller (B-ASC). The interface shall support all BIBBs defined by the BACnet standard profile for a B-ASC including, but not limited to:
   a. Data Sharing – Read Property – B.
   b. Data Sharing – Write Property – B.
   c. Device Management – Dynamic Device Binding (Who-Is; I-Am).
   d. Device Management – Dynamic Object Binding (Who-Has; I-Have).
   e. Device Management – Communication Control – B.
3. Serial communication capabilities shall include, but not be limited to; run-stop controls, speed set adjustment, and lock and unlock the keypad. The drive shall have the capability of allowing the BAS to monitor feedback such as process variable feedback, output speed / frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The BAS shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output values. All

diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible.

4. Serial communication in bypass (if bypass is specified) shall include, but not be limited to; bypass run-stop control, the ability to force the unit to bypass, and the ability to lock and unlock the keypad. The bypass shall have the capability of allowing the BAS to monitor feedback such as, current (in amps), kilowatt hours (resettable), operating hours (resettable), and bypass logic board temperature. The BAS shall also be capable of monitoring the bypass relay output status, and all digital input status. All bypass diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote bypass fault reset shall be possible.
5. The VFD/bypass shall allow the BAS to control the drive and bypass digital and analog outputs via the serial interface. This control shall be independent of any VFD function. The analog outputs may be used for modulating chilled water valves or cooling tower bypass valves. The drive and bypass' digital (Form-C relay) outputs may be used to actuate a damper, open a valve or control any other device that requires a maintained contact for operation. In addition, all of the drive and bypass' digital inputs shall be capable of being monitored by the BAS system. This allows for remote monitoring of which (of up to 4) safeties are open.
6. The VFD shall include an independent PID loop for customer use. The independent PID loop may be used for cooling tower bypass value control, chilled water value/ hot water valve control, etc. Both the VFD PID control loop and the independent PID control loop shall continue functioning even if the serial communications connection is lost. As default, the VFD shall keep the last good set point command and last good DO and AO commands in memory in the event the serial communications connection is lost and continue controlling the process.

O. EMI/RFI filters. All VFDs shall include EMI/RFI filters. The onboard filters shall allow the VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted level (Category C2) with up to 100 feet of motor cable. Second environment (Category C3, C4) is not acceptable, no Exceptions. Certified test reports shall be provided with the submittals confirming compliance to EN 61800-3, First Environment (C2).

P. Drive options shall be furnished and mounted by the drive manufacturer as defined on the VFD schedule. All optional features shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb, maintaining manufacturer's recommended clearances. Install according to ARI Guideline B.

B. Curb Support: Install roof curb on roof structure, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install and secure rooftop air conditioners on curbs and coordinate roof penetrations and flashing with roof construction. Secure units to structural support with anchor bolts.

C. Isolation Curb Support: Install units on isolation curbs and install flexible duct connectors and the following vibration isolation and seismic-control devices. Flexible duct connectors are specified in Division 23 33 00 Section "Duct Accessories." Vibration isolation and seismic-control devices are specified in Division 23 05 33 Section "Mechanical Vibration and Seismic Controls."

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

1. Gas Piping: Comply with applicable requirements in Division 23 11 00 Section "Facility Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

C. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements for down flow units (where applicable):

1. Install ducts to termination in roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Terminate return-air duct through roof structure and insulate space between roof and bottom of unit with 2-inch thick, acoustic duct liner.

D. Electrical System Connections: Comply with applicable requirements in Division 26 Sections for power wiring, switches, and motor controls.

E. Ground equipment according to Division 26 Section associated with "Grounding and Bonding."

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field quality-control tests and inspections and prepare test reports:

1. After installing rooftop air conditioners and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove malfunctioning units, replace with new units, and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to compressor, air-cooled outside coil, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean outside coil and inspect for construction debris.
10. Clean furnace flue and inspect for construction debris.
11. Connect and purge gas line.
12. Adjust vibration isolators.
13. Inspect operation of barometric dampers.

14. Lubricate bearings on fan.
15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
16. Adjust fan belts to proper alignment and tension.
17. Start unit according to manufacturer's written instructions.
    a. Start refrigeration system in summer only.
    b. Complete startup sheets and attach copy with Contractor's startup report.
18. Inspect and record performance of interlocks and protective devices; verify sequences.
19. Operate unit for an initial period as recommended or required by manufacturer.
20. Perform the following operations for both minimum and maximum firing and adjust burner for peak efficiency. Adjust pilot to stable flame.
    a. Measure gas pressure on manifold.
    b. Measure combustion-air temperature at inlet to combustion chamber.
    c. Measure flue-gas temperature at furnace discharge.
    d. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
    e. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.
21. Adjust and inspect high-temperature limits.
22. Inspect outside-air dampers for proper stroke and interlock with return-air dampers.
23. Start refrigeration system and measure and record the following:
    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outside-air, dry-bulb temperature.
    d. Outside-air-coil, discharge-air, dry-bulb temperature.
24. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
25. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.
    a. Supply-air volume.
    b. Return-air volume.
    c. Relief-air volume.
    d. Outside-air intake volume.
26. Simulate maximum cooling demand and inspect the following:
    a. Compressor refrigerant suction and hot-gas pressures.

b. Short circuiting of air through outside coil or from outside coil to outside-air intake.

27. Verify operation of remote panel, including pilot-light operation and failure modes. Inspect the following:
    a. High-limit heat exchanger.
    b. Warm-up for morning cycle.
    c. Freezestat operation.
    d. Economizer to limited outside-air changeover.
    e. Alarms.
28. After startup and performance testing, change filters, vacuum heat exchanger and cooling and outside coils, lubricate bearings, adjust belt tension, and inspect operation of power vents.

3.5 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose, without additional cost.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain rooftop air conditioners. Refer to Division 1 Sections "Closeout Procedures" and "Demonstration and Training."

END OF SECTION 23 34 16

SECTION 23 36 00

AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. Refer to the General Conditions, Supplementary Conditions, Division 1 General Requirements and Section 23.05.00.

1.2 INDUSTRY STANDARDS

A. All equipment and materials furnished under this Section and the installation of same shall be in accordance with the following standards:
   1. Construction shall be in accordance with SMACNA standards.
   2. Performance and sound ratings shall be in accordance with ADC standards.

1.3 SCOPE OF WORK

A. Furnish and install all air distribution equipment and associated appurtenances as indicated on the drawings and specified herein. Also provide any incidental work not shown or specified that is necessary to provide a complete system. This includes but is not limited to the following:
   1. Installation of zone terminal units and connection to duct systems.
   2. Removal of debris and clean up of all equipment before final acceptance of owner. Keep all work areas clean and orderly throughout construction.

B. The following related work is described/performed under other Sections:
   1. Mechanical Insulation - Section 23 07 00.
   2. Ductwork systems - Section 23 31 13.
   3. Controls Systems - Section 23 09 00.

1.4 MATERIAL HANDLING AND STORAGE

A. The contractor shall be responsible for providing, storing, and installation of all equipment specified herein.

B. Store all equipment on site in areas designated by the General Contractor. Provide all means possible to protect equipment from intrusion of dirt or damage prior to, during and after installation.

PART 2 - PRODUCTS

2.1 TERMINAL UNITS : Titus, Trane, Price or equal.

A. Terminal units shall be pressure independent variable volume, size and capacity as shown on schedule. Boxes shall include damper section and sound attenuation section as a complete factory assembled unit.

B. Boxes shall be constructed with a minimum of 22-gauge galvanized steel per SMACNA or ASHRAE standards and shall be lined with insulation meeting NFPA Bulletin 90A requirements.

C. Boxes shall be capable of handling a maximum differential of 6" S.P. Lining shall be "Nomaco" or "Armaflex" engineered polymer foam insulation, 1/2" thick, all edges sealed.

D. Boxes shall be capable of operating satisfactorily throughout their range, from minimum to maximum capacity.

E. Provide air velocity sensor with calibration pressure taps for pressure independent proportional variable volume control. Electronic actuator and DDC controller shall be supplied by the temperature control contractor and shipped to the box manufacturer for installation prior to shipment to jobsite.

F. Variable volume boxes shall be identified prior to shipment and factory set to have design air flow quantity as scheduled.

G. Variable volume boxes shall be lined with ¾" thick engineered polymer foam acoustic lining.

H. Install air terminal boxes properly supported from the structure and locate as required for access in servicing.

I. Provide hot water coils where scheduled on drawings.

J. Provide units with integral sound attenuating acoustic lined plenum.

PART 3 - EXECUTION

3.1 GENERAL

A. Refer to Section 23 05 00 for general installation requirements.

3.2 EQUIPMENT INSTALLATION

A. Set all equipment in a place allowing for easy access to all parts of the equipment. Do not block access to any access doors, pull spaces or parts requiring access for maintenance.

B. Provide all anchors and supports for proper installation on equipment. Unless noted otherwise, all materials used for anchoring and supports shall be galvanized.

C .Provide seismic restraint systems in accordance with Specification Section 23 05 29 and the drawings.

3.3 GRILLES AND DIFFUSERS

A. Provide all outlets with gaskets and metal grounds and install so that there will be no streaking of the walls or ceilings due to leakage. Standard grille frames may be used in lieu of metal grounds. Submit details of metal grounds to Architect for approval. Duct connection to outlets on exposed ducts shall be the full size of the outer perimeter of the outlet flange.

3.4 EQUIPMENT IDENTIFICATION

A. Refer to Section 23 05 53.

3.5 EQUIPMENT WARRANTIES

A. Refer to Section 23 05 00.

END OF SECTION

SECTION 23 37 13

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

B. Related Sections include the following:

1. Division 23 Section 23 33 00 "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.
2. Division 23 Section 23 05 93 "Testing, Adjusting, and Balancing" for balancing diffusers, registers, and grilles.

1.3 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

C. Register: A combination grille and damper assembly over an air opening.

1.4 SUBMITTALS

A. Product Data: For each model indicated, include the following:

1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

B. Coordination Drawings: Reflected ceiling plans and wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other items installed in ceilings and walls.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for diffusers, registers, and grilles with factory-applied color finishes.

D. Samples for Verification: Of diffusers, registers, and grilles, in manufacturer's standard sizes, showing the full range of colors. Prepare Samples from the same material to be used for the Work.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings and schedules indicate specific requirements of diffusers, registers, and grilles and are based on the specific requirements of the systems indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Product Requirements and Substitutions."

B. NFPA Compliance: Install diffusers, registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Diffusers, registers, and grilles are scheduled on Drawings.

2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

1. All diffusers and grilles shall be selected for maximum NC 30. NC valve shall be based on Octave Band 2-7 sound power levels minus a room absorption of 5 db.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION

SECTION 23 41 00

AIR FILTERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes factory-fabricated air-filter devices and media used to remove particulate matter from air for HVAC applications.

1.2 SUBMITTALS

A. Product Data: Include dimensions; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each unit indicated.

B. Shop Drawings: Include plans, elevations, sections, and details to illustrate component assemblies and attachments.

1. Show filter rack assembly, dimensions, materials, and methods of assembly of components.
2. Include Setting Drawings, templates, and requirements for installing anchor bolts and anchorages.
3. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 90A and NFPA 90B.

C. ASHRAE Compliance: Comply with provisions of ASHRAE 52.1 for method of testing and rating air-filter units.

D. Comply with ARI 850.

E. Electronic Air Cleaners and Electrical Devices and Accessories: Listed and labeled as defined in NFPA 70, Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Farr Co.
2. AAF International.
3. Airguard Industries, Inc.
4. Columbus Industries, Inc.
5. Flanders Filters, Inc.
6. International Air Filter, Inc.

B. Disposable Panel Filters: Factory-fabricated, viscous-coated, flat-panel type, disposable air filters with holding frames.

1. Media: Interlaced glass fibers sprayed with nonflammable adhesive.
2. Frame: Cardboard frame with perforated metal retainer.
3. Duct-Mounting Frames: Welded, galvanized steel with gaskets and fasteners and suitable for bolting together into built-up filter banks.

C. Extended-Surface, Disposable Panel Filters: Factory-fabricated, dry, extended-surface filters with holding frames.

1. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
2. Media and Media-Grid Frame: Nonflammable cardboard.
3. Duct-Mounting Frames: Welded, galvanized steel with gaskets and fasteners and suitable for bolting together into built-up filter banks.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Position each filter unit with clearance for normal service and maintenance. Anchor filter holding frames to substrate.

B. Install filters in position to prevent passage of unfiltered air.

C. Coordinate filter installations with duct and air-handling unit installations.

D. Electrical wiring and connections are specified in Division 26 Sections.

END OF SECTION 23 41 00

SECTION 26 00 00

ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. Refer to the General Conditions, Supplementary Conditions and Division I - General Requirements, and the drawings. The Contractor, shall read the conditions and be responsible for, and governed by, all requirements thereunder. This Condition applies to all Sections of Specification Division 26.

1.2 REGULATIONS

A. The Contractor shall give required notices to the building inspectors, the Engineer and the Owner and comply with laws, ordinances, rules and regulations applicable to the work and safety. Authorities include, but are not limited to:

1. The latest revision of the State of California Electrical Code.
2. The applicable Rules and Regulations of the National Fire Protection Association.
3. State Fire Marshal.
4. Underwriters Laboratories.
5. Any other applicable Federal, State, County or City Codes or Regulations, including O.S.H.A.

B. Nothing in these Drawings or Specifications shall be construed to permit work not conforming to the above Regulations and Codes.

1.3 DRAWINGS AND SPECIFICATIONS

A. Drawings are diagrammatic and indicate the general arrangement of equipment and wiring. Exact requirements shall be governed by architectural, structural and mechanical conditions of the job. Consult other drawings in preparation of the bid.

B. Extra lengths of wiring or pull boxes or junction boxes, etc., necessitated by conditions shall be included in the bid. Report any apparent discrepancies before submitting bid.

C. Right is reserved by the Owner to make changes of up to ten feet in location of any outlet or equipment prior to roughing-in without increasing contract cost.

1.4 EXAMINATION OF SITE

A. The Contractor shall examine the site and the existing conditions and make allowances for them in preparing his proposal. In the event of discrepancies between existing conditions and the Drawings, the Contractor shall report such discrepancies prior to bid and bid the conditions necessary to complete the job and to provide a fully operable and acceptable systems.

B. Extra charges will not be allowed for work that must be provided when it was apparent from a pre-bid inspection of the premises, even though the work is not shown on the drawings or called for in the Specification.

1.5 RECORD DRAWINGS AND SYSTEM OPERATION AND MAINTENANCE

A. Refer to Division 1 Sections "Closeout Procedures", "Operation and Maintenance Data", "Project Record Documentation" and "Demonstration and Training".

1.6 SHOP DRAWING AND MATERIAL LIST

A. Refer to Division 1 Sections "Submitall Procedures".

1.7 OPERATING AND MAINTENANCE MANUALS

A. Refer to Division 1 Sections "Operation and Maintenance Data".

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Receive, store and handle materials in a manner to prevent damage. Costs of damage shall be borne by the Contractor.

B. Protect equipment from weather (rain, sunshine, winds), water vapors, theft, and vehicular traffic.

PART 2 - PRODUCTS

2.1 MATERIAL APPROVAL

A. The design, manufacture and testing of electrical equipment and materials shall conform to or exceed latest applicable NEMA, IEEE, ANSI, and U.L. Standards.

B. Materials shall be new and bear Underwriters Laboratories (UL) label or other accepted testing laboratory certification. Materials that are not labeled by U.L. shall be tested and approved by an independent testing laboratory or a governmental agency acceptable to the Engineer, Owner and code enforcing authority.

