

PROJECT MANUAL
OF CONSTRUCTION DOCUMENTS

STEM Building Art Classroom

**CONVERSION OF THE
STEM BUILDING WOOD SHOP
INTO AN ART CLASSROOM**

San Juan Island School District #149
285 Blair Avenue
PO Box 458
Friday Harbor, WA 98250

Fred Woods
Superintendent

Architect

HKP ARCHITECTS
204 West Montgomery
Mount Vernon, WA 98273
360.336.2155
www.hkpa.com

January 25, 2023

San Juan Island School District

285 Blair Avenue
Friday Harbor, WA 98250
P.O. Box 458
(360) 378-4133
Fax (360) 378-6276

Fred Woods
Superintendent of Schools

January 25, 2023

Dear Potential Bidder,

Enclosed is an invitation to bid on the Conversion of The STEM Building Wood Shop into An Art Classroom at Friday Harbor High School. When submitted, bids must include completed Form of Proposal, non-collusion affidavit, and evidence of insurance and bonding capability. Bid packets will be available at the site inspection meeting.

Two pre-bid site inspection meetings have been scheduled for **Tuesday, February 7, and Thursday, February 9, at 10:30 a.m.** at Friday Harbor High School, 45 Blair Avenue, Friday Harbor, WA 98250.

Bid Opening is scheduled for Tuesday, February 28, 2023.

A Substantial Completion date has been set for **July 22, 2023**. Late penalties will apply.

Please call or email if you require further information about the needs of the San Juan Island School District or the requirements of this project.

Brock Hauck
Facilities and Maintenance Supervisor
W(360) 370-7105 C(360) 298-8534
brockhauck@sjisd.org

HKP Architects/ Brian Poppe
W(360) 336-2155
bpoppe@hkpa.com

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SECTION 00 03 00 - INVITATION TO BID

NOTICE TO BIDDERS:

Sealed bids will be received by San Juan Island School District, 285 Blair Ave., Friday Harbor, WA 98250 for the Conversion of The STEM Building Wood Shop Into An Art Classroom, as described in the Project Manual and Construction Drawings dated January 25, 2023. Bids will be accepted until 3:00 PM on Thursday, February 22, 2023 at the District offices, 285 Blair Ave. At that time, they will be opened. Bidders and others properly interested are invited to be present at the bid opening. Certified check, bank cashier’s check, or bid bond shall be required with the bid, equal to five percent (5%) of the base bid plus any additive alternates. **Make check or bid bond payable to San Juan Island School District No. 149.**

The Owner reserves the right to reject any and all bids or to waive any informalities or irregularities in any bid.

Bids shall be enclosed in an opaque, sealed envelope, bearing the name and address of the bidder and addressed to the Owner. Mark lower left corner of the envelope **"STEM Building Art Classroom"**. Bids may be electronically submitted, but this must be approved at least 72 hours in advance by written request submitted to Fred Woods, Superintendent of SJISD at fredwoods@sjisd.org. Bidders are encouraged to call ahead to be certain of hours for in-person submission, (360) 378-4133. Bidders may also contact Facility Director Brock Hauck at (909) 322-0022.

Two pre-bid site inspection meetings have been scheduled for Tuesday, February 7, and Thursday, February 9, at 11:00 a.m. at Friday Harbor High School, 45 Blair Avenue, Friday Harbor, WA 98250. This time has been chosen to correspond to the 9:05 AM Anacortes-to-Friday Harbor and the 1:55 PM Friday Harbor-to-Anacortes Washington State Ferry sailings.

No bidder may withdraw their bid after the Time set for the bid opening.

The bid and contract are subject to equal employment opportunity provisions of Washington State law and compliance with prevailing wage standards of RCW Chapter 39.12 and all reporting requirements relating to each of the above.

DOCUMENTS:

The Project Manual and Drawings may be examined at the following offices:

San Juan Island School District No. 149
285 Blair Avenue, PO Box 458
Friday Harbor, WA 98250

(360) 378-4133
www.sjisd.wednet.edu

HKP Architects
204 West Montgomery
Mount Vernon, WA 98273

(360) 336-2155
www.hkpa.com

iSqFt
3825 Edwards Rd, #801
Cincinnati, OH 45209

(877) 753-7043
Oregon-Washington@isqft.com

Construct Connect
232 W 5th Ave.
Eugene, OR 97401

(541) 684-4665
www.constructconnect.com
content@constructconnect.com

Builders Exchange of Washington, Inc.

(425) 258-1303
production@bxwa.com

Weekly Construction Reporter
2215 Midway Ln
Bellingham, WA

(360) 738-0370
info@wcrinc.com

Bona fide Bidders may obtain a copy of the Documents via PDF files transmitted to the Bidders Email address by request from the School District. Hard-copy sets of the Documents are available from the School District upon receipt of check(s) payable to San Juan Island School District for a Deposit in the amount of \$100.00 for each set.

Refund of Deposits: The full amount of the previously paid plan deposit for hard-copy sets only will be refunded to bona fide bidders upon return of full sets of documents in good condition to the School District office within 10 days after receipt of bids. Plan holders who do not submit a bona fide bid and do not return the documents on or before the day and prior to the time set for opening bids will forfeit the full amount of their deposits.

BY ORDER OF:

Fred Woods, Superintendent
San Juan Island School District No. 149

Published:

The Journal of the San Juan Islands
Daily Journal of Commerce
Washington State Office for Minority and Women's Enterprises

SECTION 00 10 00 - INSTRUCTION TO BIDDERS

INSTRUCTIONS TO BIDDERS:

Standard form of the American Institute of Architects, "Instruction to Bidders, AIA Document A701 - 2018 edition, shall apply in all respects to the Bidders and Sub bidders.

A sample AIA Document A701-2018 is included in this section.



AIA[®] Document A701[™] – 2018

Instructions to Bidders

for the following Project:
(Name, location, and detailed description)

THE OWNER:
(Name, legal status, address, and other information)

THE ARCHITECT:
(Name, legal status, address, and other information)

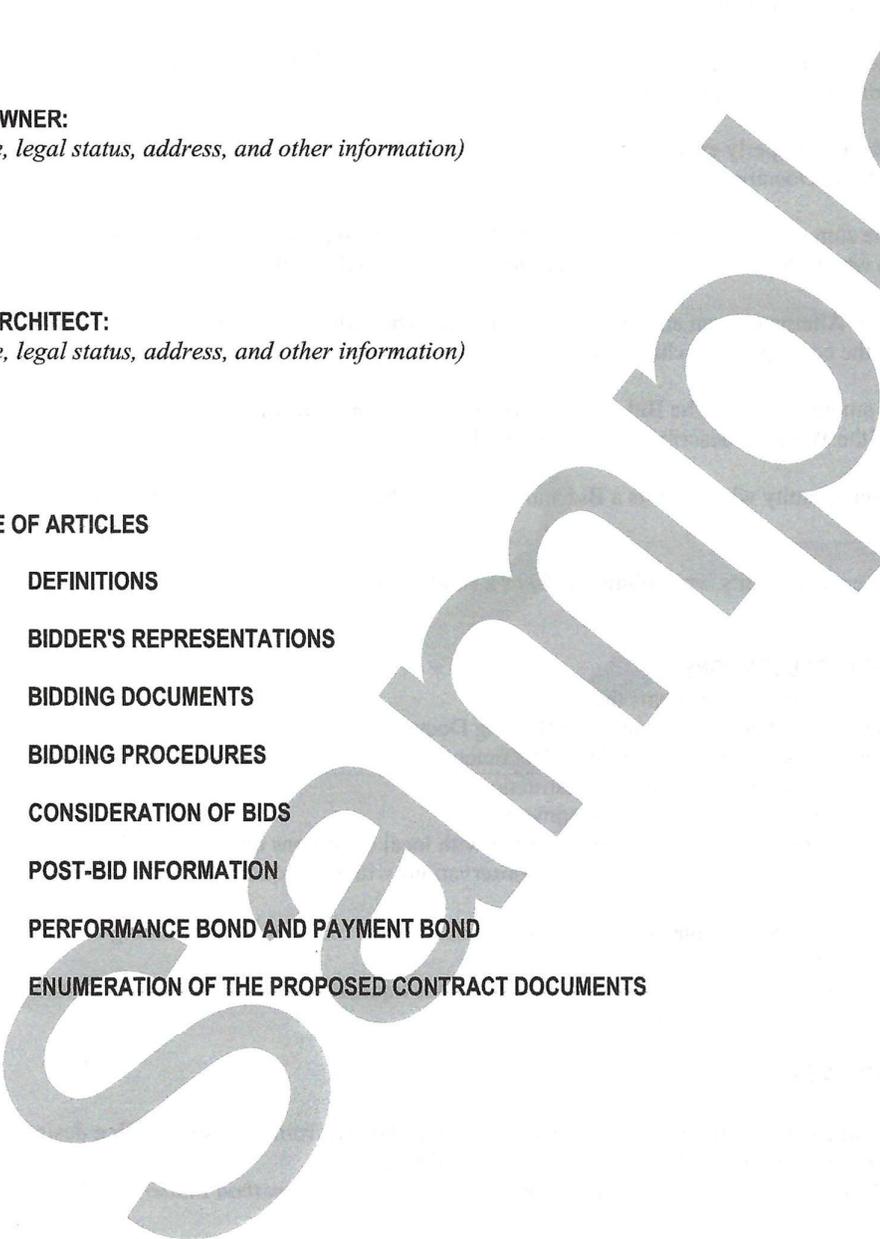
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This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612[™]-2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.



Init.

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- .1 the Bidder has read and understands the Bidding Documents;
- .2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- .3 the Bid complies with the Bidding Documents;
- .4 the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- .5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- .6 the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids. *(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)*

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.

§ 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.

§ 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security:

(Insert the form and amount of bid security.)

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning _____ days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:

(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:

(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.

(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

- .1 AIA Document A101™-2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)
- .2 AIA Document A101™-2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)
- .3 AIA Document A201™-2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)
- .4 AIA Document E203™-2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

Init.

.5 Drawings

Number	Title	Date
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.6 Specifications

Section	Title	Date	Pages
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.7 Addenda:

Number	Date	Pages
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.8 Other Exhibits:

(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.)

The Sustainability Plan:

Title	Date	Pages
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Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
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.9 Other documents listed below:

(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

SECTION 00 20 00 – SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

Supplementary Instructions to Bidders amend, modify and/or delete provisions of the “Instructions to Bidders,” AIA document A701. Where a portion of the Instruction to Bidders is amended, modified or deleted by these Supplementary Instructions, the unaltered portions of the Instructions to Bidders shall remain in effect.

The retail sales tax shall not be included in the bid sums; the Owner will pay such taxes proportionally with each periodic payment. The local building department plan check fee, building permit fee and cost to pick-up the building permit has been paid by the Owner and shall not be included in the Bid. All other necessary fees, licenses and taxes shall be paid by the Contractor and included in the Bid.

The Contractor and all Sub-Contractors doing business in the Town of Friday Harbor are required to obtain a Town of Friday Harbor business license through Washington State Dept. of Revenue.

ARTICLE 2 - BIDDER’S REPRESENTATIONS

2.1. The Contractor shall be responsible for having taken, before Bidding, all steps necessary to review conditions which can affect the Work or the cost thereof. Failure by Contractor to fully acquaint himself with conditions which may affect the Work (including, but not limited to, conditions related to transportation, handling, storage of materials, availability of labor, water, roads, limitation on access, weather, topographic and subsurface conditions, other separate contracts by the Owner which may affect the work of Contractor and require increased coordination and scheduling efforts by Contractor, applicable provisions of law and the character and availability of equipment and facilities needed preliminary to and during the prosecution of the Work), shall not relieve the Contractor of its responsibilities under the Contract Documents or be cause for adjustment of the Contract Sum.

SECTION 00 40 00 - FORM OF PROPOSAL

Bidder's Name: _____

Address: _____

Telephone: _____

Email address: _____

To: Board of Directors
San Juan Island School District No. 149
285 Blair Avenue
PO Box 458
Friday Harbor, WA 98250

The undersigned, having carefully examined the specifications entitled:

Project Manual of Construction Documents for a **Conversion and Renovation of The STEM Building Wood Shop into An Art Classroom in Friday Harbor, WA** and the Drawings similarly titled, and being familiar with all the conditions affecting the construction of the proposed Project, hereby propose to furnish all labor, materials and supplies and to construct the Project and perform all work as required by and in strict accordance with the Contract Documents at the prices stated below.

BASE BID: _____
_____ Dollars (\$ _____)

ADD ALTERNATE #1 If any, _____
_____ Dollars (\$ _____).

SALES TAX AND PERMITS: The retail sales tax shall not be included in the Bid sums; the Owner will pay such taxes on each progress payment. All other necessary fees and taxes, except for the building permit, shall be paid by the Contractor and included in the bid.

TIME OF COMPLETION: The Contractor agrees, if awarded the Contract, to achieve substantial completion no later than July 22, 2023.

SECTION 00 40 00 – FORM OF PROPOSAL (CONT.)

LIQUIDATED DAMAGES: The Contractor agrees, if awarded the Contract, that the Owner may retain from the compensation otherwise due, the liquidated damage costs incurred by the Owner, beginning July 22, 2023 that the work remains not substantially completed, Five Hundred Dollars (\$500.00) per day.

INSURANCE: The Contractor shall provide proof of and maintain during the full course of construction, Comprehensive General Liability and automobile liability insurance with a minimum combined single limit of One Million Dollars (\$1,000,000.00).

CONTRACT AND BOND: If the undersigned is notified of the acceptance of this bid, within 21 days after the opening of the Bids, he/she agrees to execute a Contract for the above work for a compensation established by adjusting the Base Bid by any Alternate Bids (if accepted) selected by the Owner, in the Form of Agreement required by the Specifications, and to furnish Performance and Labor and Material Payment Bond required by the Specifications.

AFFIRMATION:

_____		_____	
Bidder		Address	
_____		_____	
By	Title	City	
		_____	_____
		State	Zip Code
_____	_____	_____	_____
Sole Proprietor	Partnership	Corporation	Other

If Corporation - State of Incorporation _____

Contractor's Registration No.: _____

Telephone Number: _____ Email Address: _____

SECTION 00 50 00 - CONTRACT FORMS

FORM OF AGREEMENT: The "Standard Form of the American Institute of Architects, No. A-105, entitled "Standard Short Form of Agreement Between Owner and Contractor, 2017 Edition, shall be designated and made the FORM OF AGREEMENT for this Contract. A sample form of the AIA Form of Agreement is included in this Section.

PERFORMANCE BOND AND PAYMENT BOND: A bond covering performance and labor and materials payment, as required by RCW 39.08 of the State Statutes for Public Work, shall be designated and made the form of performance and labor and material payment for this Contract.



AIA[®] Document A105[™] – 2017

Standard Short Form of Agreement Between Owner and Contractor

AGREEMENT made as of the _____ day of _____ in the year _____
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

The Architect:
(Name, legal status, address and other information)

The Owner and Contractor agree as follows.

TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
- 3 CONTRACT SUM
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- 17 OTHER TERMS AND CONDITIONS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contractor shall complete the Work described in the Contract Documents for the Project. The Contract Documents consist of

- .1 this Agreement signed by the Owner and Contractor;
- .2 the drawings and specifications prepared by the Architect, dated _____, and enumerated as follows:

Drawings:
Number

Title

Date

Specifications:
Section

Title

Pages

.3 addenda prepared by the Architect as follows:

Number	Date	Pages
--------	------	-------

.4 written orders for changes in the Work, pursuant to Article 10, issued after execution of this Agreement;
and

.5 other documents, if any, identified as follows:

ARTICLE 2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 2.1 The Contract Time is the number of calendar days available to the Contractor to substantially complete the Work.

§ 2.2 Date of Commencement:

Unless otherwise set forth below, the date of commencement shall be the date of this Agreement.

(Insert the date of commencement if other than the date of this Agreement.)

§ 2.3 Substantial Completion:

Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion, as defined in Section 12.5, of the entire Work:

(Check the appropriate box and complete the necessary information.)

Not later than () calendar days from the date of commencement.