PART 3 - EXECUTION

3.1 WORKMANSHIP AND CONTRACTOR'S QUALIFICATIONS

A. Installation of parts and connection of parts into systems shall be completed by skilled electrical journeymen. Material assemblies and installation work shall be securely fastened to structure, attractive in appearance and safe to operate. Provide code required clearance about electrical equipment. Assembly work or installations that are improper, unsafe or unattractive shall be removed and replaced with satisfactory work at no additional cost to the Owner.

B. Provide a foreman or superintendent in charge of this work at all times.

3.2 COORDINATION

A. Coordinate work with other trades to avoid conflict and to provide correct rough-in and connection for equipment furnished by other trades. Inform other trades Sub-contractors of the required access to, and clearances around, electrical equipment to maintain serviceability and code compliance.

B. Verify equipment dimensions and requirements. Check actual job conditions before installing work. Report necessary changes in design to Construction Manager in time to prevent needless work. Changes, or additions subject to additional compensation, which are made without written authorization and an agreed price, shall be at Contractor's risk and expense.

3.3 MANUFACTURER'S INSTRUCTIONS

A. Where the specifications call for an installation to be made in accordance with Manufacturer's recommendations, a copy of such recommendations shall at all times be kept in the job superintendent's office and shall be available to the Owner's representative.

B. Follow manufacturer's instructions where they cover points not specifically indicated on drawings and specifications. If instructions are in conflict with the drawings and specifications, obtain clarification from the Engineer before starting work.

3.4 QUALITY ASSURANCE

A. Provide a Quality Assurance program. These specifications set forth the minimum acceptable requirements. The specifications do not prohibit the Contractor from executing other Quality Assurance measures which can improve the operating facility, improve the construction schedule, and conserve energy within the scope of this project.

B. The Contractor shall insure that workmen's practices, materials employed, equipment and methods of installation conform to accepted construction and engineering practices, and that each piece of equipment can satisfactorily perform its functional operation.

3.5 CLOSING IN UNINSPECTED WORK

A. The Contractor shall not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested and/or approved. Field observations made by the architect or engineer do not waive the inspections required by the contract documents.

B. Should a portion of the work be enclosed or covered up prior to inspection and testing, the contractor shall uncover the work at his own expense, and after it has been tested, inspected and approved, make repairs with such materials as may be necessary to restore the uncovered work to its intended condition.

3.6 PRELIMINARY OPERATION

A. Should the Owner request that a portion of the plant, apparatus or equipment be operated prior to final completion and acceptance of the work, the Contractor shall consent, and such operation shall be under the supervision and direction of the Contractor, but expense thereof shall be paid by the Owner, separate and distinct from money paid on account of the Contract. Such preliminary operation and payment thereof shall not be construed as an acceptance of that portion of the work in this Contract.

3.7 ACCEPTANCE DEMONSTRATION

A. Refer to Division 1 Section "Demonstration and Training".

B. The system demonstrations shall be made by this Contractor in the presence of the District's facilities manager or his designated representative and the manufacturer's representative.

C. Demonstrate the function (in the structure) of each system and indicate its relationship to the single line diagrams and drawings.

D. Demonstrate by "start-stop operation", the controls, how to reset protective devices, how to replace fuses and what to do in case of emergency.

E. Demonstrate how maintenance and spare parts manuals are related to the equipment and systems installed.

3.8 TESTS

A. Where the Contract Documents, laws, ordinances or any public authority requires any work to be tested specifically or reviewed by another authority, the Contractor shall give the Engineer/Owner timely notice of readiness therefor. The Contractor shall give the Engineer/Owner the test results for review. If any work to be tested is covered up without written approval or consent of the Architect, it must, if directed by the Architect, be uncovered for examination at the Contractor's expense.

B. The cost of all such tests shall be borne by the Contractor.

C. Any work which fails to meet the requirements of any test or any work which does not meet the requirements of the Contract Documents shall be considered defective and may be rejected. Rejected work shall be corrected promptly by the Contractor or removed from the site.

D. Provide written test reports for each test to the Engineer for review.

END OF SECTION

SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Supporting devices for electrical components.
2. Cutting and patching for electrical construction.
3. Touchup painting.

1.3 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground services, including provision for electricity-metering components.
2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum of 2 inches o.c., in webs.

1. Channel Thickness: Selected to suit structural loading.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

F. Expansion Anchors: Carbon-steel wedge or sleeve type.

G. Toggle Bolts: All-steel springhead type.

2.2 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

E. Coordination: Coordinate with work of other trades, especially other utilities routes and clearances required to properly provide work.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Damp Locations and Outdoors: Hot-dip galvanized materials, U-channel system components.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four (4); minimum of 200-lb design load.

3.3 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze or bracket-type hangers.

D. Size supports for multiple raceway installations, so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 1/4-inch diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical conductor supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceways with an approved fastener not more than 24-inches from the box.

K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.

2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Steel: Welded threaded studs or spring-tension clamps on steel.

    a. Field Welding: Comply with AWS D1.1.

6. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
7. Light Steel: Sheet-metal screws.
8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 CUTTING AND PATCHING

A. Refer to Division 1 Sections "Cutting and Patching" and "Through-Penetration Firestop Systems".

B. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

C. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new firepstopping where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.5 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the following:

1. Supporting devices for electrical components.
2. Electrical demolition.
3. Cutting and patching for electrical construction.
4. Touchup painting.

3.6 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touchup paint. Paint materials and application requirements are specified in Division 9 Section "Painting."

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

B. Remove and replace with new items damaged beyond repair or refinishing.

3.7 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations, and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 26 05 23

CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field Quality-Control Test Reports: From a qualified testing and inspecting agency engaged by Contractor.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

1. American Insulated Wire Corp.; a Leviton Company.
2. General Cable Corporation.
3. Okonite Wire & Cable Company.
4. Southwire Company.

B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

C. Conductor Material: Copper complying with NEMA WC 5; stranded conductor.

D. Conductor Insulation Types: Type THHN-THWN complying with NEMA WC 5.

2.3 CONNECTORS AND SPLICES

A. Manufacturers:

1. AFC Cable Systems, Inc.
2. AMP Incorporated/Tyco International.
3. Hubbell/Anderson.
4. O-Z/Gedney; EGS Electrical Group LLC.
5. 3M Company; Electrical Products Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Concrete and Below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

D. Exposed Branch Circuits: Type THHN-THWN, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.

G. Fire Alarm Circuits: Refer to Section 28 31 00 – Fire Alarm Sysrtem.

3.2 INSTALLATION

A. All conductors and cables shall be installed in raceways.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Seal around conduits penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."

E. Open cable installed above accessible ceiling space shall be supported by metallic J-hooks. No stapling is allowed. Staples used shall be removed and cable conductivity shall be tested by contractor at contractor's cost.

3.3 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

B. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.4 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to perform the following field quality-control testing:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Ground rods and ground rod well.
2. Fittings.

B. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. Comply with UL 467.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grounding Conductors, Cables, Connectors, and Rods:

a. Apache Grounding/Erico Inc.
b. Chance/Hubbell.
c. Copperweld Corp.
d. Erico Inc.; Electrical Products Group.
e. Framatome Connectors/Burndy Electrical.
f. Galvan Industries, Inc.
g. Ideal Industries, Inc.
h. ILSCO.
i. Kearney/Cooper Power Systems.
j. Korns: C. C. Korns Co.; Division of Robroy Industries.
k. O-Z/Gedney Co.; a business of the EGS Electrical Group.
l. Raco, Inc.; Division of Hubbell.
m. Superior Grounding Systems, Inc.
n. Thomas & Betts, Electrical.

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."

B. Equipment Grounding Conductors: Insulated with green-colored insulation.

C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

D. Grounding Electrode Conductors: Stranded cable.

E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

F. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

G. Copper Bonding Conductors: As follows:

1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

H. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel.

1. Size: 5/8 inch in diameter and 96 inches in length.

B. Test Wells: Provide handholes "Christy" G5 or equal, with cast iron traffic lid and hold down screws.

PART 3 - EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.

B. In raceways, use insulated equipment grounding conductors.

C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch from wall and support from wall 6 inches above finished floor, unless otherwise indicated.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and branch circuits.

C. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

D. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

E. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

F. Water Heater and Heat-Tracing Cable: Install a separate equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

G. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

G. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, Paragraph 250-81(c), using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor to the main ground bus in the electrical room.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and ground rods.

F. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

G. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

H. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.

B. Connections to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

3.6 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.
3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

    a. Equipment Rated 500 kVA and Less: 10 ohms.
    b. Equipment Rated 500 to 1000 kVA: 5 ohms.
    c. Manhole Grounds: 10 ohms.

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect and Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Divisions 26, 27 and 28 Section "Basic Electrical Materials and Methods", "Security System", "Fire Alarm System", "Paging and Clock System", and "Data / Telephone System" for supports, anchors, and identification products.
2. Division 26 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.
3. Division 23 Section "Automatic Temperature Controls" for supports, anchors, and identification products.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For conduit, fittings, surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with existing conditions and work of other trades.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 METAL CONDUIT AND TUBING

A. Available Manufacturers:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Anamet Electrical, Inc.; Anaconda Metal Hose.
4. Electri-Flex Co.
5. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
6. LTV Steel Tubular Products Company.
7. Manhattan/CDT/Cole-Flex.
8. O-Z Gedney; Unit of General Signal.
9. Wheatland Tube Co.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. EMT and Fittings: ANSI C80.3.

1. Fittings: Compression type.

E. FMC: Aluminum.

F. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers:

1. American International.

2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corp.
4. Cantex Inc.
5. Carlon.
6. Certainteed Corp.; Pipe & Plastics Group.
7. Condux International.
8. ElecSYS, Inc.
9. Electri-Flex Co.
10. Lamson & Sessions; Carlon Electrical Products.
11. Manhattan/CDT/Cole-Flex.
12. RACO; Division of Hubbell, Inc.
13. Thomas & Betts Corporation.

B. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.

C. RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.

2.4 METAL WIREWAYS

A. Available Manufacturers:

1. Hoffman.
2. Square D.

B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers: Screw-cover type.

F. Finish: Manufacturer's standard enamel finish.

2.5 SURFACE RACEWAYS

A. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard bright white color.

1. Manufacturers:

a. Walker Systems, Inc.; Wiremold Company (The).
b. Wiremold Company (The); Electrical Sales Division.

B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Available Manufacturers:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. Emerson/General Signal; Appleton Electric Company.
3. Erickson Electrical Equipment Co.
4. Hoffman.
5. Hubbell, Inc.; Killark Electric Manufacturing Co.
6. O-Z/Gedney; Unit of General Signal.
7. RACO; Division of Hubbell, Inc.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet-PLM Division.
10. Spring City Electrical Manufacturing Co.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.

D. Floor Boxes: Cast metal, fully adjustable, rectangular. Walker Omni box, RFB 4 or equal as indicated.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

G. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.7 FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors:

1. Exposed: Rigid steel or IMC.
2. Concealed: Rigid steel or IMC.
3. Underground, Single Run: RNC.
4. Underground, Grouped: RNC.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures: NEMA 250, Type 3R.

B. Indoors:

1. Exposed: EMT.
2. Concealed: EMT.
3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
4. Damp or Wet Locations: Rigid steel conduit.
5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:

    a. Damp or Wet Locations: NEMA 250, Type 4.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Division 26 Section "Basic Electrical Materials and Methods."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
4. Change from rigid nonmetallic conduit to rigid steel conduit or IMC before rising above the floor.

I. Raceways below Slabs: Install in base rock below slab where practical and leave at least 2 inches of base rock cover.

J. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

K. Join raceways with fittings designed and approved for that purpose and make joints tight.

1. Use insulating bushings to protect conductors.

L. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 18 inches of slack at each end of pull wire.

N. Telephone and Signal System Raceways, 2 Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

O. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

P. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semi recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.

Q. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.

R. Set floor boxes level and flush with finished floor surface.

S. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

B. Remove and replace with new any item damaged beyond repair or refinishing.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION

SECTION 26 05 53

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Schedule of Nomenclature: An index of electrical equipment and system components used in identification signs and labels.

PART 2 - PRODUCTS

2.1 RACEWAY AND CABLE LABELS

A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

1. Color: Black letters on orange field.
2. Legend: Indicates voltage and service.

B. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating.

C. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.

D. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

E. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.

4. Printed legend indicating type of underground line.

F. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

G. Brass or Aluminum Tags: 2 by 2 by 0.05 inch metal tags with stamped legend, punched for fastener.

2.2 NAMEPLATES AND SIGNS

A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.

1 Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb minimum.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: According to color-coding.

B. Paint: Formulated for the type of surface and intended use.

1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Install painted identification according to manufacturer's written instructions and as follows:

1. Clean surfaces of dust, loose material, and oily films before painting.
2. Prime surfaces using type of primer specified for surface.
3. Apply one intermediate and one finish coat of enamel.

F. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.

G. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 12 inches below finished grade. Where width of multiple lines installed in a common trench does not exceed 16 inches overall, use a single line marker.

H. Color-Coding of Secondary Phase Conductors: Use the following colors for phase conductors:

1. 208/120-V Conductors:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.
d. Neutral: White
e. Ground: Green.

2. 480/277-V Conductors:

    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.
    d. Neutral: Grey
    e. Ground: Green.

3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG.

    a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
    b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

I. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.

1. Legend: 1/4 inch steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
2. Tag Fasteners: Nylon cable ties.
3. Band Fasteners: Integral ears.

J. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

K. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

L. Device Identification Labels: Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating. Install on each device cover of power receptacles, switches and tele/data outlets with feeder source (i.e. panelboard, MDF, IDF) and circuit number information.

M. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch high lettering on 1-1/2-inch high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Switchboard, distribution panel, branch circuit panelboards, electrical cabinets, and enclosures.
2. Branch feeder breakers at switchboard and distribution panel.
3. Access doors and panels for concealed electrical items.
4. Disconnect switches.
5. Enclosed circuit breakers.
6. Motor starters.
7. Push-button stations.
8. Contactors.
9. Remote-controlled switches.
10. Dimmers.
11. Control devices.
12. Telephone switching equipment.
13. Paging and clock master equipment.
14. TV master station.
15. Fire alarm master station or control panel.
16. Security-monitoring master station or control panel.

END OF SECTION

SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

B. Related Sections include the following:

1. Division 26 Section "Wiring Devices" for wall-box dimmers and manual light switches.

1.3 SUBMITTALS

A. Product Data: Include dimensions and data on features, components, and ratings for lighting control devices.

B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

C. Maintenance Data: For lighting control devices to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use and installation conditions by a testing agency acceptable to authorities having jurisdiction.

B. Comply with 47 CFR 15, Subparts A and B, for Class A digital devices.

C. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate features of devices specified in this Section with systems and components specified in other Sections to form an integrated system of compatible components. Match components and interconnections for optimum performance of specified functions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Occupancy Sensors:

a. Watt Stopper, Inc.

2. Dimmer Switches
a. Watt Stopper, Inc. or Lutron equal

3. Digital Lighting Management
a. Watt Stopper, Inc

2.2 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection: Include in all 120V/277V solid-state equipment. Comply with UL 1449 and with ANSI C62.41 for Category A locations.

2.3 OCCUPANCY SENSORS

A. Ceiling-Mounting Units: Unit receives control power from a separately mounted auxiliary power and control unit, and operates power switching contacts in that unit.

B. Switch-Box-Mounting Units: Unit receives power directly from switch leg of the 120- or 277-V ac circuit it controls and operates integral power switching contacts rated 800 W at 120-V ac, and 1000 W at 277-V ac, minimum.

C. Operation: Turns lights on when room or covered area is occupied and off when unoccupied, unless otherwise indicated.

1. Time Delay for Turning Lights Off: Adjustable over a range from 1 to 15 minutes, minimum.
2. Manual Override Switch: Turns lights off manually regardless of elapsed time delay.

D. Auxiliary Power and Control Units: As follows:

1. Relays rated for a minimum of 20-A normal ballast load or 13-A tungsten filament or high-inrush ballast load.
2. Sensor Power Supply: Rated to supply the number of connected sensors.

E. Passive-Infrared Type: Detects occupancy by a combination of heat and movement in zone of coverage. Each sensor detects occupancy anywhere in an area of 1000 sq. ft. by detecting occurrence of 6-inch minimum movement of any portion of a human body that presents a minimum target of 36 sq. in. to the sensor.

F. Dual-Technology Type: Uses a combination of passive-infrared and ultrasonic detection methods to distinguish between occupied and unoccupied conditions for area covered. Particular technology or combination of technologies that controls each function (on or off) is selectable in the field by operating controls on unit.

G. All wall mounted device cover plate shall be of 0.04" thick, Type 302, satin-finished stainless steel.

2.4 DIMMER SWITCHES

A. Wall mounted 0-10V LED dimmer switch with slide-to-off controls, present on/off for 120/277v operation. Provide three way operation, proper wattage and size of gang box according to control layout shown on the plans.

2.5 DIGITAL LIGHTING MANAGEMENT

A. Digital control system for area lighting control with LED dimmers, occupancy sensor and photocell sensor for daylight harvesting.

B. The system shall include the following components as a minimum for a compete operating system,
Room Controller – LMRC-210/211/212/213.
Wall mounted digital dimmer switch – LMDM-101.
Occupancy Sensor – Dual technology LMDC-100-WH
Cables - LMRJ

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment level and plumb and according to manufacturer's written instructions.

B. Mount lighting control devices according to manufacturer's written instructions and requirements in Division 26 Section "Basic Electrical Materials and Methods."

C. Mounting heights indicated are to bottom of unit for suspended devices and to center of unit for wall-mounting devices.

3.2 CONTROL WIRING INSTALLATION

A. A factory authorized manufacturer's representative shall provide the electrical contractor a functional overview of the lighting control system prior to installation. The contractor shall schedule the pre-installation site visit after receipt of approved submittals to review the following:

1. Confirm the location and mounting of all digital devices, with special attention to placement of occupancy and daylighting sensors.

2. Review the specifications for low voltage control wiring and termination.

3. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.

4. Discuss requirements for integration with other trades.

B. Install wiring between sensing and control devices according to manufacturer's written instructions and as specified in Division 26 Section "Conductors and Cables" for low-voltage connections and Division 27 Section "Data/Telephone Systems" for digital circuits.

C. Wiring Method: Install all wiring in raceway as specified in Division 26 Section "Raceways and Boxes."

D. Bundle, train, and support wiring in enclosures.

E. Ground equipment.

F. Connections: Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Basic Electrical Materials and Methods."

3.4 FIELD QUALITY CONTROL

A. Schedule visual and mechanical inspections and electrical tests with at least seven days' advance notice.

B. Inspect control components for defects and physical damage, testing laboratory labeling, and nameplate compliance with the Contract Documents.

C. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following according to manufacturer's written instructions:

1. Continuity tests of circuits.
2. Operational Tests: Set and operate devices to demonstrate their functions and capabilities in a methodical sequence that cues and reproduces actual operating functions.
   a. Include programming and testing of devices under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.

D. Correct deficiencies, make necessary adjustments, and retest. Verify that specified requirements are met.

E. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible agency and representative.

F. Reports: Written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

3.5 CLEANING

A. Cleaning: Clean equipment and devices internally and externally using methods and materials recommended by manufacturers, and repair damaged finishes.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

3.7 ON-SITE ASSISTANCE

A. Occupancy Adjustments: Within one year of date of Substantial Completion, provide up to three Project site visits, when requested, to adjust light levels, make program changes, and adjust sensors and controls to suit actual conditions.

END OF SECTION 26 09 23

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SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes receptacles, connectors, switches, and finish plates.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

1.4 SUBMITTALS

A. Product Data: For each product specified.

B. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NEMA WD 1.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wiring Devices:

    a. Bryant Electric, Inc.
    b. GE Company; GE Wiring Devices.
    c. Hubbell, Inc.; Wiring Devices Div.
    d. Leviton Manufacturing Co., Inc.
    e. Pass & Seymour/Legrand; Wiring Devices Div.
    f. Pyle-National, Inc.; an Amphenol Co.

2. Multioutlet Assemblies:

    a. Wiremold.

3. Poke-through, Floor Service Outlets and Telephone/Power Poles:

    a. Hubbell, Inc.; Wiring Devices Div.
    b. Pass & Seymour/Legrand; Wiring Devices Div.
    c. Square D Co.
    d. Wiremold.

2.2 RECEPTACLES

A. Straight-Blade and Locking Receptacles: General-Duty grade.

B. GFCI Receptacles: Feed-through type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle arranged to protect connected downstream receptacles on same circuit. Design units for installation in a 2-3/4 inch deep outlet box without an adapter.

C. Isolated-Ground Receptacles: Equipment grounding contacts connected only to the green grounding screw terminal of the device with inherent electrical isolation from mounting strap.

    1. Devices: Listed and labeled as isolated-ground receptacles.
    2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.

2.3 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

    1. Cord: Rubber-insulated, stranded-copper conductors, with type SOW-A jacket. Green-insulated grounding conductor, and equipment-rating ampacity plus a minimum of 30 percent.
    2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.4 SWITCHES

A. Snap Switches: Heavy-duty, quiet type.

B. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.

1. Switch: 20 A, 120/277-V ac.
2. Receptacle: NEMA WD 6, Configuration 5-20R.

C. Key Switches: double prong type for restrooms.

2.5 WALL PLATES

A. Single and combination types match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Unfinished Spaces: 0.04 inch thick, Type 302, satin-finished stainless steel.
3. Material for Finished Spaces: Smooth plastic.

2.6 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used. Walker RFB 4 or equal.

B. Compartmentation: Barrier separates power and signal compartments.

C. Housing Material: Die-cast aluminum, satin finished.

D. Power Receptacle: NEMA WD 6, Configuration 5-20R, white finish, unless otherwise indicated.

E. Signal Outlet: Blank cover with bushed cable opening, unless otherwise indicated.

2.7 MULTIOUTLET ASSEMBLIES

A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

B. Raceway Material: Nonmetal.

C. Wire: No. 12 AWG.

2.8 FINISHES

A. Color: Bright white, unless otherwise indicated or required by Code.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies plumb and secure.

B. Install wall plates when painting is complete.

C. Install wall dimmers to achieve indicated rating after derating for ganging as instructed by manufacturer.

D. Do not share neutral conductor on load side of dimmers.

E. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.

F. Protect devices and assemblies during painting.

G. Adjust locations at which floor service outlets are installed to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Electrical Identification."

B. Comply with Division 26 Section "Basic Electrical Materials and Methods."

1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
2. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.3 CONNECTIONS

A. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

B. Isolated-Ground Receptacles: Connect to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.

C. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A.

3.4 FIELD QUALITY CONTROL

A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.

B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

C. Replace damaged or defective components.

3.5 CLEANING

A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes individually mounted enclosed switches and circuit breakers used for the following:

1. Motor and equipment disconnecting means.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. RMS: Root mean square.

C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Maintenance Data: For enclosed switches and circuit breakers and for components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Closeout Procedures," include the following:

1. Routine maintenance requirements for components.
2. Manufacturer's written instructions for testing and adjusting switches and circuit breakers.
3. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency that is a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA AB 1 and NEMA KS 1.

D. Comply with NFPA 70.

1.6 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fusible Switches:

a. Eaton Corp.; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Control Division.
c. Square D Co.

2. Molded-Case Circuit Breakers:

a. Eaton Corp.; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Control Division.
c. Square D Co.

3. Combination Circuit Breaker and Ground-Fault Trip:

a. Eaton Corp.; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Control Division.
c. Square D Co.

4. Molded-Case, Current-Limiting Circuit Breakers:

a. Eaton Corp.; Cutler-Hammer Products.
b. General Electric Co.; Electrical Distribution & Control Division.
c. Square D Co.

5. Integrally Fused, Molded-Case Circuit Breakers:

    a. Eaton Corp.; Cutler-Hammer Products.
    b. General Electric Co.; Electrical Distribution & Control Division.
    c. Square D Co.

2.2 ENCLOSED SWITCHES

A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.

B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.

2.3 ENCLOSED CIRCUIT BREAKERS

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
6. GFCI Circuit Breakers: Single- and two-pole configurations with 5mA trip sensitivity.
7. Molded-Case Switch: Molded-case circuit breaker without trip units.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.

2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
5. Auxiliary Switch: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b"contacts operate in reverse of circuit-breaker contacts.
6. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
7. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

2.4 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.5 FACTORY FINISHES

A. Manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Electrical Identification".

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.4 CONNECTIONS

A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.

B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
2. Test continuity of each line- and load-side circuit.

B. Testing Agency: Engage a qualified independent testing agency to perform specified testing.

C. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.6 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.7 CLEANING

A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

SECTION 26 51 00

LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, lamps, ballasts, emergency lighting units, and accessories.

B. Related Sections include the following:

1. Division 26 Section 26 09 23 "Lighting Control Devices".

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:

1. Dimensions of fixtures.
2. Certified results of laboratory tests for fixtures and lamps for photometric performance.
3. Emergency lighting unit battery and charger.
4. Fluorescent and high-intensity-discharge ballasts.
5. Types of lamps.

B. Maintenance Data: For lighting fixtures to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NFPA 70.

1.5 COORDINATION

A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction. Refer to Architectural drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Lighting Fixture Schedule on the drawings.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic unless otherwise indicated.

1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
2. Lens Thickness: 0.125 inch minimum, unless greater thickness is indicated.

2.3 LED FIXTURES

A. LED fixtures shall provide a continuous and controllable light source. Lamp output and dimensions shall be in accordance with contract drawings and specifications. LED fixture lumen output will be in accordance with the specifications and shall not depreciate more than 20% after 10,000 hours of use. Rated lumen output for LED fixtures to operate in ambient temperature of 20 deg. C to +50 deg. C. White LED's to have a minimum life of 50,000 hours and color LEDs to have a minimum of 100,000 hours.

B. All LEDs used in the LED fixtures will be of high brightness and proven quality. All LEDs shall be driven digitally with pulse width modulation control to prolong life and maintain consistency of lumen output.

C. All connections to fixtures will be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.

D. Fuse Protections: All power supply outputs will be either fuse protected or PTC-protected as per Class 2UL listing. All fixtures will have built-in fuse protection. All power supplies will provide for knockouts for conduit connections or clamp-style connection for low voltage wiring.

E. All LED drivers to be compatible with LEDs. All LED fixtures and drivers (power supplies) shall be furnished by single manufacture to insure compatibility.

F. Electric characteristics of LED drivers at 77 deg, F ambient temperature.
1. Input Voltage Range – 120-277V.
2. Efficiency Minimum – 80%
3. Output Current Regulation Range (+/-) 5%A.
4. Total Harmonic Distortion (THD) – 20% maximum.
5. Power Factor – 0.9 minimum.
6. Crest Factor (LED Current) – 1.5 maximum.
7. FCC Class B for Conducted EMI.
8. FCC Class A for Radiated EMI.
9. Driver life – 50,000 hours minimum.

2.4 EXIT SIGNS

A. General Requirements: Comply with UL 924 and the following:

1. Sign Colors and Lettering Size: Comply with authorities having jurisdiction.

B. Internally Lighted Signs: As follows:

1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.
2. Additional Lamps for DC Operation: Two minimum, bayonet-base type, for connection to external dc source.

C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

1. Battery: Sealed, maintenance-free, nickel-cadmium type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically energizes lamp from unit when circuit voltage drops to 80 percent of nominal or below. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.

D. Self-Illuminated Exit Signs:

1. Tritium filled gas tubes with 20 year luminous life.

2.5 EMERGENCY LIGHTING UNITS

A. General Requirements: Self-contained units. Comply with UL 924. Units include the following features:

1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps, and battery is automatically recharged and floated on charger.
4. Wire Guard: Where indicated, heavy-chrome-plated wire guard arranged to protect lamp heads or fixtures.
5. Integral Time-Delay Relay: Arranged to hold unit on for fixed interval after restoring power after an outage. Provides adequate time delay to permit high-intensity-discharge lamps to restrike and develop adequate output.

2.6 EMERGENCY POWER SUPPLY UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body. Comply with UL 924.

1. Test Switch and Light-Emitting Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
2. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum 10-year nominal life.
3. Charger: Fully automatic, solid-state, constant-current type.
4. Operation: Relay automatically energizes lamp from unit when normal supply circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamp, and battery is automatically recharged and floated on charger.

2.7 LAMPS

A. LED: Color Temperature and Minimum Color-Rendering Index: 3500 K and 85 CRI, unless otherwise indicated.

2.8 FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Basic Electrical Materials and Methods," for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2 inch steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2 inch steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.

D. Rod Hangers: 1/4 inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

F. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

2.9 FINISHES

A. Fixtures: Manufacturer's standard, unless otherwise indicated.

1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
2. Metallic Finish: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.

B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.

1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners.
2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner.
3. Fixtures of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4 inch metal channels spanning and secured to ceiling tees.

C. Suspended Fixture Support: As follows:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Suspend from cable installed according to fixture manufacturer's written instructions and details on Drawings.

3.2 CONNECTIONS

A. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Advance Notice: Give dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests: As follows:

1. Verify normal operation of each fixture after installation.
2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
3. Verify normal transfer to battery source and retransfer to normal.
4. Report results in writing.

E. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

F. Corrosive Fixtures: Replace during warranty period.

3.4 CLEANING AND ADJUSTING

A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

END OF SECTION

SECTION 27 00 00

DATA/TELEPHONE SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all labor, materials, tools and equipment required for the complete installation of a complete Category 6A UTP structured cabling system and work called for in the Construction Documents. This shall include but is not limited to all UTP copper cabling, racks, cabinets, patch panels, modular connectors, optical fiber cable, cable management and accessories for a complete system.

B. The purpose of this document is to describe the minimum requirements and establish the design guidelines for the Communications Horizontal Cabling that shall support data, video and voice signals throughout the network from designated Telecommunications Rooms (TR) to Work Area Outlets (WAO) located at various desks, workstation, under floor, conference room table and other locations as indicated on the contract drawings and described herein.

C. All copper cable terminations shall comply with, and be tested to ANSI/TIA/EIA 568-B.2 Commercial Building Telecommunications Cabling Standard Part: 2 Balanced Twisted Pair Cabling Components. ANSI/TIA/EIA 568-B.2-1 Commercial Building Telecommunications Cabling Standard Part: 2 Balanced Twisted Pair Cabling Components – Addendum 1 – Transmission Performance for 4 Pair 100ohm Category 6 Cabling. ANSI/TIA/EIA 568-B.2-6 Commercial Building Telecommunications Cabling Standard Part: 2 Balanced Twisted Pair Cabling Components – Addendum 6 – Category 6 Related Component Test Procedures.

D. The electrical contractor is responsible for the provision and installation of all data/telephone raceways, including all boxes and wiremold in classrooms. The low voltage cabling contractor shall provide and install all cabling and provide terminations per the specifications the Owner will supply and install the telephone system and all electronic data equipment.

E. Perform all work in compliance with local, state, and federal codes and regulations that may affect this described work.