By the following date:

ARTICLE 3 CONTRACT SUM

§ 3.1 The Contract Sum shall include all items and services necessary for the proper execution and completion of the Work. Subject to additions and deductions in accordance with Article 10, the Contract Sum is: (\$)

§ 3.2 For purposes of payment, the Contract Sum includes the following values related to portions of the Work:
(Itemize the Contract Sum among the major portions of the Work.)

Portion of the Work	Value
---------------------	-------

§ 3.3 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and hereby accepted by the Owner:

(Identify the accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

Init.

§ 3.4 Allowances, if any, included in the Contract Sum are as follows:
(Identify each allowance.)

Item	Price
------	-------

§ 3.5 Unit prices, if any, are as follows:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit (\$0.00)
------	-----------------------	-------------------------

ARTICLE 4 PAYMENTS

§ 4.1 Based on Contractor's Applications for Payment certified by the Architect, the Owner shall pay the Contractor, in accordance with Article 12, as follows:

(Insert below timing for payments and provisions for withholding retainage, if any.)

§ 4.2 Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate below, or in the absence thereof, at the legal rate prevailing at the place of the Project.

(Insert rate of interest agreed upon, if any.)

%

ARTICLE 5 INSURANCE

§ 5.1 The Contractor shall maintain the following types and limits of insurance until the expiration of the period for correction of Work as set forth in Section 14.2, subject to the terms and conditions set forth in this Section 5.1:

§ 5.1.1 Commercial General Liability insurance for the Project, written on an occurrence form, with policy limits of not less than (\$) each occurrence, (\$) general aggregate, and (\$) aggregate for products-completed operations hazard.

§ 5.1.2 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than (\$) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance, and use of those motor vehicles along with any other statutorily required automobile coverage.

§ 5.1.3 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided that such primary and excess or umbrella insurance policies result in the same or greater coverage as those required under Section 5.1.1 and 5.1.2, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require exhaustion of the underlying limits only through the actual payment by the underlying insurers.

Init.

§ 5.1.4 Workers' Compensation at statutory limits.

§ 5.1.5 Employers' Liability with policy limits not less than (\$) each accident, (\$) each employee, and (\$) policy limit.

§ 5.1.6 The Contractor shall provide builder's risk insurance to cover the total value of the entire Project on a replacement cost basis.

§ 5.1.7 Other Insurance Provided by the Contractor

(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage

Limits

§ 5.2 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance and shall provide property insurance to cover the value of the Owner's property. The Contractor is entitled to receive an increase in the Contract Sum equal to the insurance proceeds related to a loss for damage to the Work covered by the Owner's property insurance.

§ 5.3 The Contractor shall obtain an endorsement to its Commercial General Liability insurance policy to provide coverage for the Contractor's obligations under Section 8.12.

§ 5.4 Prior to commencement of the Work, each party shall provide certificates of insurance showing their respective coverages.

§ 5.5 Unless specifically precluded by the Owner's property insurance policy, the Owner and Contractor waive all rights against (1) each other and any of their subcontractors, suppliers, agents, and employees, each of the other; and (2) the Architect, Architect's consultants, and any of their agents and employees, for damages caused by fire or other causes of loss to the extent those losses are covered by property insurance or other insurance applicable to the Project, except such rights as they have to the proceeds of such insurance.

ARTICLE 6 GENERAL PROVISIONS

§ 6.1 The Contract

The Contract represents the entire and integrated agreement between the parties and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a written modification in accordance with Article 10.

§ 6.2 The Work

The term "Work" means the construction and services required by the Contract Documents, and includes all other labor, materials, equipment, and services provided, or to be provided, by the Contractor to fulfill the Contractor's obligations.

§ 6.3 Intent

The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all.

§ 6.4 Ownership and Use of Architect's Drawings, Specifications and Other Documents

Documents prepared by the Architect are instruments of the Architect's service for use solely with respect to this Project. The Architect shall retain all common law, statutory, and other reserved rights, including the copyright. The Contractor, subcontractors, sub-subcontractors, and suppliers are authorized to use and reproduce the instruments of service solely and exclusively for execution of the Work. The instruments of service may not be used for other Projects or for additions to this Project outside the scope of the Work without the specific written consent of the Architect.

Init.

§ 6.5 Electronic Notice

Written notice under this Agreement may be given by one party to the other by email as set forth below.

(Insert requirements for delivering written notice by email such as name, title, and email address of the recipient, and whether and how the system will be required to generate a read receipt for the transmission.)

ARTICLE 7 OWNER

§ 7.1 Information and Services Required of the Owner

§ 7.1.1 If requested by the Contractor, the Owner shall furnish all necessary surveys and a legal description of the site.

§ 7.1.2 Except for permits and fees under Section 8.7.1 that are the responsibility of the Contractor, the Owner shall obtain and pay for other necessary approvals, easements, assessments, and charges.

§ 7.1.3 Prior to commencement of the Work, at the written request of the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence.

§ 7.2 Owner's Right to Stop the Work

If the Contractor fails to correct Work which is not in accordance with the Contract Documents, the Owner may direct the Contractor in writing to stop the Work until the correction is made.

§ 7.3 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies, correct such deficiencies. In such case, the Architect may withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the cost of correction, provided the actions of the Owner and amounts charged to the Contractor were approved by the Architect.

§ 7.4 Owner's Right to Perform Construction and to Award Separate Contracts

§ 7.4.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project.

§ 7.4.2 The Contractor shall coordinate and cooperate with the Owner's own forces and separate contractors employed by the Owner.

ARTICLE 8 CONTRACTOR

§ 8.1 Review of Contract Documents and Field Conditions by Contractor

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

§ 8.1.2 The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner. Before commencing activities, the Contractor shall (1) take field measurements and verify field conditions; (2) carefully compare this and other information known to the Contractor with the Contract Documents; and (3) promptly report errors, inconsistencies, or omissions discovered to the Architect.

§ 8.2 Contractor's Construction Schedule

The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work.

§ 8.3 Supervision and Construction Procedures

§ 8.3.1 The Contractor shall supervise and direct the Work using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work.

§ 8.3.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner, through the Architect, the names of subcontractors or suppliers for each portion of the Work. The Contractor shall not contract with any subcontractor or supplier to whom the Owner or Architect have made a timely and reasonable objection.

§ 8.4 Labor and Materials

§ 8.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work.

§ 8.4.2 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract Work. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

§ 8.5 Warranty

The Contractor warrants to the Owner and Architect that: (1) materials and equipment furnished under the Contract will be new and of good quality unless otherwise required or permitted by the Contract Documents; (2) the Work will be free from defects not inherent in the quality required or permitted; and (3) the Work will conform to the requirements of the Contract Documents. Any material or equipment warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 12.5.

§ 8.6 Taxes

The Contractor shall pay sales, consumer, use, and similar taxes that are legally required when the Contract is executed.

§ 8.7 Permits, Fees and Notices

§ 8.7.1 The Contractor shall obtain and pay for the building permit and other permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Work.

§ 8.7.2 The Contractor shall comply with and give notices required by agencies having jurisdiction over the Work. If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs. The Contractor shall promptly notify the Architect in writing of any known inconsistencies in the Contract Documents with such governmental laws, rules, and regulations.

§ 8.8 Submittals

The Contractor shall promptly review, approve in writing, and submit to the Architect shop drawings, product data, samples, and similar submittals required by the Contract Documents. Shop drawings, product data, samples, and similar submittals are not Contract Documents.

§ 8.9 Use of Site

The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits, the Contract Documents, and the Owner.

§ 8.10 Cutting and Patching

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

§ 8.11 Cleaning Up

The Contractor shall keep the premises and surrounding area free from accumulation of debris and trash related to the Work. At the completion of the Work, the Contractor shall remove its tools, construction equipment, machinery, and surplus material; and shall properly dispose of waste materials.

§ 8.12 Indemnification

To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them, from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a subcontractor, anyone directly or indirectly employed by 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.

ARTICLE 9 ARCHITECT

§ 9.1 The Architect will provide administration of the Contract as described in the Contract Documents. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 9.2 The Architect will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the Work.

§ 9.3 The Architect will not have control over or charge of, and will not be responsible for, construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility. The Architect will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.

§ 9.4 Based on the Architect's observations and evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor.

§ 9.5 The Architect has authority to reject Work that does not conform to the Contract Documents.

§ 9.6 The Architect will promptly review and approve or take appropriate action upon Contractor's submittals, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 9.7 On written request from either the Owner or Contractor, the Architect will promptly interpret and decide matters concerning performance under, and requirements of, the Contract Documents.

§ 9.8 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 and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 9.9 The Architect's duties, responsibilities, and limits of authority as described in the Contract Documents shall not be changed without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

ARTICLE 10 CHANGES IN THE WORK

§ 10.1 The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract, consisting of additions, deletions or other revisions, and the Contract Sum and Contract Time shall be adjusted accordingly, in writing. If the Owner and Contractor cannot agree to a change in the Contract Sum, the Owner shall pay the Contractor its actual cost plus reasonable overhead and profit.

§ 10.2 The Architect may authorize or order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. Such authorization or order shall be in writing and shall be binding on the Owner and Contractor. The Contractor shall proceed with such minor changes promptly.

§ 10.3 If concealed or unknown physical conditions are encountered at the site that differ materially from those indicated in the Contract Documents or from those conditions ordinarily found to exist, the Contract Sum and Contract Time shall be subject to equitable adjustment.

ARTICLE 11 TIME

§ 11.1 Time limits stated in the Contract Documents are of the essence of the Contract.

§ 11.2 If the Contractor is delayed at any time in progress of the Work by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, or other causes beyond the Contractor's control, the Contract Time shall be subject to equitable adjustment.

§ 11.3 Costs caused by delays or by improperly timed activities or defective construction shall be borne by the responsible party.

Init.

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ARTICLE 12 PAYMENTS AND COMPLETION

§ 12.1 Contract Sum

The Contract Sum stated in this Agreement, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 12.2 Applications for Payment

§ 12.2.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment for Work completed in accordance with the values stated in this Agreement. The Application shall be supported by data substantiating the Contractor's right to payment as the Owner or Architect may reasonably require, such as evidence of payments made to, and waivers of liens from, subcontractors and suppliers. Payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment stored, and protected from damage, off the site at a location agreed upon in writing.

§ 12.2.2 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 other encumbrances adverse to the Owner's interests.

§ 12.3 Certificates for Payment

The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in part; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole. If certification or notification is not made within such seven day period, the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time and the Contract Sum shall be equitably adjusted due to the delay.

§ 12.4 Progress Payments

§ 12.4.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner provided in the Contract Documents.

§ 12.4.2 The Contractor shall promptly pay each subcontractor and supplier, upon receipt of payment from the Owner, an amount determined in accordance with the terms of the applicable subcontracts and purchase orders.

§ 12.4.3 Neither the Owner nor the Architect shall have responsibility for payments to a subcontractor or supplier.

§ 12.4.4 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the requirements of the Contract Documents.

§ 12.5 Substantial Completion

§ 12.5.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use.

§ 12.5.2 When the Contractor believes that the Work or designated portion thereof is substantially complete, it will notify the Architect and the Architect will make an inspection to determine whether the Work is substantially complete. When the Architect determines that the Work is substantially complete, the Architect shall prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, establish the responsibilities of the Owner and Contractor, and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 12.6 Final Completion and Final Payment

§ 12.6.1 Upon receipt of a final Application for Payment, the Architect will inspect the Work. When the Architect finds the Work acceptable and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment.

§ 12.6.2 Final payment shall not become due until the Contractor submits to the Architect releases and waivers of liens, and data establishing payment or satisfaction of obligations, such as receipts, claims, security interests, or encumbrances arising out of the Contract.

§ 12.6.3 Acceptance of final payment by the Contractor, a subcontractor or supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 13 PROTECTION OF PERSONS AND PROPERTY

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs, including all those required by law in connection with performance of the Contract. The Contractor shall take reasonable precautions to prevent damage, injury, or loss to employees on the Work and other persons who may be affected thereby, the Work and materials and equipment to be incorporated therein, and other property at the site or adjacent thereto. The Contractor shall promptly remedy damage and loss to property caused in whole or in part by the Contractor, or by anyone for whose acts the Contractor may be liable.

ARTICLE 14 CORRECTION OF WORK

§ 14.1 The Contractor shall promptly correct Work rejected by the Architect as failing to conform to the requirements of the Contract Documents. The Contractor shall bear the cost of correcting such rejected Work, including the costs of uncovering, replacement, and additional testing.

§ 14.2 In addition to the Contractor's other obligations including warranties under the Contract, the Contractor shall, for a period of one year after Substantial Completion, correct work not conforming to the requirements of the Contract Documents.

§ 14.3 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Section 7.3.

ARTICLE 15 MISCELLANEOUS PROVISIONS

§ 15.1 Assignment of Contract

Neither party to the Contract shall assign the Contract as a whole without written consent of the other.

§ 15.2 Tests and Inspections

§ 15.2.1 At the appropriate times, the Contractor shall arrange and bear cost of tests, inspections, and approvals of portions of the Work required by the Contract Documents or by laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities.

§ 15.2.2 If the Architect requires additional testing, the Contractor shall perform those tests.

§ 15.2.3 The Owner shall bear cost of tests, inspections, or approvals that do not become requirements until after the Contract is executed. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 15.3 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules.

ARTICLE 16 TERMINATION OF THE CONTRACT

§ 16.1 Termination by the Contractor

If the Work is stopped under Section 12.3 for a period of 14 days through no fault of the Contractor, the Contractor may, upon seven additional days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed including reasonable overhead and profit, and costs incurred by reason of such termination.

§ 16.2 Termination by the Owner for Cause

§ 16.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the subcontractors;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 is otherwise guilty of substantial breach of a provision of the Contract Documents.

§ 16.2.2 When any of the above reasons exist, the Owner, after consultation with the Architect, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may

- .1 take possession of the site and of all materials thereon owned by the Contractor, and
- .2 finish the Work by whatever reasonable method the Owner may deem expedient.

§ 16.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 16.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 16.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, 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 obligation for payment shall survive termination of the Contract.

§ 16.3 Termination by the Owner for Convenience

The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. The Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 17 OTHER TERMS AND CONDITIONS

(Insert any other terms or conditions below.)

This Agreement entered into as of the day and year first written above.

(If required by law, insert cancellation period, disclosures or other warning statements above the signatures.)

OWNER *(Signature)*

(Printed name and title)

CONTRACTOR *(Signature)*

(Printed name and title)

LICENSE NO.:

JURISDICTION:

SECTION 01 01 00 - PROJECT SUMMARY

1.1 SUMMARY

1.1.1 Project Title: Conversion and Renovation of the STEM Building Wood Shop into An Art Classroom

1.1.2 Location: 555 Guard St., Friday Harbor, WA 98250

1.1.3 Owner: San Juan Island School District No. 149
285 Blair Avenue
PO Box 458
Friday Harbor, WA 98250

1.1.4 Architect: HKP Architects
204 West Montgomery
Mount Vernon, WA 98273

1.1.5 Work Summary: Briefly, and without force and effect upon the Contract Documents, Work consists of selected demolition, casework, windows, doors, interior framing and finishes, electrical and mechanical work, and all other work described in the plans and specifications required for habitable space.

1.2 PROJECT SEQUENCE

1.2.1 MILESTONES: Key dates that shall be part of the Contractor's Construction Schedule are as follows:

February 22, 2023	Bids due
March 24, 2023	Notice to Proceed
July 22, 2023	Substantial Completion
August 21, 2023	Final Completion

SECTION 01 01 00 – PROJECT SUMMARY (CONT.)

1.3 USE OF PREMISES:

- 1.3.1 **Limits:** Confine use of premises and operations to areas immediately surrounding the project. Do not disturb portions of the facility beyond work areas.
- 1.3.2 **Owner occupancy:** N/A
- 1.3.3 **Concurrent activities:** Classroom instruction in other portions of the building.
- 1.3.4 **Storage of Materials:** Coordinate with the Owner for best location of material and equipment storage on site. Schedule deliveries to minimize space and time requirements for storage of material and equipment.
- 1.3.5 **Conduct:** Use of controlled substances, such as alcohol, drugs, tobacco products, use of profanity and loud music on site by the Contractor, his employees or others associated with the Work is prohibited.
- 1.3.6 **Work hours:** So as not to present a nuisance to the surrounding neighborhood, exterior work shall not start prior to 7:00 AM nor shall carry on past 6:00 PM.