F. Inspection of work provided by other trades is required by contractor. Commencement of work described herein will serve as evidence that the contractor has accepted all prior and or ongoing work performed by other trades for the structured cabling system. All necessary changes done without prior written authorization shall be done at the contractors own risk and expense.

G. It is the contractors' responsibility to verify the capacity of the structured cabling pathways, and that they are sufficient for the designed structured cabling system. Any discrepancy between site conditions and the construction drawings must be brought to

the attention of the Project Manager, Architect and Owner in writing. Commencement of work implies acceptance of the site conditions by the contractor.

H. It is the contractors' responsibility to field verify all pathways, routes and dimensions necessary for the structured cabling system, and that all pathways and spaces are installed prior to cable installation. Commencement of work implies acceptance of the pathways by contractor.

I. The construction documents do not necessarily describe all the required work to satisfy their intention. On the basis of work described herein, and or indicated in the Drawings, the contractor shall furnish all items and provide all labor required providing a complete, standards based structured cabling system.

J. The contractor shall be responsible for damage to any surfaces or work disrupted as a result of there work. Repair of surfaces, including painting, shall be included as necessary.

1.2 SUBMITTALS

A. Provide a contractor-generated detailed bill of materials required for installation based on the construction documents. Clearly indicate manufacturer, part number, and quantity to be provided to complete the scope of work.

B. The communications contractor shall be certain that all correct parts are ordered per Products Section of this document and installed in accordance with manufacturers design and installation guidelines. Vendor shall submit complete parts and part numbers prior to installation of equipment, failure to do so is done at the risk of the contractor.

C. It is the contractors' responsibility to verify all part numbers in this specification and to make aware the customer of any changes that the manufacturer may have made to part numbers or product.

D. The communications contractor shall guarantee at the time of the bid that all Category 6, and fiber optic cabling and components meet or exceed specifications (including installation) of ANSI/TIA/EIA-568-B.1, 568-B.2, 568-B.3 and 569.

E. Warranty shall be a twenty-five (25) year manufacturer supported extended warranty issued to the customer upon completion of the project. The warranty shall be an applications assurance warranty guaranteeing that the installed system shall support any application present and future that is designed to run on the installed infrastructure. The warranty shall cover 100% material and labor for the installed system.

F. Documentation from the manufacturer that the contractor has authority to provide the warranty on behalf of the manufacturer.

G. Complete documentation regarding the manufacturer's warranty shall be submitted as part of the proposal. This shall include, but is not limited to: a sample of the warranty

that would be provided to the customer when the installation is complete and documentation of the support procedure for warranty issues.

1.3 REFERENCES AD STANDARDS INCORPORATED

A. Published specifications, standards, tests, or recommended methods of trade, industry, or government organizations apply to work of this section where cited by abbreviation noted below.

1. ANSI American National Standards Institute
2. EIA Electrical Industries Association of America
3. ISO International Standards Organization
4. ITU International Telecommunications Union
5. IEEE Institute of Electrical and Electronic Engineers
6. NEC National Electric Code
7. NEMA National Electrical Manufacturer's Association
8. UL Underwriters' Laboratories, Inc.
9. TIA Telecommunications Industry Association

B. Nothing in drawings, details, or specifications shall be construed to permit work not conforming to applicable laws, ordinances, rules, regulations, or industry standards. It is contractor's responsibility to field verify all conditions, including footages between and within buildings.

C. It is not the intent of the drawings, details, or specifications to repeat requirements of codes or standards except where necessary for completeness or clarity.

D. Contractor is expected to adhere to and follow the most recent standards, codes and publications.

E. ANSI/TIA/EIA 568-B.1 - Commercial Building Telecommunications Cabling Standard – Part 1: General requirements, April 1, 2001.

F. ANSI/TIA/EIA 568-B.2 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cabling Components, April 1, 2001.

G. ANSI/TIA/EIA 568-B.2-1 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Components - Addendum 1 - Transmission Performance Specifications for 4-Pair 100 Ohm Category 6 Cabling, June 1, 2002.

H. ANSI/TIA/EIA 568-B.2-2 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components - Addendum 2, December 1, 2001.

I. ANSI/TIA/EIA 568-B.2-3 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling - Addendum 3 - Additional Considerations for Insertion Loss and Return Loss Pass/Fail Determination, March 1, 2001.

J. ANSI/TIA/EIA 568-B.2-3 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling – Addendum 4 – Solderless Connection Reliability Requirements for Copper Connecting Hardware, June 2002.

K. ANSI/TIA/EIA 568-B.2-3 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling – Addendum 5 – Corrections to TIA/EIA 568-B.2, January 2003.

L. ANSI/TIA/EIA 568-B.2-3 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling – Addendum 6 – Category 6 Related Component Test Procedures, December 2003.

M. ANSI/TIA/EIA 568-3 - Optical Fiber Cabling Components Standard, April, 2002.

N. ANSI/TIA/EIA-568-3-1 - Optical Fiber Cabling Components Standard - Addendum 1 - Additional Transmission Performance Specifications for 50/125 um Optical Fiber Cables, April 1, 2002.

O. Compliance to industry standards and codes is mandatory. Do not proceed with work that is in conflict with codes and or standards without written direction from the Project Manager, Designer and Owner. Proceeding with work that is not compliant with codes and standards is done so at the contractors own risk and expense.

1.4 QUALITY ASSURANCE

A. Equipment and accessories to be the product of a vendor regularly engaged in its manufacture.

B. Supply cable, equipment, and accessories which are new, free from defects.

C. Equipment and accessories in compliance with the applicable standards listed in "References and Standards" of this Section and with applicable national, state, and local codes.

D. Items of a given type shall be of the same manufacturer.

1.5 DESIGN METHODOLOGY

A. Provide Category 6A cable to each WAO location. Each of the WAO's shall be configured per the construction documents. Cables shall be installed from the corresponding IDF to each WAO location. Contractor shall terminate WAO cables onto Uniprise Category 6A RJ45 modular connectors. At the IDF locations, WAO cables shall be terminated on rack-mounted 48-port Category 6A RJ45 modular patch panels.

B. Refer to construction documents for location, quantity and configuration of each WAO needed and cable requirement at non-classroom area.

C. Cables must not be attached to ceiling grid or lighting fixture wires.

D. Pair untwist at termination shall not exceed 3.18mm (0.125").

E. Bend radius of cable in termination area shall be no less than 4 times the outside diameter of the cable.

F. All cable and connectors shall be installed and terminated to the manufacturers' guidelines, recommendations and best industry practices.

G. Cable shall be installed in continuous lengths from point of origin to termination point, no splices allowed.

H. Communications contractor shall be responsible for providing and installing the appropriate sized j-hooks where cable tray is not used.

I. Cable bundles of up to 50 cables may be supported by 2" j-hooks. Cable bundles of up to fifty 150 cables must be supported using 4" j-hooks.

J. J-hooks are to be placed at 48 to 60 inch intervals. At no point shall the cables rest on the acoustical ceiling.

K. Contractor shall use appropriate sized j-hooks for the cable bundle size the j-hooks are to support. No more than 50 UTP cables per 2" and no more than 150 UTP cables shall be placed per 4" j-hook.

1.6 PRE-INSTALLATION CONFERENCE

A. Contractor shall attend a Pre-Installation Meeting to be conducted by the construction manager. Attendance shall be at the direction of the construction manager and may include the contractor's project manager, superintendent, subcontractors for the work of this specification section and subcontractors for work affected by this section; vendors, district technology and construction representatives and other parties affected by the work.

PART 2 - PRODUCTS

2.1 GENERAL

A. Quality of Products: Material and equipment specified herein have been selected as the basis of acceptable and desired quality of performance and have been coordinated to function as components of the specified system. Where a particular material, device, piece of equipment, or system is specified directly, the current manufacturer's specification for the same shall be considered to be part of these specifications, as if completely contained herein in every detail. Each material, device, or piece of equipment provided there under shall comply with all of the manufacturer's published specifications for that item.

B. Provide Complete: Provide all auxiliary and incidental materials and equipment necessary for the operation and protection of the work of this section as if specified in full herein.

C. Provide New: All materials provided under the work of this section shall be of the manufacturer's latest design/model and shall be permanently labeled with the manufacturer's name, model number, and serial number.

D. Similar: Similar devices shall be of the same manufacturer unless specifically noted otherwise in these specifications.

E. Continuous Use: all active circuitry shall be solid state and shall be rated for continuous use. All circuit components shall be operated in full compliance with the manufacturer's recommendations and shall contain sufficient permanent identification to facilitate replacement.

2.2 DROP CABLE WIRING CLOSET HARDWARE

A. All wiring closet data connecting hardware shall be EIA/TIA TSB-40 Category 6A compliant.

B. All station cabling in the wiring closet for data connecting hardware shall be 48-port modular panels with RJ45 modular jacks.

C. The cabling in the wiring closet for voice connecting hardware that ties from the Category 3 cabling terminated on the 110 protection block in the IDF/MDF, to the equipment rack, shall have RJ45 jacks on the front and 110 style insulation displacement connectors (IDC) for termination of drop cable on the back.

D. All modular jacks shall be eight position jacks with pin/pair assignments utilizing EIA/TIA T568B.

2.3 DROP CABLE OUTLET HARDWARE

A. All data drop outlet/station outlet connecting hardware shall be EIA/TIA TSB-40 Category 6A compliant.

B. All drop outlet/station outlet hardware shall be modular jack outlets with Category 6A RJ45 modular jacks. Data inserts will be orange for cable number one and ivory for cable number two. Faceplate color will be ivory unless otherwise specified.

C. All modular jacks shall be eight (8) position jacks with pin/pair assignments utilizing EIA/TIA T568B.

D. All modular jacks will be placed into quadplex Uniprise faceplates with any unused openings supplied with blank inserts.

2.4 SYSTEM ELECTRONIC EQUIPMENT

A. No LAN switches, concentrators, or other electronic equipment are contained within this project.

2.5 MISCELLANEOUS EQUIPMENT

A. Contractor will provide all racks, patch panels, wire management and equipment necessary to support data interconnect and hub/concentrator equipment at all MDF and IDF locations. Provide wall-mounted, double hinged, swing out cabinets, height determined by quantity of patch panels at each IDF location. Provide all locks of the same key code.

B. All associated connectors, wire management components, patch cords, cable, wire management and all miscellaneous materials required for a complete installation of the system shall be included in the package. All equipment shall be compatible with other equipment.

2.6 PARTS LIST SPECIFICATION

A. The LAN UTP cabling run inside buildings shall be 4-pair, Category 6A Uniprise CAT 6e 75N4 for non-plenum installation in gray color for voice and blue color for data., 7504 for plenum installation in gray color for voice and blue color for data, 6NF4+ for outside plant installation in black color.

B. The LAN and voice UTP cabling run between buildings shall be 4-pair, Category 3, jell filled cable, Uniprise.

C. Drop cable wiring closet hardware shall be Uniprise.

D. Drop cable outlet hardware shall be Uniprise (faceplate) and Uniprise Category 6.

E. Fiber optic rack-mounted interconnect center equipment shall be Systimax.

F. Outside plant fiber optic cabling between buildings shall be 50 micron LazerCore 300 multimode and 8.3 micron single mode rated for outdoor installation or approved equivalent.

G. Outside plant voice cabling between buildings shall be wet rated, voice grade, Category 3 PE89, Uniprise. All OSP cabling shall be terminated on 110 protection blocks.

H. Wall-mounted brackets, patch panels, and wire management equipment shall be Panduit, Chatsworth, or approved equivalent.

I. Data patch panels will be Uniprise #UNP610-48P 48-port with modular Category 6A RJ45 connectors. Provide panduit wire manager above and below patch panels.

J. Vertical cable managers shall be Panduit #WMPV545 (for side), #WMPV545 (for single rack, #WMPVC45 (for center) and #WMPHF2 (for front only), black finish.

K. Provide and install junction splice kit as necessary, Chastworth Products, Inc. #11302-001.

L. Provide and install protective end-caps, as necessary, Chastworth Products, Inc. #10642-001.

M. Provide and install 3" channel rack to runway, as necessary, Chastworth Products, Inc. #10595-112.

N. Provide and install wall angle support kits, as necessary, Chastworth Products, Inc. #11421-112.

O. Provide and install universal ladder rack, as necessary, Chastworth Products, Inc. #10250-712.

P. Voice / data patch cable shall be Uniprise UNC6 of 5' or 7' in length, gray color for voice and blue color for data.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All wire and cable shall be continuous and splice free for the entire length of run between designated IDF and station termination locations.

B. Terminate cable in designated terminal cabinets and/or on designated equipment backboards.

C. Provide service loop of cables at all junction and termination cabinets or boxes.

D. Maintain consistent absolute signal polarity at all connectors, patch points, and connection points accessible in the system.

E. Land all fiber optic cables on LC style patch panels.

F. All fiber strands will be terminated using permanent bonding techniques, as opposed to crimp-type connectors, using LC style connectors.

G. Dress or harness all wire and cable to prevent mechanical stress of electrical connectors. No wire or cable shall be supported by a connection point. Provide service loops where harnesses of different classes cross or where hinged panels are to be interconnected.

H. All equipment and wiring shall be guaranteed against defects in materials and workmanship for a one (1) year period from the startup and beneficial use of the system.

I. Provide complete record drawings showing all equipment, location, and cable routing.

J. Provide one (1) voice and data cable to the automatic temperature controller in the IDF and terminate both ends on appropriate hardware.

K. Pull two (2) voice cables to the security from the IDF and terminate on RJ45 surface mounted jacks.

L. Provide cross connects from all classrooms that loop the first and last pair of all voice jacks back to the IDF on two-pairs.

M. All non-classroom locations shall have the first pair cross connected individually back to the IDF. Provide a cut sheet to the District indicating tie pair and the associated outlets.

3.2 LABELING/TESTING

A. The contractor will label all outlets using permanent/legibly typed or machine engraved labels approved by the District. The labeling information for patch panels located in the IDFs will include the IDF number, patch panel number, sequential port number, and station number. Outlets shall be labeled to match the corresponding label in the IDF. All copper/fiber terminations for riser/backbone cables in the IDF(s) shall be labeled with the IDF number, patch panel number, and sequential port number.

1. A floor plan clearly labeled with all outlet jack numbers shall be included in the as-built plans.
2. All labels shall correspond to as-built drawings and to final test reports.
3. Each fiber will be identified at the MDF and/or IDF with:

    a. Fiber number.
    b. IDF number.
    c. MDF port number.
    d. IDF port number.

B. All field testing will be done with a Microtest PentaScanner or verified comparable TDR for UTP cable, and Laser Precision (or equivalent) OTDR for fiber optic cable. Each cable segment shall be verified to pass all specifications for installation and performance as specified by the cable and connector manufacturers.

Final system acceptance will not occur prior to delivery of test results in a printed format provided by the TDR and OTDR. Contractor will provide documentation to ensure that all fiber and UTP test results are within acceptable tolerances provided by cable and connector manufacturers published standards and performance specifications. For all fiber runs, test documentation submitted will include continuity, attenuation, and length of each installed fiber strand. All UTP and fiber cables will be tested from end to end.

C. As-Builts: Contractor shall be responsible for marking-up, manually red-lined, district provided infrastructure and building plans. These as-builts shall clearly indicate detailed inter-building fiber and copper cabling routes, fiber strand and copper pairs counts, termination locations, and voice/data station locations including numerical station/drop designations. Receipt and acceptance of as-built drawings by the district is a prerequisite prior to authorization of final payment.