SECTION 01 02 70 - PAYMENT APPLICATIONS

- 1.1.1 **Submittal Timing:** The Contractor shall submit to the Architect on or about the first day of each month his request for payment, unless mutually agreed otherwise. This request shall be reviewed at the site with the Owner's representative and Architect within 3 days of receiving the Contractor's request. Modify, if required, based on review conclusions.
- 1.1.2 **Continuity:** Make each Application for Payment consistent with the previous applications.
- 1.1.3 **Times:** The period to be covered by each Payment Application shall be as indicated in the Agreement. In the event it is not so described in the Agreement, the date for each progress payment is no later than the tenth day of each month. The period covered by each Application for Payment starts on the day following the end of the preceding period and ends the last day of the month.
- 1.1.4 **Retainage:** A 5% retainage shall be deducted from each progress payment to be released to the Contractor upon Final Payment and completion of all supporting documentation including a release from Washington State Department of labor and Industries, Department of Revenue and Employment Securities for Completion of Public Works.

SECTION 01 09 50 - STANDARDS

1.1 STATE REGULATIONS

- 1.1.1 **Wage Rates:** Pay hourly wages to those employed in executing the Work required under this Contract not less than the prevailing wage rates for San Juan County in accordance with Chapter 39.12 RCW, as amended, and rules and regulations of Washington State Department of Labor and Industries, and Employment Security. See Prevailing Wage pages at this site: <https://lni.wa.gov/licensing-permits/public-works-projects/prevailing-wage-rates/>
- 1.1.2 **Wage Definition:** Prevailing rates are defined as current schedule of wages and fringe benefits for locality as determined by Industrial Statistician of Department of Labor and Industries, and by reference are made part of this Contract.
- 1.1.3 **Wage Certification:** Before starting the Work under this Contract, file statements under oath, with the Owner and with the Director of Labor and Industries, certifying rate of hourly wage and fringe benefits to be paid to each classification of worker employed by the Contractor and Subcontractors, as required by the Department of Labor and Industries.
- 1.2.1 **Miscellaneous Regulations:** Comply with the following:
- RCW 49.28 Hours of Labor
 - RCW 18.27 Contractor's registration
 - RCW 70.92 Handicapped provisions
- 1.2.2 **Nondiscrimination:** Comply with requirements of RCW 49.60. Except to the extent permitted by bona fide occupational qualifications, agree to following:
- 1.2.2.1 **Employment:** Do not discriminate against employee or applicant for employment because of race, creed, color, handicap, national origin, sex or age. Ensure that applicants are employed and are treated during employment without regard to above discrimination; including upgrading, demotion or transfers, recruitment advertising, layoff, termination, rates of pay or other forms of compensation and selection for training.
- 1.2.2.2 **Advertisements:** In solicitations for employees or job orders for employees placed with employment agencies, state that qualified applicants will receive consideration for employment without above discriminations. Indicate compliance in advertisements by use of words "Equal Opportunity Employer".
- 1.2.2.3 **Notices:** Send notice to each labor union, or representative of entity for workers' collective bargaining agreement or other contract or understanding, advising of Contractor's commitments under this Section.

SECTION 01 09 50 - STANDARDS (CONT.)

- 1.2.2.4 **Procurements:** Include nondiscrimination provisions in Subcontracts and purchase orders for goods and services under this Contract.
- 1.2.3 **Fall Protection:** The Contractor shall provide and enforce the use of fall protection for employees and others involved in the Work under this Contract, per the requirements of WAC 296-155.
- 1.2.4 **Forfeiture:** The Owner reserves the right to terminate the Contract, in whole or part, if the Contractor does not comply with nondiscrimination provisions.

SECTION 01 20 00 - PROJECT MEETINGS

1.1 SUMMARY

1.1.1 **General:** Provide administrative and procedural requirements for project meetings including, but not limited to the following:

- Pre-Contract Conference
- Project Pre-Construction Conference
- Progress meetings

1.2.1 PRE-CONTRACT MEETING

1.2.2 **Schedule:** Attend meeting to be held at District headquarters, 285 Blair Ave. at a mutually agreeable time, after bid opening, but prior to award of the Contract.

1.2.3 **Attendees:** The Owner's representative, Architect and Contractor.

1.2.4 **Agenda:** Prepare to discuss matters relevant to proposed award of the Contract, including such topics as follows:

- Contractor's qualification statement
- Letter from Contractor's insurance company specifying coverage limits.
- List of Suppliers and Subcontractors (include license and UBI Numbers)
- Written confirmation of Bonds as required by Owner

1.3.1 PRE-CONSTRUCTION CONFERENCE:

1.3.2 **Schedule:** Arrange organizational meeting at Project site after Contract signing, but prior to the starting date.

1.3.3 **Attendees:** The Owner's representative, Architect, Contractor, Project Superintendent and others as may be familiar with and authorized to conclude matters relating to the Work.

1.3.4 **Agenda:** prepare to discuss items of significance that could affect implementing the Work, including such topics as:

- Tentative work schedule
- Work sequence
- Designation of responsible personnel
- Distribution of Contract documents
- Submittals of product data and samples
- Use of premises by owner

SECTION 01 20 00 – PROJECT MEETINGS (CONT.)

1.3.4 Agenda (continued from previous page)

- Office, work and storage areas
- Safety procedures
- First aid
- Security
- Housekeeping
- Working hours
- Schedule progress meetings

1.4.1 PROGRESS MEETINGS:

1.4.2 Schedule: Conduct a bi-weekly meeting at regularly scheduled times mutually agreed to by all parties. Project progress meetings are in addition to specific meetings held for other purposes.

1.4.3 Attendees: The Architect, the Contractor or his Superintendent, the Owner's representative and any party currently involved in the coordination or planning for construction activities.

1.4.4 Agenda: May include, but not limited to:

- Tracking of Construction Schedule
- Concealed conditions
- Change orders
- Quality and work standards
- Coordination with concurrent activities
- Construction details
- Temporary facilities

SECTION 01 23 00 – ALTERNATES

1 GENERAL

1.1 RELATED SECTIONS:

1.1.1 BID FORM

1.2 SUMMARY

- 1.2.1 This Section identifies each Alternate by number and describes basic changes to be incorporated into the Work only when that Alternate is made a part of the Work by specific provisions in the Agreement.
- 1.2.2 Base Bid and Alternates shall include cost of required supporting elements so that regardless of the combination of Base Bid and Alternates selected, each portion shall be a complete entity in itself.
- 1.2.3 Coordinate related Work and modify or adjust adjacent Work as required to ensure that Work affected by each accepted Alternate is complete and fully integrated into the Project.

2 PRODUCTS (NOT USED)

3 EXECUTION

3.1 SCHEDULE OF ALTERNATES

- 3.1.1 Bid Alternate #1: Secured Storage:
 - 3.1.1.1 Bid Alternate Description: Install storage shelving cabinets and wire fencing enclosure with gate.
 - 3.1.1.2 Base Bid Description: None

END OF SECTION

SECTION 01 25 00 – PRODUCT SUBSTITUTION PROCEDURES

3.2 SUMMARY

3.2.1 Related Sections:

3.2.1.1 Substitution Request Form: Provided by Architect

3.2.2 DEFINITIONS

3.2.2.1 Performance Specifications: No manufacturer is specified, and requirements are specified by descriptive requirements, design requirements, performance requirements, reference standards, and codes. Product options complying with or exceeding provisions of Contract Documents are acceptable and require no Substitution Request.

3.2.2.2 Closed Proprietary Specifications: Products by one or more manufacturers are specified and specification Section does not allow for approval of other products by Substitution Request. No other product options will be accepted. Provide products and Work specified.

3.2.2.3 Open Proprietary Specifications: Products by one or more manufacturers are specified, and specification Section allows for approval of other products by Substitution Request. Submit Substitution Request for other products to Architect under provisions of this Section.

3.2.3 SUBSTITUTION REQUESTS DURING BIDDING PERIOD

3.2.3.1 Submit Substitution Request to reach Architect's office before 5:00 PM at least five (5) working days prior to date for receiving Bids, and in conformance with Instructions to Bidders.

3.2.3.2 Bidders will be notified by Addendum of products approved in addition to those specified. No other form of approval, including verbal or implied, is acceptable to indicate approval of Substitution Request.

3.2.4 SUBSTITUTION REQUESTS DURING CONSTRUCTION PERIOD

3.2.4.1 Substitution Requests, submitted by Contractor will not be considered, except for the following reasons. Indicate one or more reasons why substitution is required with Substitution Request.

3.2.4.2 Unavailability: Specified item has been discontinued or is unavailable in time to meet Construction Schedule through no fault of Contractor or subcontractor.

3.2.4.3 Unsuitability: Subsequent information discloses specified item is unsuitable, inappropriate, unable to perform properly, or fit designated space.

3.2.4.4 Regulatory Requirements: Substitution is required to comply with Code interpretations or insurance regulations.

- 3.2.4.5 Warranty: Manufacturer or fabricator declare specified item to be unsuitable for use intended or refuses to certify or warrant performance of specified item for Project.
- 3.2.4.6 During Construction Period, Contractor will be notified by Architect in writing of decision to accept or reject Substitution Request.

3.2.5 SUBMITTAL REQUIREMENTS

- 3.2.5.1 Submit two copies of Substitution Request. Limit each request to one Substitution Request form.
- 3.2.5.2 Burden of proof is upon Substitution Request, as proposed, to show compliance with specified requirements. Submit drawings, product data, samples, certified test results, and as needed to fully describe Substitution request for evaluation by Architect.
- 3.2.5.3 Where product data includes other than that proposed by substitution Request, clearly mark, or otherwise indicate, exact substitution.
- 3.2.5.4 Document each Substitution Request with complete data substantiating that proposed substitution complies with provisions of Contract Documents.
- 3.2.5.5 Submission of Substitution Request constitutes representation that Bidder or Contractor:
- 3.2.5.6 Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.
- 3.2.5.7 Shall provide the same or better warranty for substitution as for specified product.
- 3.2.5.8 Shall be responsible for effect of substitution upon related Work, shall coordinate installation, and be responsible for other changes which may be required for Work to be complete in all respects, in compliance with design intent and in compliance with all applicable codes and regulatory requirements.
- 3.2.5.9 Be responsible for additional costs which may subsequently become apparent. This includes additional costs for required additional Architect's services made necessary by the substitution.
- 3.2.5.10 Shall provide all cost savings to Contract Sum as credits.
- 3.2.5.11 Shall provide specified product, material, or system should substitution be rejected, at no change in Contract Sum.
- 3.2.5.12 Substitutions indicated or implied on submittals, such as Shop Drawings, will not be accepted.
- 3.2.5.13 Products and materials included in the Work, not specified or approved by Substitution Request, are defined as Non-Conforming Work. Remove and replace with conforming Work at Contractor's expense with no increase in Contract Time, as directed by architect.

3.2.6 ARCHITECT WILL NOT CONSIDER

- 3.2.6.1 Substitution Requests which do not provide adequate or clearly defined information for complete and timely appraisal.
- 3.2.6.2 Substitutions which, if accepted, will require substantial revisions of Contract Documents.
- 3.2.6.3 Substitution indicated or implied by Shop Drawings and other submittals.

- 3.2.6.4 Substitutions not approved by published Addendum during Bid Period or not approved in writing by Architect during Construction period.
- 3.2.6.5 Substitutions not submitted on completed Substitution Request Form.

3.2.7 PRODUCTS (NOT USED)

3.2.8 EXECUTION (NOT USED)

SECTION 01 33 00 – SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

1.1 SUMMARY

- 1.1.1 Items requiring Shop Drawings, Product Data, and Samples are specified in the individual Sections. Submission of Shop Drawings, Product Data, and Samples is required only for those items where submittals are specified.
- 1.1.2 Unspecified submittals will not be reviewed by the Architect. Subcontractor's drawings, setting diagrams and similar information required by the Contractor for coordination shall remain between the Contractor and subcontractors and will not be reviewed by the Architect.
- 1.1.3 Related Sections:
 - 1.1.3.1 Product Substitution Procedures: Section 01 25 13

1.2 GENERAL

- 1.2.1 Individual Submittal requirements are specified in their applicable sections.
- 1.2.2 Submittals shall be made early enough to account for a thorough review by the Architect, Owner, and consultants.
 - 1.2.2.1 Submittals requesting action in less than fourteen (14) calendar days are not timely Submittals.
- 1.2.3. Architect's and Consultant's review of Submittals is only for general compliance and conformity with the design concept and provisions of the Contract Documents.
 - 1.2.3.1 Any action indicated is subject to the requirements of the Contract Documents.
- 1.2.4 Architect's and Consultant's review of Submittals shall not be construed as relieving requirements for compliance with the Contract Documents.
- 1.2.5 Architect's and Consultant's review of separate items does not constitute review of assembly in which it functions.
- 1.2.6 Submittals reviewed by the Architect and Consultants are not modifications to the Contract.
- 1.2.7 There is no implied change, approval or responsibility on the Architect and Consultants or Owner in reviewing Submittals and giving approval even when they may be unknowingly incorrect or incomplete
- 1.2.8 Coordinate Submittals of interrelated work so that no submittal will be delayed by the need to review a related Submittal.

- 1.2.9 Deviations from the Contract Documents in Submittals shall be clearly and distinctly denoted.
- 1.2.10 Deviations, errors or omissions in any Submittals shall not modify the Contract Documents or their intent.
- 1.2.11 Instruct affected parties to promptly report in writing any inability to comply with provisions of this Specification Section.
- 1.2.12 Reference to Work “by other” shall be assumed to mean “by Contractor”.
- 1.2.13 Indicate need for selection, if any.
- 1.2.14 Reproduced Contract Documents used for Submittals shall be rejected.

1.3 SHOP DRAWINGS

1.3.1. General:

- 1.3.1.1 Freehand-drawn Shop Drawings are not acceptable.
 - 1.3.1.2 Reproduced or copied Contract Documents or standard information as the basis for Shop Drawings shall not be accepted.
 - 1.3.1.3 Size of Shop Drawings sheets shall be not less than 8-1/2 by 11 inches and not more than 24 by 36 inches.
 - 1.3.1.4 Draw plans and details to scale(s) not less that as indicated in individual Specification Sections, or, if not indicated, to a scale sufficiently large to clearly show all pertinent features, method of fabrication and connections.
 - 1.3.1.5 Delete inapplicable information from manufacturer’s standard schematic drawings and diagrams and supplement them as required to provide pertinent information unique to this project.
- #### 1.3.2. Include the following additional information:
- 1.3.2.1 Name of the firm that prepared each shop drawing.
 - 1.3.2.2 Identification of products and materials and compliance with specified standards.
 - 1.3.2.3 Identify by whom materials, items, and installation not supplied or performed by entity submitting Shop Drawings will be supplied or installed.
 - 1.3.2.4 Identify every item, material, article, or note on installation, shown or required for fabrication or installation shall be so designed.
 - 1.3.2.5 Relationships to adjacent structure or materials.
 - 1.3.2.6 Size, type, dimension, and location of all components, jointing, connections, and similar items.

1.3.2.7 Fabrication methods, assembly, installation, accessories, fasteners, and other pertinent information.

1.3.2.8 Clearly identify field dimensions and coordination requirements.

1.3.2.9 Reference Consultants Drawings.

1.3.3. Shop Drawings without required information will be rejected.

1.4 PRODUCT DATA

1.4.1 Clearly mark each copy to identify pertinent products or models. Show performance characteristics and capacities, dimensions and clearances required, wiring or piping diagrams and controls.

1.4.2 Modify manufacturer's standard schematic drawings and diagrams to delete information which is not applicable to the Work.

1.4.3 Supplement standard information to provide information specifically applicable to the Work.

1.5 SAMPLES

1.5.1 Samples shall be of sufficient size and quality to clearly illustrate functional characteristics of product, with integrally related parts and attachment devices.

1.5.2 Submit full range of colors, textures, and patterns.

1.6 CONTRACTOR'S RESPONSIBILITIES

1.6.1 Review, mark up as appropriate, and stamp Shop Drawings, Product Data, and Samples prior to submission.

1.6.2 Determine and verify field measurements, field construction criteria, catalog numbers and similar data, and conformance with requirements of Contract Documents.

1.6.3 Coordinate each submittal with requirements of the Work and of the Contract Documents.

1.6.4 Notify Architect in writing, at time of submission, of any deviation in submittals from requirements of Contract Documents.

1.6.5 Begin no fabrication or Work which requires submittals until return of Architect's final reviewed submittals.

1.7 SUBMISSION REQUIREMENTS

1.7.1 Make submittals promptly in accordance with approved schedule and in such a manner as to cause no delay in the Work.

1.7.2 Number of Submittals Required:

- 1.7.2.1 Shop Drawings: Submit one electronic copy, which will be returned for reproduction and distribution by the Contractor. Resubmit as required until final action by the Architect.
- 1.7.2.2 Product Data, and Non-Reproducible Submittals: Submit one electronic copy, which will be returned for reproduction and distribution by the Contractor. Resubmit as required until final action by the Architect.
- 1.7.2.3 Samples: Submit number stated in each Section.
- 1.7.3 Submittals shall Contain:
 - 1.7.3.1 Date of submission and dates of any previous submissions with identification of revisions on any re-submittals.
 - 1.7.3.2 Project name and address.
 - 1.7.3.3 Owner name and address.
 - 1.7.3.4 Architect name and address.
 - 1.7.3.5 Contractor name and address.
 - 1.7.3.6 Subcontractor name and address.
 - 1.7.3.7 Supplier name and address.
 - 1.7.3.8 Number and title of Specification Section.
 - 1.7.3.9 Paragraph number of for each of multiple items.
 - 1.7.3.10 Drawing number and detail references, as appropriate.
 - 1.7.3.11 Contractor's Submittal Identification Number.
 - 1.7.3.12 Relation to adjacent or critical features of the Work or materials.
 - 1.7.3.13 Applicable Standards, such as ASTM or Federal Specification numbers.
- 1.7.4 Submittals received from sources other than the Contractor will be returned without review.
- 1.7.5. Review-Action & Return of Submittals:
 - 1.7.5.1 Architect or Consultant will review each Submittal, mark with a uniform, review-action stamp, appropriately marked to indicate status of Submittal.
 - a. Where Submittals are marked "No Exceptions Taken", or similar phrase, that part of the Work covered by the Submittal may proceed provided it complies with the requirements of the Contract Documents.
 - b. Where Submittals are marked "Make Corrections Noted," "Revise As Indicated" or similar phrase, that part of the Work covered by the Submittal may proceed

provided it complies with the notations or corrections on the Submittal and requirements of the Contract Documents.

c. Returned for Re-Submittal:

- (1) Where Submittals are marked “Revised and Resubmit,” do not proceed with that part of the Work covered by the Submittal.
 - (a) Revise or prepare a new Submittal in accordance with the notations; resubmit without delay.
 - (b) Repeat as necessary to obtain a different action mark.
- (2) When Submittal is marked “Rejected,” “not Approved,” or similar phrase, do not proceed with that part of the Work covered by the Submittal.
 - (a) Revise or prepare a new Submittal in accordance with the notations; re-submit without delay.
 - (b) Repeat as necessary to obtain a different action mark.

1.7.5.2 Do not permit Submittals returned for re-Submittal to be used in any part of the Work until release is obtained.

1.7.5.3 Where a Submittal is primarily for information or record purposes, special processing, or other activity, the Submittal will be returned to Contractor marked “Action not Required.”

1.7.5.4 Upon completion of review Architect will return Submittal to Contractor.

1.7.6. Re-Submittals:

1.7.6.1 Make corrections and changes required by Architect or Consultants.

1.7.6.2 Identify all revisions made on re-Submittals with a revision cloud

1.7.6.3 Indicate all additional changes which have been made with a revision cloud and note specifically addressing the change.

1.7.6.4 Resubmit until approved.

1.7.6.5 Owner’s Representative will record time required to review resubmittals after original submittal and first resubmittal. Contractor shall reimburse Owner for charges of Owner’s Representative’s and Consultant’s for reviewing submittal more than 2 times.

1.8 SUBMITTAL SCHEDULE

1.8.1 Time of submission of Shop Drawings, Product Data, and Samples by the Contractor and their processing and return by the Architect, is a matter which must be jointly agreed to by both parties in order that items covered by required submittals will be available when

needed by the construction process and so that each party can plan their workload in an orderly manner.

- 1.8.2 The Contractor shall prepare a Submittal Schedule, coordinated with the Progress Schedule, and submit to the Architect 15 calendar days prior to submission of the first submittals or simultaneously with the Progress Schedule, whichever is earlier. No submittals will be processed before the Submittal Schedule has been reviewed by the Architect.
- 1.8.3 In preparing the Submittal Schedule, the Contractor shall first determine, from the Progress Schedule, the date the particular item is needed on the Work for installation. Working backwards, the Contractor will then add the number of days for shipment, time for fabrication, and similar items, to determine the date of first submittal. Note that the Architect will determine the time required in steps 5 and 8 of the form. To secure this, the Contractor shall furnish the Architect with draft copies of the Submittal Schedule with all information in steps 1, 2, and 3 completed.
- 1.8.4 The intent is to adjust the Schedule to produce an orderly, even workload, without peak loads if possible, and yet meet the needs of the construction process. After the schedule is completed by the Contractor, the Contractor shall, at its expense, furnish copies to the Architect as required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

SECTION 01 50 00 - TEMPORARY FACILITIES

1.1 SUMMARY

- 1.1.1 **General:** Include requirements for construction facilities and temporary controls, including temporary utilities, support facilities, security and protection. Nothing in this Section is intended to limit types and amounts of temporary work required, and no omission from this Section will be recognized as indication that such temporary activity is not required for successful completion of work and compliance with the Contract Documents.
- 1.1.2 **Temporary Utilities;** including, but not limited to:
- Sanitary facilities, including drinking water
 - Telephone service
- 1.1.3 **Support Facilities;** including, but not limited to:
- Field office
 - Waste disposal
 - Temporary enclosures
 - Temporary signage
- 1.1.4 **Security and Protection Facilities;** including, but not limited to:
- Fire protection
 - Barricades and warning signs
 - Environmental protection
- 1.1.5 **Conditions of Use:** Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on site.

1.2 QUALITY ASSURANCE

- 1.2.1 **Regulations;** Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to the following:
- Building code requirements
 - Health and safety regulations
 - Utility company regulations
 - Police, fire department and rescue squad rules
 - Environmental protection regulations

SECTION 01 50 00 – TEMPORARY FACILITIES (CONT.)

1.2.2 **Standards:** Comply with NFPA "Standard for Safeguarding Construction, Alterations, and Demolition Operations", ANSI A10 Series standards for "Safety Requirements for Construction and Demolition" and WAC 296-155 "Fall Protection for Employees in Construction,...".

2.1 PRODUCTS

2.1.1 **General:** Provide new materials. If acceptable to the Architect, undamaged, previously used materials in serviceable condition may be employed. Provide materials suitable for use intended.

2.1.2 **Signs and Directories:** Use exterior grade M.D.O. plywood with wood posts.

2.1.3 **Safety Barriers:** Orange, open mesh, plastic safety fencing 48" high supported by securely anchored posts, spacing not to exceed 10 ft. Where posts cannot be anchored to the ground (i.e. where concrete slabs are located), concrete piers may be used to support posts.

2.1.4 **Plant and Shrub Protection:** N/A

2.1.5 **Tarpaulins:** Provide waterproof, fire-resistant, UL labeled tarpaulins with a flame spread of 15 or less. For temporary enclosures, provide translucent, nylon reinforced, laminated polyethylene or polyvinyl chloride, fire retardant tarpaulins.

2.1.6 **Potable Water:** Provide potable drinking water from a Health Dept. approved source.

2.2 Equipment:

2.2.1 **General:** Use new or undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

2.2.2 **Electrical Outlets:** Provide properly configured, NEMA polarized outlets provided with ground-fault circuit interrupters, reset button and pilot light for connection of power tools and equipment.

2.2.3 **Electrical Power Cords:** Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safety length-load ratios.

2.2.4 **Temporary Job Office:** It is the responsibility of the Contractor to provide a table and any other furnishings required to set up a temporary office.

SECTION 01 50 00 – TEMPORARY FACILITIES (CONT.)

- 2.2.5 **Temporary Toilet Units:** Provide a prefabricated, self-contained, single occupant toilet unit. Provide units properly vented and fully enclosed.
- 2.2.6 **Fire extinguishers:** Provide hand carried, portable, UL rated, Class A fire extinguishers for temporary office. In other locations, provide hand carried, portable, UL rated, Class ABC, dry chemical extinguishers or combination of extinguishers of NFPA recommended classes for exposures. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent and size required by location and class of fire exposure.
- 2.2.7 **Telephones:** The use of cell phone(s) by the Contractor in place of a land line is acceptable. However, it is the Contractor's responsibility to confirm that cell phone reception at this location will provide a clear line of communication.

3.1 SECURITY AND PROTECTION FACILITIES INSTALLATION

- 3.1.1 **Barricades and Warning Signs:** Comply with standards and code requirements for erection of adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and public of hazard being protected against. Post "No Trespassing" signs along safety fencing to keep the public clear of work areas.
- 3.1.2 **Storage:** Where materials and equipment must be stored, and are of value or attractive for theft, provide secure lockup. Enforce discipline in connection with installation and release of material to minimize opportunity for theft and vandalism.
- 3.1.3 **Environmental Protection:** Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Comply with regulations for noise abatement. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons near the site

SECTION 01 61 00 - PRODUCT SUBSTITUTIONS

1.1 SUBSTITUTIONS

- 1.1.1 **Substitution Request Submittal:** Submit three (3) copies of each request for substitution for consideration.
- 1.1.2 **Information:** Provide complete documentation showing compliance with the intention of the Plans and Specifications. Provide a statement that the proposed substitution is equal to or superior to that required by the Contract Documents.
- 1.1.3 **Cost and Schedule:** Provide a statement concerning impact, if any, on the cost or construction schedule.
- 1.1.4 **Samples:** Provide representative samples if requested by the Owner or Architect.
- 1.1.5 **Architect's Action:** Within 5 working days the Architect will accept, reject or request additional information concerning the proposed substitution in writing. Acceptance will be by Supplementary Instruction (if no change in Contract Sum or Time) or by Change Order.

SECTION 01 70 00 - PROJECT CLOSE-OUT

1.1 SUMMARY

1.1.1 **Close-out** includes general requirements near the end of Contract Time in preparation for Substantial Completion and Final Acceptance of Project, including but not limited to the following:

- Substantial Completion prerequisites and inspection procedures.
- Final Acceptance prerequisites, including record documents.
- Final cleaning.

1.2 SUBSTANTIAL COMPLETION

1.2.1 **Submittals:** Submit manufacturers' warranties, final certifications and similar documents.

1.2.2 **Building Permit:** Obtain and submit signed-off permit from the Inspector for the Town of Friday Harbor.

1.2.3 **Material:** Provide a list of paint colors used.

1.2.4 **Cleaning:** Complete clean-up requirements. Architect's Punch List inspection cannot start until clean-up is done.

1.2.5 **Inspection Procedures:** Schedule date and time for inspection of the Work at least 7 days in advance. The Architect and the Owner's representative will either proceed with the inspection or cancel if there is excessive incomplete work and advise the Contractor of incomplete requirements. The Architect will prepare the Certificate of Substantial Completion after the inspection and issue a Punch-list identifying work that must be corrected or completed.

1.2.6 **Punch-List:** Allow at least 3 working days after inspection for issuance of the Punch-list.

1.3 FINAL ACCEPTANCE:

1.3.1 **Preliminary Procedures:** The Contractor shall complete the Punch-List before requesting final inspection for certification of Final Acceptance and final payment. Additionally, the following must be submitted:

- 1.3.1.1 **Costs:** Submit a draft application for final payment with lien releases and supporting documentation not previously submitted and accepted. Include updated final statement of final Contract Sum.

SECTION 01 70 00 - PROJECT CLOSE-OUT (CONT.)

- 1.3.1.2 **Punch List:** Submit a copy of Architect's Punch List with each work item initialed by the Contractor as having been corrected, completed or otherwise resolved.
- 1.3.1.3 **Liens:** Submit Contractor's Affidavit of Release of Liens for each sub-contract and material supplier. Submit release from the WA State Dept. of Revenue. Show final sign-off of Building permits.
- 1.3.1.4 **L & I Approved Affidavits:** Provide L & I approved affidavit of Wages Paid Form for the Contractor and each Subcontractor.
- 1.3.1.5 **Backcheck Procedure:** The Architect will backcheck the Punch List upon receipt of proper notice that items have been completed or corrected, except items delayed because of circumstances acceptable to the Architect.
- 1.3.1.6 **Final Acceptance:** Upon completion of backcheck, the Architect will prepare a certificate of final acceptance, or advise the Contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

1.4 FINAL CLEANING:

- 1.4.1 **General:** Clean all surfaces soiled by the Work. Employ experienced workers skilled in the work. This is in addition to ongoing clean-up during the course of the work in order to maintain a clean and orderly site.
- 1.4.2 **Labels:** Remove labels that are not permanent or required to remain in place.
- 1.4.3 **Glazing:** Clean the exterior of glass in windows and doors that may have been soiled as a result of the work.
- 1.4.4 **Finishes:** Clean exposed exterior surfaces to a dust-free condition, free of stains, films or other foreign substances that result from the Work.
- 1.4.5 **Site:** Clean the site surrounding the Work of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grass areas surrounding the work and hand pick refuse from areas with larger plants. Pick up nails.
- 1.4.6 **Compliance:** Comply with regulations regarding disposal of waste. Do not discharge volatile, toxic or dangerous materials into drainage or sewer system. Remove all waste materials from site and dispose of in a lawful manner.

SECTION 01 74 00 - WARRANTIES

1.1 SUMMARY

- 1.1.1 **General:** Include general administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers standard warranties on products and special warranties.
- 1.1.2 **Disclaimers and Limitations:** Manufacturer's disclaimers and limitation on product warranties do not relieve the Contractor of warranty on Work that incorporates products, nor does it relieve suppliers, manufacturers and Sub-contractors required to countersign special warranties with the Contractor.
- 1.1.3 **Warranty Start Date:** Project warranties will commence on day of Substantial Completion date.

1.2 WARRANTY REQUIREMENTS

- 1.2.1 **Related Damages and Losses:** When correcting warranted Work that has failed, remove and replace other Work that has been damaged as result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- 1.2.2 **Reinstatement of Warranty:** When Work covered by warranty has failed and has been corrected by replacement of rebuilding, reinstate warranty by written endorsement. Make reinstated warranty equal to time and extent of original warranty.
- 1.2.3 **Replacement Cost:** Upon determination that Work covered by warranty has failed, replace or rebuild Work to acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of Work through a portion of its anticipated useful service life.
- 1.2.4 **Owner's Recourse:** Written warranties made to the Owner are in addition to implied warranties, and shall not limit duties, obligations rights and remedies otherwise available under law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights or remedies.
 - 1.2.4.1 **Rejection of Warranties:** Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with the requirements of the Contract Documents.
 - 1.2.4.2 **Rejection of Work:** The Owner reserves the right to refuse to accept work for the Project where special warranty, certification, or similar commitment is required on such Work or part of Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

SECTION 01 74 00 - WARRANTIES (CONT.)

1.2.5 **Limitations:** Warranties do not cover failures of work resulting from improper maintenance, misuse, natural disaster, vandalism, insurrection, or acts of aggression, including war.

1.2.6 **Consequential Damages:** Except as otherwise indicated or required by regulations, warranties are not extended to cover damage to building contents.

1.3 SUBMITTALS:

1.3.1 **General:** Submit written warranties to Architect prior to date certified for Substantial Completion.