END OF SECTION 27 00 00

SECTION 28 31 00

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section shall include guidelines for the furnishing of all labor, equipment, materials, and performance of all operations associated with the installation of the fire alarm and smoke detection system as indicated in Drawings and specified herein.

B. The intent of drawings and specifications is to result in a complete functional fire alarm and smoke detection system as described herein.

C. The complete installation shall conform to the applicable sections of NFPA 72, NFPA 71, local code requirements, and the California Electrical Code with particular attention to Article 760.

D. The work covered by this section of the specifications shall be coordinated with the related work as specified elsewhere under project specifications.

1.3 RELATED SECTIONS

A. Division 26 Section “Electrical General Requirements”.

B. Division 26 Section “Conductors and Cables”.

1.4 QUALITY ASSURANCE

A. Each and all components of the fire alarm system shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the "UL" label. All control equipment shall be listed under UL category UOJZ as a single control unit. Partial listing shall not be acceptable.

B. All control equipment shall have transient protection to comply with UL 864.

C. Where fire alarm circuits leave the building, additional transient protection shall be provided for each circuit.

D. Devices shall be UL listed under Standard #497B.

E. System control shall be UL listed for Power Limited Applications and all circuits shall be marked in accordance with NEC Article 760-23.

1.5 FIRE ALARM SYSTEM

A. System as indicated on drawings and specified herein has been pre-approved by the Division of the State Architect.

1.6 GENERAL SYSTEM DESCRIPTION

A. System Requirements

B. The contractor shall furnish and install a complete fire alarm and smoke detection system as described herein and drawn.

C. The contractor shall wire, connect, and make operational each and all components of the system.

D. The system shall include:

1. Sufficient fire alarm control panels (FACPs).
2. Annunciators.
3. Manual stations.
4. Automatic fire detectors.
5. Smoke detectors.
6. Duct detectors.
7. Alarm indicating appliances.
8. Miscellaneous components.
9. Wiring.
10. Terminations.
11. Raceway system.
12. All other necessary material for a complete operating system.

E. The system shall meet all national and local codes.

1.7 FIRE ALARM SYSTEM SUPPLIER

A. The fire alarm system shall be furnished and installed by:
Sound and Signal, Inc.
290 Rickenbacker Circle
Livermore, CA 94550

B. The fire alarm shall be supplied by a distributor authorized by the fire alarm system manufacturer. The supplier's personnel shall be factory trained.

C. The fire alarm system supplier shall provide point to point wiring diagrams and equipment data sheets for submittal to the local authority. Where required, the fire alarm system supplier shall obtain all permits required for the installation of the system from the local authority.

1.8 SYSTEM MANUFACTURER

A. The system and components shall be supplied by one (1) manufacturer who shall have produced similar systems for a period of at least three (3) years.

B. The manufacturer shall be able to refer to similar installations rendering satisfactory service.

1.9 SYSTEM SOFTWARE

A. The system shall be capable of self-programming upon initialization.

B. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation.

C. All software operations shall be stored in a non-volatile programmable memory within the FACP.

D. Loss of primary and secondary power shall not erase the instructions stored in memory.

E. System programming shall be password protected and shall include full upload and download capability.

F. The system shall feature flexibility for selective input/output control functions based on ANDing, ORing; NOTing, timing, and special coded operations shall also be incorporated in the resident software programming of the system.

G. Resident software shall allow for full configuration of initiating circuits. The system shall require no additional hardware to change from sensing normally open contact devices to sensing normally closed contacted devices or vice versa. Nor shall the system require additional hardware to change from sensing normally open contact devices to sensing and distinguishing between a combination of current limited and non-current limited devices on the same circuit. Nor shall the system require additional hardware for changing from a non-verification circuit to a verification circuit or vice-versa.

H. There shall be no limit, other than maximum system capacity, to the number of intelligent/analog devices which may be in alarm simultaneously.

I. The system shall have the capability of recalling alarm and trouble conditions in chronological order for the purpose of recreating an event history.

1.10 SUBMITTALS

A. Shop Drawings: Include sufficient information, clearly presented, to determine compliance with drawings and specifications.

1. Include manufacturer's name, model numbers, California State Fire Marshal's listing numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
2. Show remote annunciator layout, configurations, and terminations.

B. Certifications: Submit certification from major equipment manufacturer that proposed installer of installation and proposed performer of maintenance are authorized representatives of the manufacturer. Include names and address in certification.

1.11 OPERATION AND MAINTENANCE DATA

A. Refer to Division 1 Section "Operation and Maintenance Data".

B. Submit complete operating and maintenance manual listing manufacturer's name and including technical data sheets along with as-built shop drawings.

C. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between items of equipment.

D. Provide clear and concise description of operation that gives detailed information required to properly operate equipment and system.

1.12 QUALITY ASSURANCE

A. System shall have listing and/or approval for the following :

1. Underwriters' Laboratories, Inc.
2. California State Fire Marshal.

1.13 QUALIFICATIONS

A. Manufacture: Company specializing in the manufacture of fire alarm systems with minimum five (5) years documented experience, whose installations have rendered satisfactory service for minimum two (2) years, and who shall provide factory trained technical support.

B. Installer: Company specializing in the installation of fire alarm systems with minimum two (2) years documented experience and meeting the following criteria:

1. NICET Level 2 or greater.
2. Located within 60 mile radius of project site.
3. Authorized dealer of specified manufacturer employing factory trained personnel.

4. All parts of system stocked within offices.
5. Capable of providing service response within 24 hours or less.

C. Criminal Background Investigation Certification:

1. Contractor must comply with the fingerprinting and criminal background investigation requirements of California Education Code Section 45125.1 with respect to all contractor's employees who may have contact with District pupils in the course of providing services pursuant to the contract, and that the California Department of Justice has determined that none of those employees has been convicted of a felony, as that term is defined in Education Codes Section 45122.1.
2. A complete and accurate list of contractor's employees who may come in contact with District pupils during the course and scope of the contract must be provided to the District prior to contractor working on project.

1.14 REGULATORY REQUIREMENTS

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with these standards.

B. Applicable codes:

2016 Building Standards' Administrative Code, Part 1, Title 24, C.C.R.

2016 California Building Code (CBC), Part 2, Title 24, C.C.R.
(2015 International Building Code and 2013 California Amendments)

2016 California Electrical Code (CEC), Part 3, Title 24, C.C.R.
(2011 National Electrical Code and 2013 California Amendments)

2016 California Mechanical Code (CMC), Part 4, Title 24, C.C.R.
(2015 Uniform Mechanical Code and 2013 California Amendments)

2016 California Plumbing Code (CPC), Part 5, Title 24, C.C.R.
(2015 Uniform Plumbing Code and 2013 California Amendments)

2016 California Energy Code, Part 6, Title 24, C.C.R.

2016 California Fire Code, Part 9, Title 24, C.C.R.
(2015 International Fire Code and 2013 California Amendments)

Title 19 C.C.R. Public Safety, State Fire Marshal Regulations.

Partial list of applicable standards:

NFPA 13	Automatic Sprinkler Systems	2016 Edition
NFPA 14	Standpipe Systems (CA Amended)	2013 Edition
NFPA 17a	Wet Chemical Systems	2013 Edition

NFPA 24	Private Fire Mains (CA Amended)	2016 Edition
NFPA 72	National Fire Alarm Code (CA Amended)	2016 Edition

Reference code section for NFPA Standards, 2016 CBC (SFM) Chapter 35.

C. Underwriters' Laboratories, Inc. (UL) - USA.

D. Local and State Building Codes.

E. All requirements of the Authority Having Jurisdiction (AHJ).

1.15 PROJECT/SITE CONDITIONS

A. Detectors must be protected from dust due to construction.

1. Detectors installed and not protected from dust shall be removed and replaced at contractors expense.
2. Detectors subjected to construction debris will not be accepted.

B. Mounting devices on walls prior to final painting is not acceptable.

1.16 WARRANTY

A. Fire alarm panel shall have a five (5) year manufacturer's warranty from date of system acceptance.

B. Signaling devices shall have a two (2) year manufacturer's warranty from date of system acceptance.

C. Installation labor shall have a two (2) year warranty on all fire alarm equipment.

D. Warranties shall not begin until the fire alarm system has been completely tested and inspected by the authority having jurisdiction and the fire alarm system accepted by the school district.

E. The full cost of maintenance, labor, and materials that is required to correct any defect during the warranty period shall be included.

F. System inspections per NFPA-72 shall be included for the two (2) year warranty period.

1.17 OWNER'S INSTRUCTIONS AND TRAINING

A. Refer to Division 1 Section “Demonstration and Training”.

B. Installing contractor shall provide training on fire alarm system by factory-trained personnel.

1. Provide as a minimum two (2) on-site training sessions for school staff.

2. Provide as a minimum one (1) on-site training session for school district maintenance personnel.

C. Training sessions shall provide:

1. Instruction for operating the fire alarm system.
2. "Hands-on" demonstrations of the operation of all system components.
3. Instruct District maintenance personnel the process of changing program and functions.

C. Provide typewritten Sequence of Operation to school district and school staff.

D. Permanently attach laminated Sequence of Operation for fire alarm panel on wall next to fire alarm panel.

1.18 MAINTENANCE

A. Maintenance and testing shall be per NFPA-72 or as required by the authority having jurisdiction.

B. A preventive maintenance schedule shall be provided by the fire alarm contractor. The schedule shall include:

1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, water flow switches, and all accessories of the fire alarm system.
2. Each circuit in the fire alarm system shall be tested minimum of semi-annually.
3. Each smoke detector shall be tested in accordance with the requirements of NFPA-72.

PART 2 - MATERIALS

2.1 CONDUIT, WIRE AND BOXES

A. Conduit:

1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
2. All wiring shall be installed in conduit or raceway in non-accessible area. Conduit fill shall not exceed 40 percent or interior cross sectional area where three or more cables are contained within a single conduit. Conduit shall be ¾" minimum.
3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box, or raceway containing these conductors, as per NEC Article 760-29.
4. Wiring for 24 volt control, alarm notification, emergency communication and similar power limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient

suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or back boxes, except where conduit entry is specified by the FACP manufacturer.
6. Fire rated open cables shall be installed above accessible ceiling space, J-hooks shall be provided for cable support. No staples shall be allowed.

B. Wire:

1. All fire alarm system wiring shall be new.
2. Wiring shall be in accordance with local, state, and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 14 AWG (stranded) for initiating device circuits and signaling line circuits, and 12 AWG (stranded) for notification appliance circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR). Wires shall be supported by J-hooks. No staples shall be allowed.
5. Wiring used for the multiplex communication loop shall be twisted pair and a data grade cable meeting FPL ratings. Cable is to be that which is recommended by the fire alarm equipment manufacturer. The system shall permit use of IDC and NAC wiring in the same conduit with the communication loop.

C. Terminal Boxes, Junction Boxes, and Cabinets:

1. All boxes and cabinets shall be UL listed for their use and purpose. All boxes shall be painted red.
2. Notification circuits shall be arranged to serve like categories (manual, smoke, and water flow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to addressable reporting devices.
3. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.
4. Provide back boxes as listed below:
   a. Flush strobe, Horn/Strobes: 4" square box flush to finished wall.
   b. Exterior horns: Wheelock WBBR supplied by Sound and Signal and installed by electrical contractor.
   c. Smoke detectors/heat detectors: 4"sqaure box with 3 "O" ring.
   d. Pull stations: 4" square box with single gang ring flush to finished wall.
   e. Surface strobe, horn/strobe: Wheelock ESB-R supplied by Sound and Signal and installed by electrical contractor.

2.2 OPERATION

A. Alarm Operation:

1. The actuation of any approved alarm initiating device shall automatically initiate the following operations where furnished as part of the system.
2. All audible alarm indicating appliances within corresponding building shall sound a fire alarm signal until the system acknowledge key or the signal silence key is depressed. The alarm must sound five (5) minutes before it can be silenced.
3. All visible alarm indicating appliances shall flash continuously until the system acknowledge key or the signal silence key is depressed.
4. The off-site central monitoring station shall be notified automatically until the system acknowledge key or the signal silence key is depressed.
5. Shutdown of the corresponding HVAC system equipment shall occur until the system acknowledge key or the signal silence key is depressed.
6. Activation of all programmed outputs assigned to the initiating device shall occur until the system acknowledge key or the signal silence key is depressed.
7. Any subsequent zone alarm shall reactivate the alarm indicating appliances.

2.3 ALARM VERIFICATION

A. The activation of any system smoke detector or sensor shall initiate an alarm verification operation whereby the panel will reset the activated detector and wait for a second alarm activation.

B. The alarm verification shall operate only on smoke detector alarms. Other activated initiating devices shall be processed immediately.

D. The alarm verification operation shall be selectable by zone.

2.4 ALARM INDICATION

A. The alarm shall be displayed on a 160 character (4x40) LCD display on the local fire alarm control panel, and where applicable, the remote annunciator. The top line of 40 characters shall be the point label and the second line shall be the device type identifier.

B. The system alarm LED shall flash on the control panel and the remote annunciator until the alarm has been acknowledged. Once acknowledged, this same LED shall latch on.

C. A subsequent alarm received from another zone shall flash the system alarm LED on the control panel and remote annunciator. The LCD display shall indicate the new alarm information.

D. A pulsing alarm tone shall occur within the local building control panel and, where applicable, the remote annunciator until the event has been acknowledged.

E. A manual evacuation (drill) switch shall be provided to operate the alarm indicating appliances without causing other control circuits to be activated. However, should a true alarm occur, all alarm functions would occur as described previously.

F. The system shall have a single key that will allow the operator to display all alarms, troubles, and supervisory service conditions including the time of each occurrence.

G. Any momentary opening of an initiating or indicating appliance circuit wiring shall cause an audible signal to sound at the building fire alarm panel and, where applicable, the remote annunciator for four (4) seconds indicating a trouble condition.

2.5 ALARM WALK TEST

A. The actuation of the "enable walk test" program at the control panel shall activate the "Walk Test" mode of the system, which shall initiate the following events:

1. The off-site central monitoring station connection shall be bypassed.
2. Control relay functions shall be bypassed.
3. Walk test shall be selectable by circuit.
4. Alarms received on normal circuits shall cause the control panel to go into alarm and override the walk test mode.
5. The control panel shall show a trouble condition.
6. The alarm activation of any initiation device shall cause the audible signals to activate for two (2) seconds.
7. The panel shall automatically reset itself after signaling is complete.
8. The control panel shall automatically return to normal condition if there is no activity on a walk test circuit for a period of 30 minutes.

2.6 SUPERVISION

A. The system shall contain Class "A" or "B" independently supervised initiating device circuits. The alarm activation of any initiation circuit shall not prevent the subsequent alarm operation of any other initiation circuit.

B. Each independently supervised circuit shall include a discrete LED readout to indicate disarrangement conditions per circuit.

C. The incoming power to the system shall be supervised so that any power failure must be audible and visually indicated at the control panel and the remote annunciator. A green "power on" LED shall be displayed continuously while incoming power is present.

D. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the control panel and the remote annunciator.

E. The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.

2.7 POWER REQUIREMENTS

A. Each control panel or console shall receive 120V AC power (as noted on the plans) via a dedicated circuit.

2.8 PRODUCTS

A. Fire Alarm Control Panel: Existing Gamewell 610.

1. Panel Function:

   a. The fire alarm control panel shall provide power, annunciation, supervision, and control for the detection and alarm system, as well as alarm signaling to alert occupants of a fire or other emergency situations.
   b. Control panel construction shall be modular with solid state microprocessor based electronics.
   c. Operation shall be guided via LEDs to simplify operation under any condition.