1.3.2 **Form of Submittal:** At Final Completion, compile 2 copies of each required warranty properly executed by the Contractor, Subcontractor, suppliers, or manufacturer. Organize warranty documents into orderly sequence based on table of contents of Project Manual.

2.1 EXECUTION

2.1.1 **Warranty Correction Period:** Work performed under this contract is subject to a one-year correction period, except for roofing and flashings, which are subject to a two-year correction period.

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected items.
 - 2. Salvage of existing items to be reused.

1.02 RELATED REQUIREMENTS

- A. 01 50 00 – Temporary Facilities

1.03 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Demolition: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- C. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- D. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- E. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.04 SUBMITTALS

- A. Schedule of Selective Demolition Activities: Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, interruption of utility services, use of elevator and stairs, and locations of temporary partitions and means of egress.
- B. Pre-Demolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

- B. Standards: Comply with ANSI A10.6 and NFPA 241.
- C. Pre-Demolition Conference: Conduct conference at Project site; 555 Guard Street, Friday Harbor, 98250.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 4. Review areas where existing construction is to remain and requires protection.

1.06 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: Hazardous Materials have not been identified in materials anticipated to be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered do not disturb; immediately notify Architect and Owner for third-party testing.
 - 2. Testing shall be provided at the Owner's Expense.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Sub-contractors employed by the Contractor shall be bound to all work and safety standards.
- G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.
- H. Environmental Controls: Use water sprinkling, temporary enclosures and other suitable methods to limit dust and dirt rising and scattering into the air to lowest practical level. Comply with governing regulations pertaining to environmental protection. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, pollution or damage to finishes.

1.07 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and/or preconstruction videotapes.
- G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated 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, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

3.03 PREPARATION

- A. 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.

- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent facilities to remain. Provide temporary weather protection as may be required to protect spaces to be maintained from water leakage.
- C. Temporary Shoring: Provide and maintain shoring, bracing, and 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.

3.04 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. 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, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 3. 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 fire watch and portable fire-suppression devices during flame-cutting operations.
 - 4. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 5. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- C. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 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 item functional for use indicated.

- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition, cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.05 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 demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.06 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.

3.07 SCHEDULE

- A. Locations and extent in accordance with drawings.
- B. Items to be selectively demolished include but are not limited to the following:
 - 1. WRB and Flexible Flashings
 - 2. Metal Corrugated Wall Panel and Flashings
 - 3. Joint Sealer and Backer Rod:
 - 4. Interior GWB
 - 5. Casework
 - 6. Ventilation equipment, Control Valves, related piping
 - 7. Electrical devices and related wiring and conduit

END OF SECTION

SECTION 06 20 23
INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Finish carpentry materials.
- B. Medium density fiberboard panels with no added formaldehyde resins (NAF).

1.2 RELATED REQUIREMENTS

- A. Section 07 90 05 - Joint Sealers
- B. Section 09 90 00 - Painting and Coating.

1.3 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI A208.2 - Medium Density Fiberboard for Interior Use.
- B. ASTM International (ASTM):
 - 1. ASTM D 1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.
 - 2. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. Architectural Woodwork Institute (AWI):
 - 1. AWI Quality Standards; Sections 100, 200, 400, 500, 600, 700, 1500, and 1700.
- D. International Organization for Standardization (ISO):
 - 1. ISO 14021 - Environmental Labels and Declarations - Self-Declared Environmental Claims (Type II Environmental Labelling).
- E. Scientific Certification Systems (SCS):
 - 1. Certification by independent evaluation of 82-92 percent pre-consumer recycled wood fiber content depending on product standard and contains no added formaldehyde (made without the use of phenol formaldehyde and shown in lab testing to be free of formaldehyde down to a detection limit of 0.05 ppm). Furnished by Scientific Certification Systems, Oakland, CA.
- F. UL Environment: A business unit of Underwriters Laboratories.

1.4 SUBMITTALS

- A. Submit under provisions of Section 0133 – Shop Drawings, Product Data, and Samples.

- B. Product Data:
 - 1. Provide data on fire retardant treatment materials and application instructions.
 - 2. Provide instructions for attachment hardware and finish hardware.
- C. Maintenance Data: For users' operation and maintenance of system including:
 - 1. Precautions about cleaning materials and methods that could be detrimental to finishes.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualification: Company specializing in the manufacture of work specified in this section with minimum 5 years' experience.
- B. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
- C. Single Source Responsibility: Provide and install this work from single fabricator.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. As required by the Quality Certification Program for installation of the installed products to meet the Performance and Design Criteria.
- B. Protection: Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- C. Delivery: Do not deliver finish carpentry materials until wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.
- D. Conditioning: Have installer advise Contractor of temperature and humidity requirements for finish carpentry installation areas. Do not install finish carpentry until required temperature and relative humidity conditions have been stabilized and will be maintained in installation areas.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard limited warranty against defects in manufacturing.
- B. Installation Warranty: Contractor shall correct defective Work within a 2-year period after Date of Substantial Completion; remove and replace materials no extra cost to Owner.

PART 2 - PRODUCTS

2.1 DESCRIPTION

- A. Plywood, wall base, and other wood trim, bases, casings, and miscellaneous trim. Carpentry items shop fabricated and finished in accordance with AWI/AWMAC/WI Architectural Wood Work standards.

2.2 MATERIALS

- A. Interior Medium Density Fiberboard Panels made with NAF Resin:
 - 1. Basis of Design: Medite II MDF by Roseburg Forest Products Company.
 - a. Standards Compliance: ANSI A208.2 - Grade 155; MR30 for panels greater than or equal to 5/8 in (16 mm).
 - b. General Requirements:
 - 1) Type: Medium density fiberboard panels with no added formaldehyde.
 - 2) Composition: Lignocellulosic fibers and no-added formaldehyde synthetic resin.
 - 3) Dimensions: As indicated on Drawings; match existing.
 - c. Fabricate with no seams.
- B. Shop Finishing:
 - 1. Sand work smooth and set exposed nails and screws.
 - 2. Apply wood filler in exposed nail and screw indentations.
 - 3. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.
 - 4. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards, Section 5 - Finishing for Grade specified.
 - 5. Back prime woodwork items to be field finished, prior to installation.
- C. Site Finishing:
 - 1. In accordance with Section 09 90 00 - Painting and Coating.

2.3 FASTENINGS

- A. Fasteners: Of size and type to suit application; As appropriate for materials and installation finish in concealed location.

2.4 ACCESSORIES

- A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions meet the requirements of the quality standard specified before starting work.

3.2 PREPARATION

- A. Prepare substrates using methods recommended by the manufacturer to achieve the best results under proper conditions.
- B. Do not proceed with installation until substrates have been prepared based on recommended methods from the manufacturer. Commencement of installation constitutes acceptance of conditions of substrate.

3.3 INSTALLATION

- A. General: Install all materials in accordance with quality standard specified based on conditions present.
- B. Comply with AWI AWS fabrication and installation standard as applicable to the project.
- C. Install according to approved architectural drawings, shop drawings and manufacturer's published installation instructions. Shim as required for proper installation.
- D. Reject: Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum joining arrangements, or which are of defective manufacture with respect to surfaces, sizes or patterns.
- E. Trueness: Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to tolerance of 1/8 inch in 8 feet 0 inches for plumb and level; and with 1/16 inch maximum offset in flush adjoining surfaces. Scribe and cut work to fit adjoining work and refinish cut surfaces. Scribe and cut work to fit adjoining work and refinish cut surfaces, or repair damaged finish at cuts.
- F. Standing and Running Trim: Install in lengths of 16 feet maximum with minimum number of joints possible, using full-length pieces to greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end-to-end wood joints, chamfered at 20 degrees and with sharp edges eased to 1/16 inch thickness. Use butt joints for end-to-end cement board joints.
- G. Attachment: Secure trim to anchorage devices stripping, blocking framing or directly to structural substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Except where prefinished matching fastener heads are required, use finishing nails for exposed nailing's, countersunk and filled flush with finished surface.

3.4 PROTECTION

- A. Protect installed work as required by the quality standard to maintain product performance, design criteria and warranty without damage or deterioration at time of acceptance.
- B. Clean in accordance to manufacturer's published care and maintenance instructions.
- C. Touch up, repair or replace damaged products before completing installation.

END OF SECTION

SECTION 07 21 00
THERMAL AND ACOUSTIC INSULATION

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Acoustic insulation for interior partitions and ceilings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 INFORMATION SUBMITTALS

- A. Produce test reports.
- B. Research/evaluation reports.

PART 2 - PRODUCTS

2.1 SOUND ATTENUATION BATT INSULATION

- A. Formaldehyde free fiberglass acoustic batt insulation designed for interior wall and floor/ceiling applications.
 - 1. Manufacturer: Owens Corning, or approved.
 - a. Assembly: As noted in drawings.
 - b. Fire Rating: 1 hour
 - c. Sound Transmission Class (STC), as noted in drawings.
 - d. Thickness: 3 – ½” or as necessary to fill stud cavity depth.
 - e. Width: 15.25”

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

- C. Extend insulation 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. 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.

END OF SECTION

SECTION 07 25 00
WEATHER BARRIERS

PART 1 - GENERAL

1.0 SECTION INCLUDES:

- A. Weather Resistive Barrier
- B. Flexible Flashing
- C. Self-Adhering Membrane

1.1 RELATED REQUIREMENTS

- A. 07 62 00 Sheet Metal Flashing and Trim
- B. 07 90 05 Joint Sealers

1.2 SUBMITTALS

- A. Product Data: For each type of product:
 - 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.
- B. Shop Drawings: Show details of building paper and/or wrap at terminations, openings, and penetrations. Show details of self-adhering flashing applications.
- C. Evaluation Reports: For weather-resistive barrier and self-adhering membrane, from ICC-ES.
- D. Warranty

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 - 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA certified installers and supervisors on Project.

1.4 MOCKUP

- A. For proposed substitutions, prepare side-by-side mockups of specified and substitute products.
- B. Locate where directed.

1.5 WARRANTY

- a. Applicators Warranty: Provide labor and materials to correct defective work, including areas of water infiltration, and including replacement of affected construction, within a 2-year period after Substantial Completion
- b. Manufacturer's Material and Labor Warranty: Provide labor and materials to correct defective work including areas of water infiltration, and including replacement of affected construction, within a 10-year period after Substantial Completion.

PART 2 - PRODUCTS

2.0 WEATHER RESISTIVE BARRIER

- A. (WRB) Weather Resistive Barrier: ASTM E1677, Type I air barrier; with flame-spread and smoke developed indexes of less than 25 and 450, respectively, when tested according to ASTM E84; UV stabilized; and acceptable to authorities having jurisdiction.
 1. Basis of Design: VaproShield WrapShield IT Integrated Tape, or approved equivalent.
 - a. Water-Vapor Permeance: Not less than 21 perms per ASTM E96, Desiccant Method (Procedure A).
 - b. Air Permeance: Not more than 0.0004 L/s•m² @ 75 Pa when tested according to ASTM E2178.
 - c. Allowable UV Exposure Time: 180 days maximum.
 - d. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
 - e. Flame Spread: 0 when tested according to ASTM E84.
 - f. Smoke Developed: 55 when tested according to ASTM E84.
- B. Weather Resistive Barrier Seam Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.
 1. Basis of Design: VaproShield VaproTape 4", or approved equal
- C. Fasteners and Self Gasketed Washers: Produce recommended in writing by weather-resistant barrier manufacturer and complying with ASTM F1667.
 1. Basis of Design: VaproShield VaproCaps, or approved equal.
- D. Weather Resistive Barrier Sealant: Reference Section 07 90 05.

2.1 WEATHER BARRIER FLASHINGS

- A. (WBFF-1) Weather Barrier Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.030 inch.
 1. Basis of Design: VaproShield WrapFlashing SA Self-Adhered Roll, size per details.

- B. (FAF-1) Fluid Applied Flashing: Basis of Design: VaproShield VaproLiqui-Flash or approved equal.
- C. Primer for Flexible Flashing: Product recommended in writing by flexible flashing manufacturer for substrate.

PART 3 - EXECUTION

3.0 WEATHER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with weather-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:
 - 1. Cut back barrier ½ inch on each side of the break in supporting members at expansion or control joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 6-inch overlap unless otherwise indicated.
- C. Comply with manufacturer's written instructions and warranty requirements.
 - 1. Seal seams, edges, fasteners, and penetrations with tape.
 - 2. Extend into jambs of openings and seal corners with tape, unless otherwise depicted in the architectural drawings.

3.1 WEATHER BARRIER FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
 - 1. Prime substrates as recommended by flashing manufacturer.
 - 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 flashing over water-resistive barrier at bottom and sides of openings.
 - 4. Lap water-resistive barrier over flashing at heads of openings.
 - 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates. On horizontal sky-facing surfaces, turn flexible flashing up vertical intersections a minimum 4-inches, and seal all flashing edges with the weather-resistant barrier manufacturer's approved sealant.

3.2 FIELD QUALITY CONTROL

- A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Inspections: Weather-Barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of weather-barrier system has been achieved throughout the building envelope with no gaps or holes.
 2. Weather-barrier dry film thickness.
 3. Continuous structural support of weather-barrier system has been provided.
 4. Concrete surfaces are smooth, clean, and free of cavities and protrusions.
 5. Site conditions for application temperature and dryness of substrates have been maintained.
 6. Maximum exposure time for materials to UV deterioration has not been exceeded.
 7. Surfaces have been primed, if applicable.
 8. Laps in strips and transitions strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
 9. Termination mastic has been applied on cut edges.
 10. Strips and transition strips have been firmly adhered to substrate.
 11. Compatible materials have been used.
 12. Transitions at changes in direction and structural support at gaps have been provided.
 13. Connections between assemblies (weather-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 14. All penetrations have been sealed.
- D. Tests: As determined by testing agency from among the following tests:
1. Air-leakage-location testing: Weather-barrier assemblies will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers or ASTM E1186, chamber depressurization using detection liquids.
- E. Weather-barriers will be considered defective if they do not pass test and inspections.
1. Apply additional weather-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
 2. Remove and replace deficient weather-barrier components for retesting as specified above.
- F. Repair damage to weather barriers caused by testing; follow manufacturer's written instructions.

3.3 CLEANING AND PROTECTION

- A. Protect weather barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
1. Protect weather barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace weather barrier or install additional, full-thickness, weather-barrier application after repairing and preparing the overexposed materials according to weather-barrier manufacturer's written instructions.

2. Protect weather barrier from contact with incompatible materials and sealants not approved by weather barrier manufacturer.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items.
- B. Self-Adhering Membrane (SAM)

1.02 RELATED REQUIREMENTS

- A. 07 25 00 – Weather Barriers
- B. 07 90 05 – Joint Sealers

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section in accordance with Section 01 30 - Administrative Requirements.
 - 1. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.04 SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Shop Drawings: Indicate material profile, jointing locations, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples:
 - 1. Finish Sample: Submit two samples illustrating each metal finish color.
 - 2. Fabrication Sample: Submit sample of soldered flashing.
- D. Warranty: Submit manufacturer finish warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Fabricators Qualifications: Company specializing in performing the work of this section with minimum 5 years' experience on projects of similar size and complexity.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.07 WARRANTY

- A. Manufacturer's Finish Warranty: Correct defective work within a 20-year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
 - 1. Panel Finish Criteria are listed AAMA 2605.

PART 2 - PRODUCTS

2.01 DESCRIPTION

- A. Sheet metal including steel, stainless steel, and aluminum fabricated into items such as flashings, counterflashings, step flashings, base flashings, and other items indicated and scheduled.
- B. Flashing of thru-wall ventilation grilles

2.02 MATERIALS

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch (0.6 mm), unless otherwise noted thick base metal, shop pre-coated with PVDF coating.
 - 1. Fluoropolymer Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: Match adjacent materials. Consult with Architect prior to ordering.
- B. Stainless Steel: for all other uses: ASTM A 666 Type 304, rollable temper, 26 gauge; smooth No. 4 finish.
- C. Fasteners: Fasteners: Same material as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened. Provide fastener with neoprene washers in areas with exposed screw type fasteners.
- D. Mastic Sealant: Polyisobutylene, non-hardening, non-shrinking, non-drying, non-migrating sealant.