2. Local Audible Device:

   a. A local audible device shall sound during alarm, trouble, or supervisory conditions.
   b. This audible device shall sound differently during each condition to distinguish one condition from another without having to view the panel.
   c. This audible device also shall sound during each "key-press" to provide an audible feedback to ensure that the key has been pressed properly.

3. Primary Controls:

   a. The following primary controls shall be visible through a front access panel:

      (1) 160 character liquid crystal display.
      (2) Individual red system alarm LED.
      (3) Individual red pre-alarm LED.
      (4) Individual yellow supervisory service LED.
      (5) Individual yellow trouble LED.
      (6) Individual yellow security LED.
      (7) Green "power on" LED.
      (8) Alarm acknowledge touch switch.
      (9) Supervisory acknowledge touch switch.
      (10) Trouble acknowledge touch switch.
      (11) Alarm silence touch switch.
      (12) Reset touch switch.
      (13) Manual evacuation (drill).

4. Interface Function:

a. The control panel interface shall provide the following:

(1) Setting of time and date.
(2) LED testing.
(3) Alarm, trouble, and abnormal condition listing.
(4) Enabling and disabling of each monitor point separately.
(5) Activation and deactivation of each control point separately.
(6) Changing operator access levels.
(7) Walk test enable.
(8) Running diagnostic functions.
(9) Displaying software revision level.
(10) Displaying historical logs.
(11) Displaying card status.
(12) Point listing.

5. Point Lists Menu:

a. For maintenance purposes, the following lists shall be available from the point lists menu:

(1) All points list by address.
(2) Monitor point list.
(3) Signal/speaker list.
(4) Auxiliary control list.
(5) Feedback point list.
(6) Utility point list.
(7) LED/switch status list.

6. Menu Lists:

a. Scrolling through the menu options or lists shall be accomplished in a self-directing manner in which prompting messages shall direct the user.
b. Menu lists shall be password protected.
c. 'Acknowledgment for each abnormal condition shall be provided in accordance with NFPA 72 requirements.

7. Condition Display Order:

a. The system shall display the first unacknowledged condition.

8. Acknowledge Password Protection:

a. Acknowledge functions shall feature password protection if the user has insufficient privilege to acknowledge such conditions.
b. A message shall indicate insufficient privilege but shall allow the user to view the points without acknowledging them.
c. Should the user have sufficient privilege to acknowledge, a message will be displayed informing the user that the condition has been acknowledged.

9. Acknowledgment:

   a. After all points have been acknowledged, the LEDs shall glow without blinking and the audible signal shall be silenced.
   b. The total number of alarms supervisory and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be clearly defined.

10. Alarm Silencing:

   a. When the "Alarm Silence" button is pressed, all alarm signals shall cease operation, except during alarm silence inhibit mode.
   b. It shall be possible to selectively program signal circuits as non-silenceable.

11. System Reset:

   a. The system reset button shall be used to return the system to its normal state after an alarm condition has been remedied.
   b. The LCD display shall step the user through the reset process with simple English language messages including a final message indicating the system has been returned to the normal condition.

12. Function Keys:

   a. Additional function touch switches shall be provided to access status data for the following points:

      (1) Initiating device circuits.
      (2) Indicating appliance circuits.
      (3) Auxiliary relays.
      (4) Feedback points.
      (5) All other input/output points.

13. Available Status Data:

   a. The following status data shall be available:

      (1) Primary state of point.
      (2) Zone, point address and card type information.
      (3) Circuit status.
      (4) Current priority of outputs.
      (5) Disable/enable status.
      (6) Automatic/manual control status of output points (Hand-Off/Auto switches).
      (7) Relay status.

14. Utility Points:

a. Each control panel shall have dedicated utility point supervisory and acknowledge buttons. Activation of a utility point shall activate the system supervisory service audible signal and illuminate the appropriate utility point LED on the control panel, at the master control console, and at the guard shack network control panel.
b. Pressing the appropriate acknowledge button shall silence the audible alarm, while maintaining the LED "ON" indicating the OFF-normal condition.
c. Restoring the condition to its normal position, or locally resetting the acknowledge switch shall extinguish the LED, indicating normal conditions.

15. Alarm History Log:

a. The system shall be capable of logging and storing up to 1,000 events in the History Log. These events shall be stored in a battery protected random access memory. Each recorded event shall include the time and date of that event's occurrence.
b. The following alarm history events shall be stored:

(1) Alarms.
(2) Alarm acknowledgment.
(3) Alarm silence.
(4) System reset.
(5) Alarm historical log cleared.

16. Trouble History Log:

a. The following Trouble History events shall be stored:

(1) Trouble conditions.
(2) Supervisory alarms.
(3) Trouble acknowledgment.
(4) Supervisory acknowledgment.
(5) Walk test results.
(6) Trouble Historical Log cleared.

17. Access Levels:

a. There shall be four (4) access levels with level 4 being the most secure level.
b. Level 1 actions shall not require a passcode.
c. Passcodes shall be numerical and shall consist of up to six (6) digits. Changes to passcodes shall be made only by authorized personnel.

18. Printer/CRT Interface Card:

a. The control panel shall include an output port (RS-232) capable of operating remote CRTs and/or printers from a central processing unit.

19. Remote Station Interface:

    a. A digital alarm communicator transmitter, remote station transmitter, or municipal tie shall provide interface with a remote control station for monitoring alarm and trouble conditions. Communication to central station shall be by way of two (2) supervised telephone lines.

20. Addressable Interface Module:

    a. The system must provide communication with initiating and control devices individually. All of these devices will be individually annunciated at the control panel. Annunciation shall include the following conditions for each point:

        (1) Alarm.
        (2) Trouble.
        (3) Open.
        (4) Short.
        (5) Device missing/failed.

21. All Addressable Devices:

    a. All addressable devices shall have the capability of being disabled or enabled individually.
    b. Up to 126 addressable devices may be multi-dropped from a single pair of wires. Systems that require factory re-programming to add or delete devices are unacceptable.
    c. The communication format must allow T-tapping of the circuit wiring.

22. Alarm Signaling:

    a. The fire alarm control panel shall provide sufficient power and signal circuit capability to meet the requirements of the plans and specifications and to comply with ADA (Americans with Disabilities Act) requirements.
    b. The fire alarm control panel and power supplies shall be designed to accommodate all signaling circuits and 20% spare capacity.
    c. The fire alarm control panel shall allow for field programming operation of the signal circuits (i.e. march time, zone coded, zone-signal linking, etc.). This capability shall be included in the system firmware with no additional cost to the Owner.

23. Annunciator Panel:

    a. The fire alarm control panel shall provide an LCD annunciator where drawings indicate remote area annunciation of the corresponding fire alarm signals.
    b. The annunciator shall indicate alarm, supervisory and trouble conditions by dedicated LEDs and an audible signal.

c. The annunciator shall feature an acknowledge button which, when depressed, shall silence the audible signal.
d. A 160 character LCD display shall provide the same message as displayed on the corresponding fire alarm control panel. The annunciator panel shall be capable of alarm silence and system reset functions.
e. The annunciator shall be panel mounted with controls visible through a front access panel and operable only by activating an enable key switch.
f. The annunciator panel shall be Gamewell SAN or approved equal.

24. Cabinets and Consoles:

a. The fire alarm control panel and annunciator cabinets shall be sized to accommodate all components and modules specified and required for a complete system.
b. Additional space for future expansion shall be provided in the cabinet including, as a minimum, space for:

(1) Two (2) addressable interface modules.
(2) Conventional interface modules (CIM-4 or CIM-8)
(3) Building control modules (BC-4 or BC-8).
(4) Relay modules (RM-4 or RM-8).
(5) Universal signaling modules (USM-4 or USM-8).
(6) System will have space for auxiliary power supply (APS-8) as required to provide 8 amps @ 24V DC for additional signal circuits and other functions.
(7) Cabinets shall be capable of surface or flush mounting as indicated.
(8) Sheet steel cabinets shall be completely primed and finish painted.
(9) The control consoles shall accommodate, in one section, power supply, modules and components required for fire alarm control, and system network control and annunciator.

c. Fire alarm control panel shall be Gamewell IdentiFlex 602.

B. Alarm Initiating Devices:

1. Addressable/Analog Detectors:

a. All addressable/analog detectors.
b. All addressable/analog smoke and heat detectors as specified below shall be pluggable into their bases.
c. The detector unit shall contain electronics that communicate the detector chamber analog value to determine (normal, alarm, trouble) to the control panel over two (2) wires. The same two (2) wires shall also provide power.
d. Upon removal of the head, the base shall transmit a trouble signal to the control panel.
e. It shall be possible to change out detector heads without having to reprogram or address the unit.
f. The detector's address shall be stored in the base. Detectors that store address information in the head shall not be allowed.

g. Addressable/analog detectors shall be UL listed.

2. Thermal Type Detectors:

a. Addressable Thermal Detectors shall connect with two wires to one of the control panel addressable input circuit.

b. The detectors shall use an electronic sensor to measure temperature levels in its chamber and shall, on command from the control panel, send data to the panel representing the analog temperature level.

c. Units shall be restorable with individual indicating lamp.
d. Sensitivity of detectors shall be individually adjustable at the control panel.
e. Stable operation under varying conditions such as vibration, mechanical shock, and changes in supply voltage, ambient temperature and barometric pressure.
f. A combustion gas signal verification circuit shall check to avoid false alarm.
g. A visual indication of alarm shall be provided by a LED on the detector.
h. Addressable/analog ionization detectors shall be Gamewell Model XP95-T or approved equal.

3. Photoelectric Type Detectors:

a. Addressable/analog photoelectric smoke detectors shall sense the presence of smoke particles between a light source and a receiver within the detector.
b. Sensitivity shall be set by the manufacturer and provisions shall be included to check the sensitivity at the control panel without generating smoke.
c. The unit shall be equipped with a visible LED for alarm indication.
d. The detector screen and cover shall be easily removable for field cleaning.
e. Addressable/analog photoelectric detectors shall be Gamewell Model XP95-P or approved equal.

4. Duct Type Detectors:

a. Addressable/analog duct type smoke detectors shall operate on ionization or photoelectric principal, as indicated and previously specified.
b. For mounting on ductwork, the detector shall include a sampling tube which shall be field cut to size to cover complete duct width.
c. The unit shall be restorable.
d. The detector shall be capable of stable operation under varying conditions, including vibration, mechanical shock, and changes in supply voltage, ambient temperature and barometric pressure.

e. Unit shall be complete with relay as required for fan shutdown, and auxiliary contacts for building automation system interface.
f. The unit shall be equipped with a visible LED for alarm indication.
g. The detector screen and cover shall be easily removable for field cleaning.
h. Addressable duct detectors shall be Gamewell Model No. XP95-PD or XP95-ID for use with ionization or photoelectric detectors specified above, or approved equal.

5. Addressable Manual Stations:

a. The addressable manual station shall be capable of field programming of its "address" location on an addressable initiating circuit.
b. The manual station shall be fitted with screw terminals for field wire attachment.
c. The manual station shall be non-coded, semi-recessed, and restorable.
d. The addressable manual station shall be UL listed.
e. The addressable manual station shall be Gamewell Model No. MS-95 or approved equal.
f. Supervised fire suppression system flow switches, pressure switches and other components provided by others shall be wired to meet the requirements of Division 26.
g. Conduit and wire shall comply with the requirements in other Division 26 sections.

6. Point Identification Device (PID):

a. A point identification device (PID) shall be suitable for monitoring a single conventional initiating device type such as waterflow, manual station or non-addressable detectors, and for control of evacuation indicating appliances and AHU systems. Modules shall include cover for surface mounting. The PID shall provide for feedback to the FACP for positive confirmation of the controlled devices activity.
b. A point identification device shall be provided for interfacing normally open direct contact devices to any of the addressable initiating circuits, and providing HVAC equipment shutdown. Control module relay contacts are rated 2A @ 120V AC or 28V DC, resistive.
c. A point identification device shall be Gamewell Model No. PID-95 for single point applications and devices.

7. Collective Zone Interface Module (CZI):

a. A collective zone interface module (CZI) shall be suitable to connect supervised conventional initiating device or zone of initiating such as waterflow switches, tamper switches, detectors, and other such devices to any of the intelligent analog loops.
b. The collective zone interface module shall be provided for configuring remotely located conventional zones on the analog circuit. The collective zone interface shall provide power for up to 25 conventional type

detectors. The collective zone interface are designed for surface or flush mounting and are provided with an LED for annunciation. The CZI shall utilize a 4-11/16" x 3" deep backbox and shall include a cover for surface mounting.

c. The collective zone interface module shall be Gamewell Model No. CZI-95.

8. Control Elements:

a. A remote control element (CE) shall be provided for any devices that require control, activation or feedback during fire alarm condition such as stairwell pressurization fans, smoke exhaust, and damper control. Provide Gamewell Model No. CE-95 control element with one Form C relay rated @ 10 amps @ 30V DC suitable for flush or surface mounting.

b. The control element shall be Gamewell Model No. CE-95.

C. Alarm Indicating Devices:

1. Visual Alarm Signals:

a. Visual units with flush trims and backboxes shall be provided for all locations as shown on the plans (office areas, etc.). Visual units shall provide 100 candela/second Xenon flash visible at all angles, and shall meet the requirements of the Americans with Disabilities Act (ADA).

b. Visual alarm signals shall be UL listed for fire protection service and shall produce a minimum intensity of 100 candela at all angles with a flash rate of 1 Hz minimum to 3 Hz maximum with continuously applied voltage. The xenon flash tube shall be enclosed in clear or nominal white (i.e., unfiltered or clear filtered white light) lens. The maximum pulse duration shall be two-tenths of one second (0.2 sec) with a maximum duty cycle of 40 percent. The pulse duration is defined as the time interval between initial and final points of 10 percent of maximum signal.

c. Visual signals shall be Wheelock ST or approved equal.

2. Audible Alarm Signals:

a. Alarm horns shall be 4" vibrating type and shall include backboxes, flush mounted baffle and ceiling tile bridge.

b. Where indicted on the plan, provide a Wheelock HS horn/strobe combination with backbox.

c. Audible alarms shall not exceed sound levels of 120 dbA.

d. The visual alarm shall be mounted with the alarm horn where shown.

e. Horns shall be Wheelock AH or approved equal.

D. Printers:

1. Printers shall be provided and installed as shown.

2. All printed information shall include time and date.

3. A desktop 80 column printer shall provide a hard copy record of system events. The printer shall support the following features:

   a. 120V AC input power.
   b. 180 characters per second.
   c. Kilobytes buffer capacity.
   d. UL listed.

E. Graphic Chart:

1. CAD generated graphics charts shall be installed in each building indicating building floor plan(s) and initiating devices with circuit numbers.
2. Charts shall be 11 x 17 floor plans reduced from manufacturer's approved floor plan shop drawings, framed beneath non-glare glass for wall hanging.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The contractor shall provide and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations.

B. Detector Installation:

1. Detector locations shall be no closer than 4 feet from air supply outlets, nor in beam pockets deeper than 12". No detector shall be purposely recessed in a ceiling.
2. Duct type smoke detectors shall be provided under this section of the specification for mounting by other trades.

C. Programming:

1. The contractor shall perform all programming of system including local panel programming and network programming.
2. The contractor shall perform the necessary assigning of system points.

D. Wiring:

1. The contractor shall furnish and install, in accordance with manufacturer's instruction, all wiring, conduit, and outlet boxes for installation of a complete system as described herein and drawn.
2. All wiring shall meet NEC 760 for fire alarm system wiring. All wiring shall be tagged at junction points and shall test free of grounds and shorted between conductors. All additional labor costs, incurred by the fire alarm system technician to clear wiring faults, shall be charged to the installing contractor.
3. All final terminations of the field wiring shall be made by or under the direct supervision of the fire alarm system manufacturer's representative. Any damage to the panel as a result of the contractor terminating wires or powering

up the panel without the supervision of an authorized representative of the fire alarm panel manufacturer shall be charged to the installing contractor.

E. Miscellaneous:

1. All junction boxes shall be painted red and labeled "Fire Alarm". Color coded wiring shall be maintained throughout the installation.
2. Installation of equipment and devices relevant to other work in the contract shall be closely coordinated with the appropriate subcontractors.
3. The contractor shall clean all dirt and debris from the interior and exterior of the fire alarm equipment after completion of the installation.
4. The manufacturer's authorized representative shall provide on-site supervision of installation.

3.2 ON-SITE START-UP

A. System Check: Prior to energizing any part of this system, the factory authorized representative shall check thoroughly the installation and perform pre-start checks. This representative shall check all points, fire alarm panels and complete network to ensure proper operation and make any needed repairs and/or replacements required. Sufficient time shall be included in the project bid to cover all required start-up assistance and testing.

B. Testing:

1. The contractor shall test fully the completed fire alarm system in accordance with NFPA-72 in the presence of the Owner's representative and under the direction of the factory authorized representative.
2. Testing shall be provided as required by the local fire marshal.
3. Upon successful completion of tests, the contractor shall so certify in writing to the Owner's representative.
4. Alarm horn sound levels shall be tested during Owner's normal operating conditions to ensure emergency signaling is of an approved sound level over normal ambient noise. The test shall be performed during a 90 day period following the above "Fire Marshal" test on a date to be selected by the Owner.

3.3 TRAINING

A. Refer to Division 1 Section “Demonstration and Training”.

B. Demonstration:

1. A factory authorized representative shall demonstrate the fire alarm system.
2. The demonstration shall simulate possible operating conditions and alarms.

C. Scope of Training: Training shall include documentation and hands-on exercise necessary to enable the Owner's representative to assume full programming and operating responsibility.

D. Project Bid: The project bid shall include sufficient time for required initial training and follow-up assistance.

E. Technical Support: Technical support and service by factory-trained personnel shall be available from the manufacturer's representative.

3.4 CENTRAL STATION

A. Provide general alarm supervisory and trouble relays for connection to external communicator (provided by Owner) low voltage contractor to provide one (1) four-conductor FPL rated cable between the security control panel and the FACP for remote monitoring.

3.5 GUARANTEE

A. The installing contractor shall guarantee all wiring to be free from inherent mechanical and electrical defects for a period of one (1) year from installation.

B. The manufacturer's representative shall provide the Owner's representative and Certification of Installation for the entire system certifying that the system was installed and is operating properly and in accordance with these specifications.

C. The manufacturer's representative shall provide the Owner with a three (3) year maintenance proposal upon completion of the project.

3.6 COMMISSIONING

A. Commission system in full conformance to the manufacturer's written instructions. Owner's designated representative shall witness commissioning.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Protecting existing trees, shrubs, groundcovers, plants, and grass to remain.
   2. Removing existing trees, shrubs, groundcovers, plants, and grass.
   3. Clearing and grubbing.
   4. Stripping and stockpiling topsoil.
   5. Removing above- and below-grade site improvements.
   6. Disconnecting, capping or sealing, and removing site utilities.
   7. Temporary erosion and sedimentation control measures.

B. Related Sections:
   1. Division 1 Section for temporary utilities, temporary construction and support facilities , and temporary protection facilities.
   2. Section 02 41 16 "Building Demolition" for demolition of buildings, structures, and site improvements.
   3. Section 02 41 19 "Selective Demolition" for partial demolition of buildings or structures undergoing alterations.
   4. Section 31 20 00 "Earthwork" for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

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1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Photographs sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Section 31 20 00 "Earthwork."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

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C. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.
   1. Do not store construction materials, debris, or excavated material within fenced area.
   2. Do not permit vehicles, equipment, or foot traffic within fenced area.
   3. Maintain fenced area free of weeds and trash.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.
   1. Employ an arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
   2. Replace trees that cannot be repaired and restored to full-growth status, as determined by Architect.

3.4 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities identified for removal.
   1. Arrange with utility companies to shut off indicated utilities.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

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1. Notify Architect not less than ***[5]*** working days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

C. Excavate for and remove underground utilities identified for removal.
1. Backfill excavations in accordance with requirements of Section 31 20 00 "Earthwork".

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18-inches below exposed subgrade.
4. Use only hand methods for grubbing within tree protection zone.
5. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated. Place and compact fill material in accordance with requirements in Section 02200 "Earthwork".

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials. ***[or, as required to remove all vegetation and organic laden topsoil, as determined in the field by the Geotechnical Engineer]***
1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within tree protection zones.
3. Dispose of excess topsoil as specified for waste material disposal.
a. Stripped topsoil material may be used in landscaped areas if approved in writing by Landscape Architect.

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3.7 SITE IMPROVEMENTS

A. Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Concrete and Asphalt Paving: Cleanly saw-cut vertically and in straight lines, perimeter of area to be removed, then break up and remove portion indicated.

a. At concrete paving, use existing joints to define area of removal, unless indicated otherwise.

2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.8 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION 31 10 00

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SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes: edit following list to suit project
   1. Removal of existing painted striping and markings from asphalt paving.
   2. Parking lot pavement striping.
   3. Accessible parking loading zone striping and parking symbol.
   4. Painting of curbs.
   5. Playground pavement striping.

B. Related Sections include:
   1. Section 09 91 00 "Painting" for general exterior and interior painting.

1.3 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A117.1: Standard on Accessible and Usable Buildings and Facilities.

B. California Building Code (CBC) – California Code of Regulations, Title 24, Part 2.

C. State of California Department of Transportation (Caltrans): Specification No. PTWB-01, Paint, Waterborne Traffic Line, White, Yellow and Black.

D. Code of Federal Regulations (CFR):
   1. 40 CFR, Part 59, Subpart D: National Volatile Organic Compound Emission Standards.

E. Federal Standard 595B: Colors.

F. United States Department of Justice:
   1. 2010 ADA Standards for Accessible Design.

1.4 DEFINITIONS

A. VOC: Volatile Organic Compound.

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1.5 SUBMITTALS

A. Product Data: For each type of paint product indicated.

B. Samples for Verification: For colors indicated.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Label each Sample for location and application area.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying pavement striping and markings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups as follows:
      a. Typical removal of existing striping and markings.
      b. Typical parking stall striping.
      c. Playground game marker as directed by Architect.
      d. 5-foot length of curb.
   2. Obtain Architect's approval of mockups prior to starting pavement striping and marking.
   3. Approved mockups may become part of completed Work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
   1. Product name or title of material.
   2. Product description.
   3. Manufacturer's stock number and date of manufacture.
   4. Contents by volume, for pigment and vehicle constituents.
   5. Thinning instructions.
   6. Application instructions.
   7. Color name and number.
   8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area within temperature range required by manufacturer. Maintain storage containers in a clean condition, free of foreign materials and residue. Protect stored materials from direct sunlight.

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1.8 PROJECT CONDITIONS

A. Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 50 deg F, and not exceeding 95 deg F, or within other temperature ranges as recommended in writing by paint manufacturer.

B. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent, or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Pavement markings for parking stalls designated as accessible, to be in compliance with applicable provisions of the following:
   1. California Building Code (Title 24, Part 2), Chapters 11A and 11B.
   2. United States Department of Justice's 2010 ADA Standards for Accessible Design.

2.2 PAVEMENT MARKING PAINT

A. Latex, water-borne product, lead and chromate free, ready mixed, complying with Caltrans State Specification No. PTWB-01.
   1. VOC Content: No more than that allowed by local and federal regulations when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Colors:
      a. Parking stall striping and accessible parking symbols: White, unless indicated otherwise.
      b. Striping for accessible parking stall access aisle: Blue (No. 15090 per Federal Standard 595B) at perimeter border and diagonal hatching.
      c. Accessible parking symbol background: Blue (No. 15090 per Federal Standard 595B).
      d. Playground striping: White.
      e. Curbs at general drop-off areas: White.
      f. Curbs at accessible drop-off areas and accessible parking stalls: Blue (No. 15090 per Federal Standard 595B).
      g. Curbs at No Parking zones: Red.
   3. Products: Subject to compliance with requirements, provide one of the following:
      a. Dunn-Edwards Corporation; VIN-L-STRIPE Traffic Marking Paint W801.
      b. Frazee Paint; 506 Traffic Paint.
      c. Kelly-Moore Paints; 1450 Mark Right, Latex Marking Paint.
      d. Equal product in accordance with Division 1 requirements for product substitutions.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

3.2 REMOVAL OF EXISTING STRIPING AND MARKINGS

A. Remove existing painted pavement striping and markings as indicated, using abrasive blasting or milling methods and equipment specially designed for this purpose. Minimize amount of existing paving material removed as a result of abrasive methods used in removing existing striping and markings. Recover and collect residual blasting materials, paint, and debris, and legally dispose of in a manner acceptable to authorities having jurisdiction.

3.3 PREPARATION

A. Allow paving to cure for a minimum time period of 45 days prior to start of pavement striping and marking, or for minimum time period as recommended in writing by traffic paint manufacturer, whichever is more.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the coatings. Remove dirt, oil, grease, and other foreign matter.

C. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface material film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.4 APPLICATION

A. General: Apply pavement marking paint according to manufacturer's written instructions.

1. Apply pavement marking paint with atomizing spray type striping machine equipped with separate thermostatically controlled heating devices for each paint pot and capable of applying paint such that lines and markings have uniform, straight edges, true and smooth alignments and uniform thickness.

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2. Apply paint at manufacturer's recommended rates and wet film thickness.
3. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so it cannot run beneath stencil.
4. Refer to Part 2 "Pavement Marking Paint" Article for paint colors.
5. Completed lines, markings, and curbs shall be clean, sharp, and to dimensions indicated.
    a. Ragged ends of segments, fogginess along the sides or objectionable dribbling of paint along the unpainted portions or the stripes will not be permitted.
    b. The finished paint shall have an opaque, well-painted appearance with no black or other discolorations showing through.

B. Pavement Markings:
1. Stripe and mark parking stalls and access aisles as shown on Drawings.
    a. Width of Parking Stall Striping: 4 inches.
    b. Width of Striping at Accessible Parking Stall Access Aisle: 4 inches.
        i) Paint words NO PARKING in 12-inch high letters (color: white) at foot of access aisle.
    c. Paint International Symbol of Accessibility at accessible parking stalls. Center symbol in stall, facing outwards, with lower edge of symbol aligned with end of parking stall, as indicated on Drawings. Symbol to painted white on blue background, in accordance with ANSI A117.1.
2. Stripe playground game areas as shown on Drawings.

C. Curbs: Paint curbs to designate parking or drop-off functions as indicated on Drawings, and as specified in Part 2 "Pavement Marking Paint" Article of this Section.

3.5 CLEANING

A. At completion of pavement striping and marking, and curb painting, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
1. After completing painting, clean adjacent paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging surfaces.

3.6 PROTECTION

A. Exercise reasonable precautions to protect the paint, as applied, during drying time. Remove objectionable tracking and marks.

END OF SECTION 32 17 23

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SECTION 32 17 26

TACTILE WARNING SURFACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:

1. Tactile warning surface panels with truncated domes for horizontal pedestrian traffic areas.

a. Surface-applied.

1.3 REFERENCES

A. ASTM International (American Society for Testing and Materials):

1. ASTM B 117: Standard Practice for Operating Salt Spray (Fog) Apparatus.
2. ASTM C 501: Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.
3. ASTM C 1028: Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
4. ASTM D 570: Standard Test Method for Water Absorption of Plastics.
5. ASTM D 638: Standard Test Method for Tensile Properties of Plastics.
6. ASTM D 695: Standard Test Method Compressive Properties of Rigid Plastics.
7. ASTM D 790: Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
8. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
9. ASTM G 26: Standard Practice for Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials.
10. ASTM G 155: Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.

B. California Building Code (CBC) - California Code of Regulations, Title 24, Part 2.

C. Federal Standard 595B: Colors.

D. United States Department of Justice:

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1. 2010 ADA Standards for Accessible Design.

1.4 COORDINATION

A. Coordinate installation of cast-in-place tactile warning surface panels with placement of site concrete as specified in Section 32 13 13 "Site Concrete."

B. Verify concrete slump range is within limits as recommended in writing by manufacturer of tactile warning surface cast-in-place panels.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

B. Shop Drawings: Show layout and placement of tactile warning surface panel joints and fasteners.

C. Samples for Verification: 6 inch by 6 inch sample, yellow.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For tactile warning surfaces to include in maintenance manuals. Include manufacturer's written cleaning instructions.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing tactile warning surfaces and with a record of successful in-service performance.

B. Installer Qualifications: A qualified installer who employs workers for this Project that are trained and approved by manufacturer.

C. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by testing and inspecting agency acceptable to authorities having jurisdiction.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's written instructions for delivery, storage, and handling of tactile warning surface panels.

B. Store panels on flat surfaces.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when substrate temperature and ambient temperature, and existing and forecasted weather conditions permit installation of tactile warning surfaces to be performed according to manufacturer's written instructions and warranty requirements.

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B. Close area to traffic for 48 hours after tactile warning surface installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: Comply with requirements for tactile warning surfaces as per the following:
   1. California Building Code (Title 24, Part 2) Chapter 11B.
   2. United States Department of Justice's 2010 ADA Standards for Accessible Design.

2.2 TACTILE WARNING SURFACES - GENERAL

A. General: Manufacturer's detectable warning system consisting of prefabricated panels with raised truncated dome pattern and non-slip surface field area to provide warning and directional assistance to visually impaired pedestrians.

B. Truncated Dome Profile Dimensions:
   1. Base Diameter: 0.9 inch.
   2. Diameter at Top of Truncated Dome: 0.45 inch.
   3. Dome Height: 0.2 inch.
   4. Dome Pattern: In-line square pattern.
      a. Dome Spacing: 1.67 inches minimum, 2.35 inches maximum, center to center, both ways.

2.3 TACTILE WARNING SURFACES - SURFACE-APPLIED PANELS

A. General: Manufacturer's prefabricated polymer or glass and carbon-reinforced composite panels with raised truncated dome pattern; designed for installation over hardened concrete surface; homogeneous color and pattern throughout thickness of material; waterproof and nonabsorbent; ultraviolet light-stable; approved by Division of the State Architect (DSA).
   1. Manufacturers: Subject to compliance with requirements, provide surface-applied tactile warning panels by one of the following:
      a. ADA Solutions, Inc.
      b. Engineering Plastics, Inc.; Armor-Tile.
      c. Manufacturer of equal product in accordance with Division 1 requirements for product substitutions.

B. Panel Dimensions: 24 inches by 36 inches, 24 inches by 48 inches, 24 inches by 60 inches, 36 inches by 48 inches, and 36 inches by 60 inches, as indicated on Drawings.

C. Panel Thickness: 1/8 inch minimum.

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D. Color: Yellow - Federal Standard No. 595C, Color No. 33538.

E. Physical Properties:

1. Slip Resistance: Not less than 0.80 static coefficient of friction for wet surfaces, per ASTM C 1028.
2. Water Absorption: 0.13 percent maximum, per ASTM D 570.
3. Compressive Strength: Not less than 23, 800 psi, per ASTM D 695.
4. Tensile Strength: Not less than 12,100 psi, per ASTM D 638.
5. Flexural Strength: Not less than 24, 600 psi, per ASTM D 790.
6. Wear Resistance: Not less than 500, per ASTM C 501.
7. Flame Spread: 15 or less, per ASTM E 84.
8. Weathering: No change or deterioration at 3,000 hours of exposure, per ASTM G 26 or ASTM G 155.
9. Salt and Spray Performance: No deterioration or other effects after 120 hours of exposure, per ASTM B 117.