2.03 FABRICATION

- A. Field measure site conditions prior to fabricating work.
- B. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- C. Form pieces in longest possible lengths.

- D. Fabricate vertical faces with bottom edge formed outward 1-inch at a forty-five-degree angle and hemmed to form drip.
- E. Fabricate fully-soldered stainless steel flashings such that they are one continuous flashing with all seams and pin holes soldered.

2.04 ACCESSORIES

- A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. Fluid-Applied Flashing: See Section 07 25 00 – Weather Barriers.
- C. Weather Barrier Flexible Flashing: See Section 07 25 00 – Weather Barriers.
- D. Self-Adhering Membrane (S.A.M.):
 - 1. Basis of Design: Grace Ultra by GCP Applied Technologies.
 - a. 30-mil thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl adhesive, with release-paper backing; cold applied.
 - b. Performance Criteria:
 - 1) Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
 - 2) Permeance: 0.05 perms maximum when tested in accordance with ASTM E96.
 - c. Features:
 - 1) Thickness: 30-mil.
 - 2) Width: 34-inches.
 - 3) Weight: 42 lbs. per roll.
 - d. Provide primer when recommended by manufacturer.
- E. Sealant: See Section 07 90 05 - Joint Sealers.
- F. Solder:
 - 1. For stainless steel: ASTM B32, Grade Sn60, with an acid flux of type recommended by stainless steel sheet manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION

- A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. General: Install all pre-manufactured materials in accordance with manufacturer's instructions based on conditions present.
- B. Examine the substrate and the conditions under which the work is to be performed, and do not proceed until unsatisfactory conditions have been corrected. Surfaces to receive sheet metal are to be clean, even, smooth, dry, and free from defects and projections that might adversely affect the application. Verify slope prior to installation. Remove all mechanical units as required for access to curbs. Reinstall as required. Comply with SMACNA recommendations.
- C. Work shall be accurately formed to sizes, shapes, and dimensions indicated with all angles and lines in true alignment. All work shall be straight, sharp, and erected plumb and level in proper plane without bulges or waves. Conform to standards of SMACNA.
- D. Fabricate all items in maximum length and keep the number of joints to a minimum.
- E. Typical sheet metal laps shall be a minimum 4 inches and sealed with two continuous beads of approved butyl sealant.
- F. When no detail direction is provided in the contract documents for an existing flashing condition, the contractor shall bring such transitions to the attention of the owner and consultant.
- G. Make proper allowances for expansion and contraction of materials in all work.
- H. Provide required separations between non-compatible products. Do not allow direct contact of non-compatible products.
- I. Provide positive-water-shedding slope on all sky-facing legs.

3.04 PROTECTION

- A. Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

3.05 SCHEDULE

- A. Unless otherwise noted all exposed exterior sheet metal flashing and trim is Pre-Finished Galvanized Steel.
- B. Drip Flashing, Ledge Flashing, and Other Metal Transition Flashings (unless called out in the specifications and details):
 - 1. Material: Prefinished Galvanized Steel.
 - 2. Thickness: 24 gauge
 - 3. Color: To be selected by Architect from manufacturer's standard colors.
 - 4. Seaming: Upturned end dams.
 - 5. Continuous Cleats: 22-gauge minimum.

6. Sill and ledge flashings to be lapped seam as shown in drawings.
- C. Thru-Wall Opening Head and Jamb Flashing:
1. Material: Prefinished Galvanized Steel.
 2. Thickness: 24 gauge.
 3. Seaming: Uprturned end dams (fully sealed with (S-1 sealant).
- D. Fully-Soldered Stainless Steel Flashings, Fully-Soldered Stainless Steel Window and Louver Pan Flashings, and Fully-Soldered Stainless Steel Door Pan Flashings:
1. Material: Stainless steel with all seams and joints fully soldered.
 2. Thickness: 26 gauge.
 3. Seaming: Fully-welded shop fabricated corners and end dams.
 4. Fabricate in one-piece with all seams soldered. Segmenting fully-soldered flashings with sealed, lapped seams, is not permitted.

END OF SECTION

SECTION 07 90 05
JOINT SEALERS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Sealants for exterior surfaces.
- B. Sealants for interior surfaces.

1.02 SUBMITTALS

- A. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- B. Sample: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- D. 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.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- F. Maintenance Data: For user's operation and maintenance of system including:
 - 1. Methods for maintaining system's materials and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project. Minimum 5 years of documented experience in facilities of this size and scope.
 - 1. Prequalification of single source installers for exterior sealants is encouraged.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

- C. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
1. Contractor and Owner's representative together shall locate test joints on the project.
 2. Manufacturer's representative to conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.
 3. Notify Architect seven 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 in ASTM C 1193.
 - 1) 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. Prepare a written report as to whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type 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.
 7. Record test locations on Project Record Documents

1.04 DELIVERY, STORAGE, AND HANDLING

- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.05 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two (2) years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Five (5) years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and

- compression caused by structural settlement or errors attributable to design or construction.
2. Disintegration of joint substrates from natural 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

2.01 MANUFACTURERS

- A. Sealant specification is based on products listed by Sika USA or other approved manufacturers.
 1. Comparable products by one of the following are also acceptable. See Section 01 for submittal requirements.
 - a. BASF www.buildingsystems.basf.com
 - b. Building Products, ChemRex, Inc www.chemrex.com.
 - c. Tremco Inc: www.tremcosealants.com
 - d. DowSil, www.dow.com
 2. Substitutions for products by manufacturers other than those listed above: See Section 0125\.

2.02 DESCRIPTION

- A. Joint sealers for properly designed joints in interior and exterior materials; selected for durability, movement capacity, adhesion to substrates and non-staining characteristics.

2.03 PERFORMANCE AND DESIGN CRITERIA

- 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 sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants As selected by Architect from manufacturer's full range.
- C. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- D. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

2.04 MATERIALS

- A. Sealants for exterior surfaces:
1. (S-1): Exterior Sealant
 - a. Premium Grade High Performance Moisture Cured 1-Component Polyurethane-Based Sealant; ASTM C 920 Type S, Grade NS, Class 35, Uses T, NT, M, G, A and O; single component.
 - b. Basis of Design: Sikaflex-1A by Sika USA, or approved.
 - c. Color: To match adjacent surfaces from manufacturer's full range.
 2. (S-2): Weather Resistive Barrier Sealant
 - a. Neutral-cure silicone; ASTM C 920 Type S, Grade NS, Class 100/50; single component.
 - b. One-part air sealant between weather resistive barrier and fenestrations including other exterior wall penetrations.
 - c. Movement Capability: +/- 25 percent.
 - d. Basis of Design: Dowsil 758 Silicone Weather Barrier Sealant manufactured by Dow, or VaproBond manufactured by VaproShield, or approved.
 - e. Color: To match adjacent surfaces from manufacturer's full range.
 3. (S-3): Butyl Sealant:
 - a. Blend of butyl rubber and polyisobutylene; ASTM C 1311.
 - b. Movement Capability: +/- 10 percent.
 - c. Color: Black
 - d. Basis of Design: Tremco Butyl Sealant manufactured by Tremco Inc., or approved.
 - e. Designed for concealed joints requiring non-drying sealant like lap joints in sheet metal flashing and trim.
- B. Sealants for interior surfaces:
1. (S-4): Interior Paintable Aesthetic Sealant
 - a. Siliconized Acrylic latex sealant: ASTM C 834, Grade -18 °C, Class 12.5, single component, non-staining.
 - b. Movement Capability: +/- 12.5 percent.
 - c. Basis of Design: Tremflex 834 manufactured by Tremco Inc., or approved.
 - d. Color: White
 2. (S-5): Interior Sanitary Sealant
 - a. Neutral cure silicone sealant: Class 25, single component, non-staining.
 - b. Movement Capability: +/- 25 percent.
 - c. Basis of Design: Dowsil 680 Sanitary Sealant manufactured by Dow, or approved.
 - d. Color: White.

2.05 ACCESSORIES

- A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. Backer Rod: Nomaco Sof-Rod or equal, as approved by the sealant manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION

- A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.

3.04 PROTECTION

- A. Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

3.05 SCHEDULE

- A. Sealants for exterior surfaces:
 - 1. (S-1): Typical exterior weather-proofing joints including metal to metal, metal to lap siding and various joint transitions.
 - 2. (S-2): For use as interior sealant between weather resistive barrier and fenestrations and various WRB/flexible flashing transitions.
 - 3. (S-3): Concealed sealants in sheet metal flashing, metal work and other joints calling for nonhardening, non-skinning, non-drying, nonmigrating sealant.
- B. Sealants for interior surfaces:
 - 1. (S-4): Aesthetic interior sealant at various interior finishes.
 - 2. (S-5): Water-resistant interior sealant at restrooms and laundry room.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Non fire rated interior steel doors.
- B. Non fire rated interior steel frames.

1.2 RELATED REQUIREMENTS

- A. Section 08 71 00 - Door Hardware
- B. Section 08 80 00 - Glazing
- C. Section 09 90 00 - Painting and Coating

1.3 SUBMITTALS

- A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes. Include U-value data for thermally broken doors and frames.
- B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- C. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- E. Maintenance Data: For users operation and maintenance of system including:
 - 1. Methods for maintaining system's materials and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Specification is based on doors and frames by Assa Abloy Curries: www.assaabloydss.com.
 - 1. Comparable products by one of the following are also acceptable. See Section 0160 - Product Requirements for submittal requirements.
 - a. Ceco, Assa Abloy brand; www.assaabloydss.com.
 - b. Fleming, Assa Ably brand; www.assaabloydss.com.
 - c. Steelcraft, Allegion brand; www.allegion.com
 - 2. Substitutions for products by manufacturers other than those listed above: See Section 01.

2.2 DESCRIPTION

- A. Hollow metal frames for hollow metal doors, wood doors and glazing. Hollow metal doors for fire rated, non-fire rated, sound rated, and bullet resistant and insulated openings.

2.3 PERFORMANCE AND DESIGN CRITERIA

- A. Comply with ANSI/ICC A117.1. Accessibility Code.
- B. Comply with ANSI A250.8 in general and for grade and style specified.
- C. NAAMM HMMA doors of equivalent or better construction are allowed.
- D. Provide hardware preparation in accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard. Coordinate with Section 08 71 00 - Door Hardware.

2.4 MATERIALS

- A. Doors: Commercial quality cold-rolled sheet steel in conformance with ASTM A 366. Stretcher level steel for door faces.
- B. Frames: Commercial quality cold-rolled sheet steel in conformance with ASTM A 366.
- C. Hardware: Comply with SDI 107. Furnished as specified in Section 08 70 00. Machine door frames for installation of concealed door contacts specified in Division 26. Provide at locations where door contacts are shown. Coordinate with Division 26 for rough-in and installation.
- D. Sound Fill Insulation: Hilti, Inc., CF-128 Insulation Foam, CFC-free, one-component polyurethane filler foam or biobased foam alternative at doors. Provide Rockwool Mineral wool insulation at door frames.

2.5 FABRICATION

- A. Interior Doors:
 - 1. Type: Level 2 - Heavy-duty, seamless design, in accordance with SDI-100 for Model 2 doors, 1-3/4 inch thick.
 - 2. Face Sheets: Galvanized steel, 18 gage minimum.
- B. Interior Frames and Relites:
 - 1. One-piece, welded, 14 gage minimum, with integral stops, jambs, and trim in accordance with SDI 100 for Level 3 doors. Profiles as shown on Drawings. Provide hardware reinforcement gages in accordance with SDI for Level 3 doors.
- C. Door and Frame Finishes: Apply one coat of manufacturer's standard primer, compatible with finishes specified in Section 09 90 00, to exposed surfaces.
- D. Sound Fill Insulation: Fill door frames solid with mineral wool insulation for acoustical treatment.
- E. Glazed Openings: Location and size as shown. Glass as specified in Section 08 80 00.
- F. Wall and Floor Anchors: Weld 14 gage clip angles, with extensions and holes to receive floor anchors, to bottom of each jamb. Provide for field adjustment as required. Provide 1 wall anchor for each 30 inches of height, but not less than 3 for each jamb, unless otherwise shown.
- G. Provisions for Hardware: Do not pre-drill for hardware prior to approved Shop Drawings and templates. Mortise, reinforce, and tap doors and frames at factory for hardware to templates furnished as specified in Section 08700. Drill for door silencers as required. Provide plaster guards at strike pockets and door silencer locations. Reinforce for door closers whether or not closers are listed in the hardware schedule.

2.6 ACCESSORIES

- A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. Mineral Fiber Insulation: for filling frame cavities.

2.7 FINISHING

- A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.
- C. Field Finish: In accordance with Section 09 90 00 - Painting and Coating.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.2 PREPARATION

- A. Prepare surfaces to receive work in accordance with manufacturer's instructions.
- B. Coat inside of other frames with bituminous coating to a thickness of 1/16 inch.

3.3 INSTALLATION

- A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
- C. Seal seam at top closures after finish is applied to create a smooth surface without groove or pits
 - 1. Seal with sealant Per Section 07 90 05 - Joint Sealers.
- D. Pack all frames with mineral wool insulation.
- E. Coordinate installation of hardware.
- F. Coordinate installation of electrical connections to electrical hardware items.
- G. Touch up damaged factory finishes.

3.4 TOLERANCES

- A. Clearances Between Door and Frame: As specified in ANSI A250.8.
- B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.5 ADJUSTING

- A. Adjust and lubricate hardware for proper operation.
- B. Adjust for smooth and balanced door movement in accordance with manufacturer's instructions.

3.6 PROTECTION

- A. Delivery: Hollow-metal work crated to provide protection during transit and job storage.
- B. Damage: Inspect hollow-metal work upon delivery. Minor damages may be repaired provided finish items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

END OF SECTION

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. Work under this section includes the complete finish hardware requirements for the project. Quantities listed are for the Contractor's convenience only and are not guaranteed. Items not specifically mentioned, but necessary to complete the work shall be furnished, matching the items specified in quality and finish.
- B. Related Sections:
 - 1. Division 01 Section "Shop Drawings, Product Data and Samples"
 - 2. Division 01 Section "Product Requirements"
 - 3. Division 06 Section "Interior Finish Carpentry"
 - 4. Division 08 Section "Hollow Metal Doors and Frames"

1.3 REFERENCES

- A. Standards: Current edition at date of bid.
 - 1. ADAAG - Americans with Disabilities Act, "Accessibility Guidelines for Buildings and Facilities".
 - 2. ANSI/BHMA A156.18 - Materials and Finishes
 - 3. ICC A117.1 - Accessible and Usable Buildings and Facilities
 - 4. NFPA 80 - Standard for Fire Doors and Windows
 - 5. NFPA 252 - Standard of Fire Tests of Door Assemblies
 - 6. Underwriters Laboratories - Building Materials Directory
 - 7. Underwriters Laboratories Test Standard UL 10C - Positive Pressure Fire Tests of Door Assemblies
- B. Codes:
 - 1. Chapter 51-50 WAC Washington State Building Code

1.4 SUBMITTALS

- A. General Requirements: Submittals shall be in accordance with Division 01 Section "Shop Drawings, Product Data, and Samples".
- B. Product Data: Submit manufacturer's data for each item of Door Hardware.
- C. Hardware Schedule: Submit a detailed Door Hardware Schedule.