F. Accessories: As provided by manufacturer of tactile warning surface panels.

1. Adhesive: As recommended by tactile warning surface manufacturer.
   a. VOC Content: Provide adhesive that complies with local regulatory limits for VOC content when calculated according to 40 CFR, Part 59, Subpart D (EPA Method 24).
2. Fasteners: Manufacturer's standard non-corrosive low-profile-head expansion anchors.
3. Joint and Edge Sealant: As recommended by manufacturer for sealing joints between tactile warning surface panels and at exposed edges of panels.
   a. VOC Content: Provide sealant that complies with local regulatory limits for VOC content when calculated according to 40 CFR, Part 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

B. Do not begin installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of tactile warning surface panels.

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B. At areas to receive surface-applied tactile warning panels, verify that substrates are dry and free of curing compounds, sealers, loose material, dust, oils, grease, and other foreign materials that might impair adhesive bond.

C. Prior to installation, clean backside of surface-applied tactile warning surface panels in accordance with manufacturer's written instructions.

3.3 INSTALLATION, GENERAL

A. General: Install tactile warning surface in accordance with manufacturer's written instructions.

B. Lay out tactile warning surface panels in sizes and configurations as shown on Drawings.

C. If not indicated otherwise, lay out panels from center marks established at end points, so panels at opposite ends of run are of equal width. Adjust as necessary to avoid using cut widths equal to less than one-half of a panel width at ends.

D. Maintain correct orientation of each panel, so as to maintain correct alignment of truncated domes from panel to panel.

E. Set panels true and square to adjacent curbs, ramps, and paving edges.

F. Install adjacent panels in accordance with manufacturer's written instructions to maintain correct spacing and alignment of truncated domes from panel to panel.

G. Where cut widths are necessary, cut and fit panels along a clean, straight line.

H. Where occurring adjacent to vertical surfaces, scribe, cut, and fit panels to butt neatly and cleanly to base of vertical surface.

3.4 INSTALLATION - SURFACE-APPLIED TACTILE WARNING SURFACE PANELS

A. Adhere surface-applied panels to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, and other surface imperfections.

B. After panels have been set, install drilled fasteners at manufacturer's specified locations, working in a sequence to prevent buckles in the panels.

C. Remove all concrete dust generated by drilling for fasteners.

D. Seal joints between panels and at exposed edges of panels in accordance with manufacturer's written instructions.

3.5 PROTECTION

A. Do not allow traffic on tactile warning panels until the following conditions have been met:

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1. Surface-Applied Panels: Sufficient time has been allowed for adhesive to set as per written instructions of manufacturer.

B. Once conditions have been met for allowing traffic over tactile warning panels, do not move heavy or sharp objects directly over surfaces. Place plywood or hardboard sheets over tactile warning surfaces and under objects while objects are being moved. Slide or roll objects over protective sheets without moving sheets.

3.6 CLEANING

A. Remove adhesive and other surface blemishes using cleaner recommended by tactile surface manufacturer.

B. Clean tactile warning surfaces in accordance with manufacturer's written instructions.

END OF SECTION 32 17 26

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SECTION 32 31 19

DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Decorative steel fences.
   2. Gates included as part of decorative metal fencing system:
      a. Swing gates.
   3. Concrete for fence and gate post footings.

B. Related Sections include:
   1. Section 08 71 00 "Door Hardware" for hinges, lockset, and exit hardware installed on decorative metal gates.

1.3 REFERENCES

A. American Welding Society (AWS).

B. ASTM International.
   1. ASTM A 36: Standard Specification for Carbon Steel.
   2. ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   3. ASTM A 153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   4. ASTM A 500: Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   5. ASTM A 653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   6. ASTM C 33: Standard Specification for Concrete Aggregates.
   7. ASTM C 94: Standard Specification for Ready-Mixed Concrete.
   8. ASTM C 150: Standard Specification for Portland Cement.
   9. ASTM D 1654: Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.

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10. ASTM D 2244: Standard Practice for Calculation of Color Tolerrances and Color Differences from Instrumentally Measured Color Coordinates.
11. ASTM D 2794: Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
12. ASTM D 3359: Standard Test Methods for Measuring Adhesion by Tape Test.
13. ASTM F 2200: Standard Specification for Automated Vehicular Gate Construction.
14. ASTM F 2408: Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets.

C. Builders Hardware Manufacturers Association (BHMA):
1. BHMA A156.1: Butts and Hinges.
2. BHMA A156.3: Exit Devices.
3. BHMA A156.5: Auxiliary Locks and Associated Products.

D. California Air Resources Board:
1. Suggested Control Measure for Architectural Coatings.

E. California Building Code (CBC) – California Code of Regulations, Title 24, Part 2.

F. National Electrical Manufacturers Association (NEMA):
1. NEMA MG 1: Motors and Generators.
2. NEMA 250: Enclosures for Electrical Equipment (1000 Volts Maximum).

G. National Fire Protection Association (NFPA):
1. NFPA 70: National Electrical Code.

H. National Ornamental & Miscellaneous Metals Association (NOMMA):
1. Guideline 1: Joint Finishes.

I. South Coast Air Quality Management District (SCAQMD):
1. Rule 1113 – Architectural Coatings.

J. Underwriters Laboratory (UL):
1. UL 325: Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site to review pertinent issues related decorative metal fencing.

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1.5 ACTION SUBMITTALS

A. Product Data: For decorative metal fencing and gates. Include material descriptions, constructions details, dimensions of individual components and profiles, and information on finishes.

B. Shop Drawings: For decorative metal fencing and gates. Include plans, elevations, details, and attachments to other work. Indicate layout of posts, rails, pickets, and gate swings.

1. Include accessories, hardware, gate operation, and operational clearances.
2. Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
3. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's color charts or 6-inch lengths of actual fence components showing full range of colors available for components with factory-applied color finishes.

1. Minimum Number of Colors for Selection: Two.

D. Samples for Verification: For each type of factory-applied color finish, on 6-inch lengths of actual fence components.

E. CALGreen Submittals:

1. Manufacturer's product data for factory-applied paints indicating compliance with product requirements specified in "CALGreen Requirements" Article.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For decorative metal fencing, including finish, indicating compliance with referenced standard and other specified requirements.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For gate operators to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of decorative metal fencing required for this Project.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Include 10-foot length of fence and one gate complying with requirements.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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1.9 FIELD CONDITIONS

A. Field Measurements: Verify layout information for decorative metal fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace decorative metal fencing that does not comply with requirements or that fails in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Deterioration of metals and other materials beyond normal weathering.
      c. Failure of operating components to function properly.
      d. Deterioration of factory-applied finish beyond normal weathering, including peeling, cracking, chipping, blistering, and corroding of factory-applied finish.
   2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CALGREEN REQUIREMENTS

A. General: Conform with all applicable requirements of the California Green Building Standards Code (CALGreen).

B. Paints and Coatings: Provide paints and coatings that comply with VOC limits in Table 1 of the California Air Resources Board (ARB) Architectural Coatings Suggested Control Measure, unless more stringent local limits apply.

2.2 PERFORMANCE REQUIREMENTS

A. Decorative metal fencing and gates, including minimum post size and maximum post spacing, and footing dimensions, shall withstand the following loads and stresses:
   1. Vertical and horizontal loads, and loads on infill areas, as required by ASTM F 2408 for Industrial class fencing.
   2. Wind loads and stresses calculated based on requirements of the California Building Code, using factors defined therein and applicable to local site conditions.
      a. Wind Speed (Ultimate Design Wind Speed V_{ult}): 115 mph.

B. Allowable Soil Values for Footing Design:
   1. Bearing Value: 1,500 lbs per square foot.
   2. Lateral Bearing Pressure: 100 lbs per square foot.

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3. Lateral Sliding Resistance: 130 lbs per square foot.

C. Thermal Movements: Provide decorative metal fence and gate system that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.3 DECORATIVE METAL FENCING

A. Decorative Metal Fencing: Complying with ASTM F 2408 for Industrial application; identical appearance from both sides of fence; manufacturer's adjustable rake design to allow fence to accommodate different ground slopes with posts and pickets plumb to ground.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Ameristar; Montage II.
      i) Style: Majestic (3-Rail).
   b. Equal product in accordance with Division 1 requirements for product substitutions.

B. Posts:

1. End and Corner Posts: Square tubes formed from 0.105-inch nominal thickness (12 gage), galvanized steel sheet.
2. Posts at Swing Gate Openings: Square galvanized steel tubing or square tubes formed from galvanized steel sheet. Size and wall thickness as required to withstand loads and stresses to be expected for size and configuration of gate.
3. Posts at Horizontal-Slide Gate Openings Up to 12 Feet: Square galvanized steel tubing, size and wall thickness as required to withstand loads and stresses to be expected for size and configuration of gate.
4. Guide Posts for Horizontal Slide Gate: Square galvanized steel tubing, of size and wall thickness as required to withstand loads and stresses to be expected for size and configuration of gate; installed adjacent to gate post to permit gate to slide in space between.

C. Post Caps: Manufacturer's metal caps for closing off exposed open end at top of post, formed from steel and hot-dip galvanized after forming. Finish and color to match post.

1. Style: Flat top.

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D. Rails: Double-wall channels formed from 0.105-inch nominal thickness (12 gage), galvanized steel sheet; 1-3/4 inches by 1-3/4 inches.

E. Pickets: 1-inch square tubes from 0.075-inch nominal thickness (14 gage), galvanized steel sheet.
   1. Terminate pickets at top rail for flush top appearance.
   2. Picket Spacing: 4.715 inches on center (3.715 inches clear between pickets).

F. Fasteners: Manufacturer's standard concealed fastening system.

G. Fabrication:
   1. Attach pickets to rails with manufacturer's fusion welding process, to produce a seamless, spatter-free appearance.
   2. Fabricate sections with clips welded to posts for field fastening to rails.
   3. Drill posts and clips for fasteners before finishing to maximum extent possible.

H. Finish: Electrostatic finish.

2.4 SWING GATES

A. General: Swinging gates of the same general design and construction as adjacent decorative fencing system in which gate occurs.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Ameristar; Montage II.
         i) Style: Majestic.
      b. Equal product in accordance with Division 1 requirements for product substitutions.

B. Gate Configuration: Single-leaf.

C. Gate Opening Width: As indicated.

D. Automated vehicular gates shall comply with ASTM F 2200, Class II.

E. Gate Frames and Bracing: Fabricated from galvanized steel tubing or square tubes formed from galvanized steel sheet. Size and wall thickness as required to withstand loads and stresses based on gate size and configuration. Fully welded frame.
   1. Additional Rails: Provide as required to withstand loads and stresses based on gate size and configuration.

F. Picket Size, Configuration, and Spacing: Match adjacent fencing.

G. Gate Posts: Fabricated from galvanized steel square tubes of dimensions and wall thickness as required to withstand expected loads and stresses based on gate size and configuration.

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H. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than 5 feet wide. Provide center gate stops and cane bolts for pairs of gates. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

I. Hardware:

1. Hinges: BHMA A156.1, Grade 1, suitable for exterior use; weight as required by size and weight of gate.
   a. Finish: Painted to match gate frame.
2. Rim Locksets: BHMA A156.5, Grade 1, suitable for exterior use.
   a. Mounting Plate: Configuration necessary for mounting lockset. Fabricate from 1/8-inch thick galvanized steel plate.
3. Exit Hardware: BHMA A156.3, Grade 1, Type 1 (rim exit device), with push pad actuating bar, suitable for exterior use.
   a. Function: 08 – Entrance by lever. Key locks or unlocks lever.
   b. Mounting Channel: Bent-plate channel formed from 1/8-inch-thick, galvanized steel plate. Channel spans gate frame. Exit device is mounted on channel web, recessed between flanges, with flanges extending 1/8 inch beyond push pad surface.

J. Cane Bolts: Provide for inactive leaf of pairs of gates. Fabricated from 3/4-inch diameter, round steel bars, hot-dipped galvanized after fabrication. Finish to match gates. Provide galvanized-steel pipe strikes to receive cane bolts in both open and closed positions.

K. Finish exposed welds to comply with NOMMA Guideline 1, Finish #2 – completely sanded joint, some undercutting and pinholes okay.

L. Finish: Electrostatic finish.

2.5 STEEL

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Steel Tubing: ASTM A 500, cold-formed steel tubing.

C. Galvanized Steel Sheet: ASTM A 653, structural quality, Grade 50, with G90 (Z275) coating.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Concrete: Normal-weight concrete with not less than 3000-psi compressive strength (28 days), 3-inch slump. Measure, batch, and mix according to ASTM C 94.

1. Portland cement: ASTM C 150, Type I or II.

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2. Aggregate: ASTM C 33; 1-inch maximum size.
3. Water: ASTM C 94; potable.

2.7 STEEL FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 123 for steel tubes and shapes, and with ASTM A 153 for steel and iron hardware.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Finishing of Galvanized Items: After galvanizing, thoroughly clean surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with a conversion coating compatible with the organic coating to be applied over it.

C. Electrostatic Finish: Manufacturer's electrodeposition coating process consisting of a multi-stage pretreatment/wash (with zinc phosphate), followed by application of epoxy primer and acrylic topcoat.
   1. Color: Black.
   2. Coating Thickness: 2 mils minimum.
   3. Performance Requirements: Meeting requirements of the following:
      a. Adhesion: ASTM D 3359, Method B.
      b. Corrosion Resistance: ASTM D 1654, 1,500 hours.
      c. Impact Resistance: ASTM D 2794, 60 inch-lbs minimum.
      d. Weathering Resistance: ASTM D 2244, 1000 hours minimum.
   4. VOC Content:
      a. Complies with requirements specified in "CALGreen Requirements" Article.
      b. Complies with requirements specified in "LEED v4 Requirements" Article.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.

B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

A. Stake locations of fence lines, gates, and end and corner posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 DECORATIVE METAL FENCING INSTALLATION

A. Install decorative metal fencing according to manufacturer's written instructions.

B. Where occurring along property line, install fencing on established lines inside property line.

C. Install fences by setting posts and fastening rails to posts.

D. Post Excavation: Drill or hand-excavate holes in firm undisturbed soil for posts to diameters and depths indicated, but not less than a diameter of four times post size and depth of not less than 24 inches plus 3 inches for each foot or fraction of a foot that fence height exceeds 4 feet.

E. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
   1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
   2. Concrete Fill: Place concrete around posts and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
      a. Top of concrete footing shall be 2 inches below grade to allow covering with surface material. Slope top surface of concrete to drain water away from post.
   3. Posts Set in Concrete: Extend post to within 6 inches of specified excavation depth, but not closer than 3 inches to bottom of concrete.

F. Space posts uniformly at spacing indicated.

G. Fence Panels: Install fence panels, consisting of horizontal rails and vertical pickets, spanning between fence posts. Set panels accurately in location, alignment, and elevation.

H. Where ground slopes, align horizontal rails to follow ground slope between posts, using adjustable rail/post connections.

I. Where bare metal surfaces are exposed due to cutting, drilling or other field fabrication methods, apply manufacturer's primer and coating over exposed metal surfaces to maintain continuity of corrosion protection equal in performance to factory-applied portions.

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3.4 DECORATIVE METAL GATE INSTALLATION

A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.5 ADJUSTING

A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

3.6 DEMONSTRATION

A. Train Owner's personnel to adjust, operate, and maintain gates.

END OF SECTION 32 31 19

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