1. Include cover sheet indicate project title, Architect, Contractor, and Supplier's names and addresses, date of submittal, and name of certified Hardware Consultant.
 2. The submitted Door Hardware Schedule shall indicate the complete designation of every item required for each door or opening.
 3. List each opening individually under separate headings in the same order as the door schedule. Do not list like or similar doors under the same heading. Do not continue headings on separate pages.
 4. Each heading shall indicate opening location, handing, degree of opening, door size, type, fire rating, and Door and Frame material.
 5. Indicate product Manufacturer and incorporate cross-reference to symbols used in paragraph 2.13 Hardware Groups.
 6. A Key Schedule and index shall be included indicating door, heading, and page numbers, and locking function for each opening.
 7. Locations shall be included and miscellaneous hardware items.
 8. A cross reference for abbreviations or symbols used shall be included.
 9. Schedules in coded or horizontal format are unacceptable. Submittals not conforming to these requirements will be returned without review, for re-submittal.
- D. Processing and Revisions: Hardware schedules will not be reviewed by the Architect until they have been reviewed and approved by Contractor. The Finish Hardware Submittal shall be kept current throughout the project duration. Revisions incorporated shall be submitted in accordance with the above requirements. Submit only cover sheet and revised pages. Revisions shall clearly identify changes from previous submittal content.
- E. Samples: If requested by the Architect, submit one (1) sample of each exposed hardware category, finished as required, and tagged with full description for coordination with the hardware schedule. Samples will be reviewed, by the Architect, for design and finish only; compliance with other requirements is the responsibility of the Contractor. Units which are acceptable and remain undamaged through submittal procedures may be used on the project.
- F. Color Samples: Submit color charts and physical samples of each product requiring color selection.
- G. Key Schedule: Upon completion of the Keying Conference submit a key schedule indicating the complete project key system for approval. Obtain approval prior to proceeding with lock portion of the project.
- H. Operations and Maintenance Data.
1. Submit Maintenance and Operations Manuals under the provisions of Division 01 Section "Operations and Maintenance Data".
 2. Manuals shall contain final copy of the Finish Hardware Submittal, Product Data, Parts Lists and Diagrams, Templates, Key Schedule, Installation Instructions, and Warrantees.

1.5 QUALITY ASSURANCE

- A. Supplier:
 - 1. Door hardware shall be supplied by a recognized builders' hardware supplier who has been furnishing hardware in the same area as the project for a period of not less than five (5) years.
 - 2. Factory direct, authorized and stocking distributor of the Exit Devices, Locksets and Door Closers.
 - 3. Employ an Architectural Hardware Consultant, certified by the Door and Hardware Institute, who is available during the course of the work to meet with the Owner, Architect or Contractor for project hardware consultation.
- B. Source: Obtain each kind of Hardware (Hinges, Locksets, Exit Devices, Door Closers, etc.) from only one manufacturer.
- C. Installer: Door hardware shall be installed only by experienced tradesmen in compliance with trade union jurisdictions, either at the door and frame fabrication plant or at the project site.
- D. Templates: Furnish hardware templates for each fabricator of doors, frames and other work to be factory prepared for the installation of hardware. Upon request, check the shop drawings of such other work to confirm that provisions will be made for the proper installation of hardware.
- E. Regulatory Requirements:
 - 1. Finish hardware shall comply with applicable local and state current building codes.
 - 2. Hardware for fire-rated openings shall also be in compliance with fire codes applicable to the district in which the building is located. Provide only hardware which has been tested and listed by "UL" for the types and sizes of doors required, and which complies with the requirements of the door and door frame labels.
 - 3. Door hardware shall meet the requirements of ADAAG, and ICC/ANSI A117.1, Accessible and Usable Building and Facilities.

1.6 PRODUCT HANDLING AND STORAGE

- A. Packaging: Each item or package is to be separately tagged with identification related to the final hardware schedule. Basic installation instructions shall be included in the packages.
- B. Storage: Provide a locked room at the jobsite for the storage of the hardware.

1.7 WARRANTY

- A. Finish hardware shall be guaranteed against defects in workmanship and operation for a period of one (1) year, backed by a factory guarantee of the hardware manufacturer. The following products shall be guaranteed for periods beyond One (1) Year:
1. Locks - Two (2) Years
 2. Door Closers - Ten (10) Years
 3. Panic Devices - Three (3) Years

1.8 MAINTENANCE

- A. Furnish the following extra materials, which shall be delivered directly to the Owner prior to substantial completion, in accordance with Division 01 Section "Project Close Out".
1. Provide One (1) Set of Special Tools required for installation and adjustment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers: Products may be furnished by the manufacturers listed "As Specified" below or equivalent products of type, grade, design, and function from manufacturers listed under "Acceptable Substitutions". Requests for products not listed must be made in accordance with Section 01600, Product Requirements.

Product	As Specified	Acceptable Substitutions
Butt Hinges	McKinney (MC)	Stanley, Hager
Locksets	Corbin Russwin (CR)	None
Cylinders	Corbin Russwin (CR)	None
Exit Devices	Von Duprin (VD)	None
Door Closers	LCN (LCN)	None
Kick & Mop Plates	Rockwood (RO)	Tice, Trimco
Wall and Floor Stops	Rockwood (RO)	Trimco
Overhead Stops	Sargent (SA)	ABH
Weatherstrip & Thresholds	Pemko (PE)	National Guard

2.2 FINISH

- A. Finish in general shall be: US26D, Satin Chrome Plated (BHMA 626), except:
1. Overhead Stops, Door Pulls, Locksets, Satin Stainless Steel (BHMA 630).
 2. Exit Devices,: 630 Stainless
 3. Kick and Mop Plates: US32D
 4. Interior Hinges: Satin Chrome plated over Steel (BHMA 652).
 5. Exterior hinges: Stainless steel
 6. Door Closers: Aluminum Painted (BHMA 689)
 7. Smoke Gasketing: Charcoal
 8. Threshold, Weatherstrip & Door Bottoms: Anodized aluminum

2.3 BUTT HINGES

- A. Quantity (per Leaf):
 - 1. Door openings up to 60": Two (2) each.
 - 2. Door openings 60 to 90": Three (3) each.
 - 3. Doors over 90": Furnish one (1) additional for each 30" increment or fraction thereof.
- B. Sizes:
 - 1. 1-3/4" Interior Doors up to and including 36": 4-1/2 x 4-1/2"
 - 2. 1-3/4" Interior Doors over 36": 5 x 4-1/2"
- C. Width of Hinges shall be as required to clear projecting trim or other conditions to allow maximum degree of opening.
- D. Locked doors to have non-removable pins (NRP - Set Screw in Barrel).
- E. Hinges shall have Flat Button Tips.
- F. For unusual size or weight doors, furnish type, size and quantity recommended by the hinge manufacturer.

2.4 LOCKSETS AND CYLINDERS

- A. Furnish Lever Handle Locksets and Latches in LW1L Design.
- B. Backset: 2-3/4".
- C. Locksets and Latchsets shall be listed with Underwriters Laboratories for A label and lesser class doors.
- D. Cylinders:
 - 1. Provide standard cylinder applications.
 - 2. Provide appropriate cylinder type, length, collars, and cam type to operate specified Locksets and Exit Devices
- E. Provide Curved Lip Strikes with adequate projection to protect door trim. Provide flat, flush lip strikes for pairs of doors with overlapping Astragals.
- F. Provide manufacturers standard wrought or plastic strike boxes.
- G. Contact Contract Hardware for Medeco cylinders PH# 206-298-4770

2.5 PANIC DEVICES AND FIRE EXIT HARDWARE

- A. Provide U.L. Listed Fire Exit Hardware at rated openings.
- B. Provide Exit Devices sized in accordance with the manufacturer manufacturers recommendations.

- C. Furnish Sex Nuts and Bolts for Wood Composite and Mineral Core Door applications.
- D. Exit Device Lever Handles shall match Lockset design listed under 2.04 A.
- E. Provide Glass Bead Kits where interference with Door Vision Frames occurs.

2.6 DOOR CLOSERS

- A. Furnish drop plates where doors have insufficient height top rails, or where Regular Arm Door Closers are used in conjunction with Concealed Overhead Stops.
- B. Furnish cold weather fluid, at exterior & vestibule doors. Furnish non-flammable fluid at fire rated openings in conformance with UL Standard 10C.
- C. Furnish Spacer Blocks where frame stop does not provide for adequate support for the parallel arm soffit shoe.
- D. Provide special closer mounting as required where interference with weatherstrip or sound seals occurs.
- E. Furnish Shoulder Through Bolts for Wood Composite and Mineral Core Door applications.

2.7 KICK, MOP, AND ARMOR PLATES

- A. Kick and Armor Plates shall be applied to the Push Side of the Door, Mop Plate applied to the Pull Side.
- B. Plates shall be beveled four edges (B4E) and countersunk for screws.
- C. Height: Kick Plates, 10", Mop Plates 6", Armor Plates 34".
- D. Plates shall be furnished with width as required to provide 1/4" clearance at sides of doors, stops, sound seal, or weatherstrip.

2.8 STOPS AND HOLDERS

- A. Furnish Overhead Stop and Holders sized as recommended by the manufacturer.
- B. Furnish Overhead Stop and Holders with special shims, brackets, or special template mounting as required.
- C. Where wall stops are not applicable, furnish Floor Stops 1215CKU, or Overhead Stops if required.

2.9 THRESHOLDS

- A. Furnish Thresholds with FHSL14200, 1/4-20 x 2" Phillips Flat Head Sleeve Anchors.

2.10 WEATHERSTRIP AND GASKETING

- A. Furnish weatherstrip and gaskets for complete perimeter of opening, including mullions, and astragals. Furnish weatherstrip at sill of Four (4) sided frames.
- B. Rain Drips shall be full opening width including frame faces.

2.11 DOOR SILENCERS

- A. Furnish Rubber Door Silencers for openings not specified to have Smoke Gasketing or Weatherstrip. Quantity: Furnish three (3) for each single door frame, and four (4) for each pair of door frames.
- B. Type 608 for metal frames.

2.12 KEYING

- A. Key operated products specified under this section shall be keyed to the existing Master Key system for Friday Harbor High School.
- B. Provide temporary construction cylinders and keys during the construction period.
- C. The Door Hardware Supplier shall meet with the Owner to prepare the permanent keying schedule. Submit Key Schedule for approval in accordance with paragraph 1.4 G.
- D. Prior to substantial completion, the General Contractor shall remove the temporary construction cylinders and install the permanent cylinders. Temporary construction cylinders shall be returned to the Door Hardware Supplier.
- E. Permanent Keys shall be sent directly to the Owner via Registered Mail, Return Receipt Requested.
- F. Stamp Keys "Do not Duplicate" and with change designation as directed.
- G. Furnish:
 - 1. Two (2) Construction Keys.

2.13 HARDWARE GROUPS

A. HW-1 (Door 050.2)

3	Each Hinges	MC	T4A3786 NRP 4-1/2" x 4-1/2"
1	Exit device	VD	98.L .996L(Std)
1	Mortise cylinder	CR	CR3070-178 6-Pin
1	Interchangeable Core	CR	CR8000
1	Door Closer	SA	4040XP .EDA
1	Kick Plates	RO	K1050 10" x 34"
1	Door stop	RO	445
1	Gasketing	PE	S88D 17'
1	Door Bottom	PE	420APKL 36"

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examination: Examine Doors, Frames, and related items for conditions that would prevent the proper application of the Finish Hardware. Do not proceed until defects are corrected.
- B. Provide solid blocking for wall stops, wall plate actuators and magnetic holders.
- C. Fasteners: Check all conditions and use fastening devices as needed to securely anchor hardware as per manufacturer's published templates. Self-tapping sheet metal screws are not acceptable. Door Closers and Exit Devices on wood doors shall be through bolted.

3.2 INSTALLATION

- A. Mounting Heights: Mount units at heights as recommended in "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames (2001)" by Doors and Hardware Institute, except as indicated below. Products not specifically covered shall be installed in accordance with the manufacturer's templates and instructions.
 - 1. Hinges:
 - a. Top Hinge: 7-1/4", Top of frame rabbet to centerline of hinge.
 - b. Bottom Hinge: 12-1/4", Bottom of Frame to centerline of hinge
 - c. Intermediate Hinges: Centered, equal spacing between top and bottom hinges.
 - 2. Mortise Lock Strikes: 40", bottom of frame to centerline of Strike.
 - 3. Wall Stops: Locate Wall Stops intended for use with Lever Handle Locksets and Exit Devices at the centerline of the Spindle or Pull.
- B. Install each hardware item in compliance with manufacturer's templates and instructions, except as modified below.
 - 1. Wherever cutting and fitting are required to install hardware surfaces which will be painted or finished at a later time, install each item completely and then

- remove and store in a secure place. After completion of the finishes, re-install each item.
2. Do not install surface-mounted items until finishes have been completed on the substrate.
 3. Install Fire Rated Openings to comply with NFPA 80.
 4. Door shall swing to the maximum degree that project conditions will allow. The swings indicated on the floor plan are intended to depict direction and do not indicate full degree of opening.
 5. Trim Exit Devices to provide 1-1/2" clearance between End Cap and hinge jamb stop face and/or stop applied weatherstrip.
 6. Door Closers shall be located to allow maximum degree of opening that project conditions will allow. Door Closers shall not be used to stop the door, except for models equipped with an integral stop-on-the-arm feature.
 7. Overhead Stops: Furnish Overhead Stop and Holders with maximum degree of opening that project conditions will allow.
 8. Floor Stops: Locate Floor Stops at maximum degree of opening that project conditions will allow. Do not locate Floor Stops where they create a hazardous condition. Stops should be located no more than 1/3 Door width from the latch edge of the Door. Confirm locations in the field with the Architect.
 9. Thresholds: Set exterior Thresholds in a bed of butyl rubber sealant in conformance with Division 7 requirements. Remove excess sealant. Caulk edges and joints to exclude moisture.
 10. Smoke Gasket: Thoroughly clean frame and install smoke gasketing in accordance with manufacturer's instructions.
 11. Weatherstrip: Mount and adjust Rigid Jamb Weatherstrip prior to mounting Parallel Arm Door Closers. Weatherstrip shall be installed to provide a continuous seal at head and jambs. Do not notch Weatherstrip for Door Closer shoe. Provide Parallel Arm 5th hole spacer of increased thickness to allow for revised location.
 12. Mount Astragals on the pull side of active leaf for out-swinging applications, inactive leaf for in-swinging.
 13. Smoke Gasket
 - a. Completely clean frame and apply gasket in accordance with manufacturer's instructions.
 - b. Apply Gasket to Door rabbet of hinge jamb and to stop face of Strike Jamb and Headers, as described in Pemko's installation instructions for alternative positioning.
- C. Adjust and check each operating item of hardware and each door to insure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.

3.3 ADJUSTMENT

- A. Wherever hardware installation is made more than one (1) month prior to acceptance or occupancy, make a final check and adjustment of hardware items during the week prior to acceptance or occupancy. Clean and lubricate operating items as necessary to restore proper function and finish of hardware and doors.

Adjust door control devices to compensate for final operation of heating and ventilating equipment.

- B. Door Closer Adjustment: After mechanical systems have been balanced, adjust Door Closers to comply with following ICC/ANSI A117.1 requirement, as modified by WAC 51-50 and the International Building Code:
1. Closing Speed: Door Closers shall be adjusted so that from an open position of 90 degrees, the time required to move the door to an open position of 12 degrees shall be 5 seconds minimum.
 2. Opening Force: The maximum force for pushing or pulling a door open shall be as follows: (these forces do not apply to the force required to retract latch bolts or disengage other devices securing the door.
 - a. Fire Doors: The minimum opening force allowable by the appropriate administrative authority.
 - b. Exterior Doors: 10.0 lbf (44.4 N).
 - c. Interior Doors: 5.0 lbf (22.2 N).
 3. Adjust backcheck to prevent damage to the closer, hardware, door and frame, and wall.
- C. Instruct Owner's Personnel in proper adjustment and maintenance of hardware and hardware finishes

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Insulating glazing units.

1.2 RELATED REQUIREMENTS

- A. Section 08 11 13 - Hollow Metal Doors and Frames: for assembly requiring components from this section.

1.3 SUBMITTALS

- A. Qualification Data: For Installer, fabricator and design engineer.
- B. Product Data:
 - 1. Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
 - 2. Glazing Compounds & Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements and identify available colors.
- C. Shop Drawings: For any glazing installed with components from this section alone.
 - 1. Submit shop drawings for glazing installed within other systems in accordance with the system submittal requirements.
- D. Sample: Submit two samples in manufacturer's standard size of glass type units, showing coloration and design.
- E. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Data: For users operation and maintenance of system including:
 - 1. Methods for maintaining system's materials and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

1.4 QUALITY ASSURANCE

- A. Fabricators Qualifications: Company specializing in performing the work of this section with minimum 5 years' experience.

- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years' experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

1.6 WARRANTY

- A. Sealed Insulating Glass Units: Provide a ten (10) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Specification is based on PPG Industries, Inc. or approved.
 - 1. Comparable products by one of the following are also acceptable. See Section 016000 - Product Requirements for submittal requirements.

2.2 DESCRIPTION

- A. Glass glazing, plastic glazing and accessories installed as monolithic glazing, insulating glazing units, or horizontal glazing within framing systems and support structures specified elsewhere.

2.3 PERFORMANCE AND DESIGN CRITERIA

- A. By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
- B. Roll Wave Maximum Distortion Tolerance: 0.003 inch target with 0.005 inch maximum peak to valley measurement.
- C. Bow and Warp Maximum Tolerance: 50 percent of the maximum allowed in ASTM C 1048.
- D. Thickness: As required for loads indicated
- E. Deflection no greater than 1/175 of the longest dimension or 1/2 inch whichever is less.

2.4 MATERIALS

- A. Float Glass:
 - 1. Performance Criteria:
 - a. By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

- b. Roll Wave Maximum Distortion Tolerance: 0.003 inch target with 0.005 inch maximum peak to valley measurement.
 - c. Bow and Warp Maximum Tolerance: 50 percent of the maximum allowed in ASTM C 1048.
 - d. Tinted Types: Performance and features to match basis of design product.
 2. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
 3. Heat-Strengthened in accordance with ASTM C1048.
 4. Fully Tempered in accordance with ASTM C1048.
 - a. Safety Glazing: Comply with 16 CFR 1201 test requirements for Category II.
 - B. (GL-2) Insulating Safety Units:
 1. Fabricator:
 - a. Any of the manufacturers specified for float glass.
 - b. Any fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified performance, features and warranty.
 2. Sealed Insulating Glass Units:
 - a. Performance:
 - 1) Outdoor Lite: Clear, tempered.
 - 2) Indoor Lite: Clear, tempered.
 - 3) Durability: Certified by an independent testing agency to comply with ASTM E2190.
 - 4) Air Space: Hermetically sealed and dehydrated, 1/2 inch thick minimum separation.
 - 5) Total thickness: 1 inch, minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.2 PREPARATION

- A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.3 INSTALLATION

- A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.

3.4 ADJUSTING

- A. Adjust and lubricate hardware for proper operation.

3.5 PROTECTION

- A. Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

3.6 SCHEDULE

- A. (GL-2) Insulating Acoustical Safety Units: Typical Glazed Door and Relite.
 - 1. Regular.
 - 2. Safety: as required.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Gypsum Wall Board

1.02 RELATED REQUIREMENTS

- A. 06 10 00 – Rough Carpentry
- B. 07 90 05 – Joint Sealers
- C. 09 90 00 – Painting and Coating

1.03 SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Data: Provide data on gypsum board, glass mat faced gypsum board, accessories, joint finishing system, and cement board.
- C. Maintenance Data: For users' operation and maintenance of system including:
 - 1. Methods for maintaining system's materials and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Professional structural engineer with 5 years of documented experience in design of this work and licensed in the location of the project.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years' experience on projects of similar size and complexity.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

PART 2 - PRODUCTS

2.01 DESCRIPTION

- A. Gypsum board materials for interior and exterior gypsum board assemblies.

2.02 PERFORMANCE AND DESIGN CRITERIA

- A. Provide completed gypsum board assemblies complying with ASTM C840 and GA-216.

2.03 MATERIALS

- A. Specification is based on products listed by Georgia-Pacific.
 - 1. Comparable products by one of the following are also acceptable. See Section 0160 - Product Requirements for submittal requirements.
 - a. USG.
 - b. National Gypsum Company
 - c. CertainTeed Corporation
 - 2. Substitutions for products by manufacturers other than those listed above: See Section 01.
- B. Gypsum Wall Board
 - 1. Sizes to minimize joints in place; ends square cut.
 - a. Application: Interior gypsum wall board for wall and ceiling unless otherwise indicated.
 - b. Paper faced gypsum substrate: Glass-fiber reinforced core non-combustible sheathing as defined in ASTM E136.
 - 2. Core Type: Type X.
 - 3. Thickness: 5/8 inch (16 mm).
 - 4. Dimensions: 4' x 8'
 - 5. Flame Spread: 15
 - 6. Smoke Developed: 0
 - 7. Edges: Tapered
 - 8. Product: ToughRock Fireguard X Gypsum Board manufactured by Georgia-Pacific, or approved equal.

2.04 ACCESSORIES

- A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless otherwise indicated.
 - 1. Types: As detailed or required for finished appearance.
 - 2. Special Shapes: In addition to conventional cornerbead and control joints, provide U-bead at exposed panel edges.
- C. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.
 - 1. Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
 - 2. Typical: Ready-mixed vinyl-based joint compound.
 - 3. Exterior Soffits: Chemical hardening type compound.

- D. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- E. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION

- A. Prepare surfaces to receive work in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B. Comply with ASTM C 840 and GA-216. Install to minimize butt end joints, especially in highly visible locations.
- C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- D. Exterior Gypsum Sheathing at Soffits: Install perpendicular to framing, with staggered end joints over framing members or other solid backing.

3.04 PROTECTION

- A. Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

END OF SECTION

SECTION 09 22 00
NON-STRUCTURAL METAL WALL FRAMING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Non-load-bearing steel framing systems for interior gypsum board assemblies.

1.2 SUBMITTALS

- A. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Specification is based on products by members in good standing of the Steel Stud Manufacturer's Association.
 - 1. Substitutions for products by manufacturers other than those listed above: See Section 0125.

2.2 DESCRIPTION

- A. Non-structural metal support framing for gypsum board assemblies and other finishes.

2.3 PERFORMANCE AND DESIGN CRITERIA

- A. Perform Work in accordance with ASTM C 754.
- B. Coordinate the placement of components to be installed within stud framing system.
- C. Suspended Assemblies: Coordinate with installation of overhead work to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
- D. Design and install framing and furring to limit deflection to the following under point loads of 100 lbs and uniform loads as noted below psf except where required to withstand greater load. (pressurized shafts and stairwells for example)

1. Maximum Deflection of Vertical Assemblies:
 - a. Assemblies spanning single floor: Sustained loads of 5 lbf/sq ft with a maximum mid span deflection of 1:240.
 - b. Assemblies spanning multiple floors: Sustained loads of 7.5 lbf/sq ft with a maximum mid span deflection of 1:240.
 2. Maximum Deflection of Horizontal Assemblies: 1:240 deflection under dead loads and wind uplift.
 3. Maximum Deflection for assemblies under applied plaster finishes (Portland Cement or Gypsum) and ceramic tile is 1:360.
 4. Use The SSMA Product Technical Information Book to look up the appropriate stud size, spacing and thickness.
- E. Acoustic Attenuation for Interior Partitions: STC's are calculated in accordance with ASTM E 413 and based on published tests conducted in accordance with ASTM E 90.
1. Provide materials and construction identical to those tested in assembly indicated according to ASTM E 90.

2.4 MATERIALS

- A. Metal stud framing.
1. Framing System Components: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 and "SSMA Product Technical Information" book for the spacing indicated
 - a. Minimum Framing Component thickness is 20 Gage.
 - b. Studs: C shaped.
 - c. Runners: U shaped, sized to match studs.
 - d. Ceiling Channels: C shaped or T shaped.
 - e. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
 2. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
 - a. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
 - b. Material:
 - 1) Typical: ASTM A653/A653M steel sheet, SS Grade 50, with G40/Z120 hot dipped galvanized coating.
 - 2) Areas Subject to Moisture: ASTM A653/A653M steel sheet, SS Grade 50, with G60/Z180 hot dipped galvanized coating. Areas include exterior or non-conditioned space, shower rooms, locker rooms or other locations subject to regular wetting or high humidity.
 - c. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems.
 3. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs with provision for crimp locking to stud.
 4. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C754.

5. Fasteners: ASTM C1002 self-piercing tapping screws.
 6. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.
- B. Slip-Type Head Joints: Where indicated, provide one of the following in thickness not less than indicated for studs and in width to accommodate depth of studs:
1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges and fastened to studs, and outer runner sized to friction fit inside runner.
 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes due to deflection of structure above.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
 - 2) MBA Building Supplies; FlatSteel Deflection Track.
 - 3) Steel Network Inc. (The); VertiClip SLD Series.
 - 4) Superior Metal Trim; Superior Flex Track System (SFT).
 - 5) Telling Industries; Vertical Slip Track. 6)
 - 6) Or Approved.
- C. Blocking and backing panels.
1. Sheet Metal Backing (Blocking): 0.036 inch thick, galvanized. 4 inch minimum width
 2. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
 3. Specifically, provide the following non-structural framing and blocking:
 - a. Cabinets and shelf supports.
 - b. Wall brackets.
 - c. Handrails.
 - d. Grab bars.
 - e. Towel and bath accessories.
 - f. Wall-mounted door stops.
 - g. Chalkboards and marker boards.
 - h. Wall paneling and trim.
 - i. Joints of rigid wall coverings that occur between studs.
 - j. Wall mounted ducts and flues.

2.5 ACCESSORIES

- A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that rough-in utilities are in proper location.
- B. Verify existing conditions meet the manufacturer's requirements before starting work.

3.2 INSTALLATION OF STUD FRAMING

- A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.
- B. Comply with requirements of ASTM C754.
- C. Extend partition framing to structure where indicated and to ceiling in other locations.
- D. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- E. At partitions indicated with an acoustic rating:
 - 1. Provide components and install as required to produce STC ratings as indicated.
 - 2. Place two beads of acoustic sealant (one on either side) between runners and substrate, studs and adjacent construction.
 - 3. Place one bead of acoustic sealant between studs and adjacent vertical surfaces.
 - 4. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- F. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- G. Backing and Blocking: Use steel channels or flat sheets secured to studs minimum 4" wide. Provide blocking for support of all wall hung items and equipment.
 - 1. Use sheet metal backing for reinforcement of 16 ga. min.
- H. Install supplementary framing and bracing at openings and terminations in the work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar construction to comply with details indicated and with recommendations of gypsum board manufacturer
- I. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement:
 - 1. Where edges of suspended ceilings abut building structure at ceiling perimeters and at penetrations of structural elements.
 - 2. Where partition and wall framing abuts overhead structure.
 - 3. Where studs are installed directly against exterior walls of masonry or concrete, install asphalt felt strips between studs and wall.

3.3 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

- C. Level ceiling to a tolerance of 1/1200. For tilted ceilings maintain this tolerance as a "flatness". tolerance.

3.4 PROTECTION

- A. Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

3.5 SCHEDULE

- A. Interior Assemblies: Finish: G40, Sizes: Profiles indicated, Metal Thickness: As required to meet performance criteria.

END OF SECTION

PART 1 – GENERAL

1.1 SUMMARY

- A. This section includes the following:
 - 1. AlphaSorb® High Impact Acoustic Panel

1.2 SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details for acoustical wall panels, including plans, elevations, sections, details and attachment to other work.
- B. Submittals: Furnish 4" x 6" sample, color chart showing all manufacture's full range of colors, texture and patterns available for each type of acoustical product specified.
- C. Product Test Report: From a qualified testing agency indicating wall panels comply with requirements.
- D. Qualification Data: For firms specified in "Quality Assurance" Article to demonstrate their capabilities and experience.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualification: Manufacture shall have a minimum of 5 years' experience in production of specified products and shall furnish supporting documentation showing completed jobs of approximately the same size and scope.
- B. Fire Test Reports: Provide acoustical wall panels with the following surface- burning characteristics as per ASTM E 84.
 - 1. Flame Spread: 25 or less
 - 2. Smoke Developed: 450 or less
- C. Acoustical Test Report: Provide acoustical test report from a qualified testing agency indicating acoustical wall panels meets NRC noted in section 2.1 A.4 per ASTM C-423.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect Acoustical Wall Panels from excessive moisture when

shipping, storing, and handling. Deliver in unopened skids and store in a dry place with adequate air circulation. Do not delivery material until all wet-work has been completed.

1.5 PROJECT CONDITIONS

- A. Environmental Requirements: Do not install panels until wet work, such as concrete and plastering is complete; the building is enclosed; and the temperature and relative humidity are stabilized at 60-80 degrees F and 35% MINIMUM RH and 55% MAXIMUM RH, respectively. All product with wood or wood fiber content must be stored for at least 72 hours in the controlled environment specified herein prior to installation to allow the materials to stabilize.

PART 2 – PRODUCTS

2.1 WALL PANELS, GENERAL

- A. Acoustical Wall Panels shall be 2-1/8” thick – 6.0-7.0 lb. per cubic foot acoustical fiberglass substrate with 1/8” thick 16-20 PCF High impact/ tackable underlayment. Standard panel construction wrapped with panel manufactures standard full line of fabric.

1. Products: AlphaSorb® High Impact Acoustic Panel, or as approved.

As Manufactured by: Acoustical
Solutions 2420 Grenoble Road,
Richmond, VA 23294
Ph. (800) 782 5742
Web: AcousticalSolutions.com

2. Facing Material: Guilford of Maine Whisper Fabric
 - a) Panel color: to be selected from manufacturer’s standard colors
3. Panel Thickness: 2-1/8”
4. Noise Reduction Coefficient: NRC 1.05
5. Edge Detail: Square
6. Edge Construction: Chemically Hardened
7. Panel Width: As indicted in drawings, up to 4 feet wide
8. Panel Length: As indicated in drawings, up to 10 feet long.

2.2 CONSTRUCTION

- A. The acoustical wall panel product shall be supplied in widths up to 4 feet wide and lengths up to 10 feet long. All edges will be fully wrapped with mounting as indicated.

2.3 MOUNTING

- A. Back-Mounting Accessories: Manufactures standard accessories for securely mounting panels, of type and size indicated and complying with the following requirements:
 1. Impaling Clips: Clip is mounted to the wall, adhesive applied on wall around clip, then panel pressed into place until flush with wall.
 2. Z Clips: Two-part metal clips designed to support weight of panels. One part mechanically attached to wall substrate according to manufactures standard pattern and other part fastened to back of panel.
 3. Rotofast Snap-On Anchors
 4. Other: as specified

2.4 ACOUSTICAL PERFORMANCE

- A. Sound Absorption: Per ASTM C – 423
- B. Sound Absorption Coefficient per Octave Band Center Frequency (Hz) Thickness

	125	250	500	1000	2000	4000	NRC
2-1/8"	0.55	0.95	1.16	1.04	1.05	1.07	1.05

2.5 FLAMMIBILITY RATING

- A. All components shall have a Class A Flammability rating per ASTM E- 84: Surface Burning Characteristics of Building Materials, with a Flame Spread of 25 or less and Smoke Developed of 450 or less

2.6 FABRICATION

- A. Wrap panel edges and return facing fabric 1-2 inches on back of panel. Secure fabric with adhesive applied to edges and back of panel only.

PART 3 – EXECUTION

- 3.1 MANUFACTURER'S INSTRUCTIONS
 - A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

- 3.2 EXAMINATION
 - A. Site verification of conditions: verify that substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions
 - 1. Verify that stud spacing is 16 inches O.C., maximum for panels installed over open studs
 - 2. Do not install panels until unsatisfactory conditions are corrected

- 3.3 INSTALLATION
 - A. Install Acoustical Wall panels in locations indicated, top edges level and in alignment with other panels. Comply with manufacturer's written instructions for installation of panels using type of mounting accessories indicated or, if not indicated, as recommended by manufacturer.

- 3.4 CLEANING
 - A. After completion of installation of panels, remove dust and other foreign material according to manufacturer's written instructions.

 - B. Remove surplus material, rubbish, and debris resulting from panel installation, on completion of the work, and leave areas of installation in a neat and clean condition.

END OF SECTION

SECTION 09 90 00
PAINTING AND COATING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Exterior paint systems.
- B. Interior paint systems.

1.02 SUBMITTALS

- A. Product Data: Provide product criteria, characteristics, accessories, jointing and seaming methods, and termination conditions.
- B. Sample: Submit three paper chip samples, 8.5 x 11 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.
- C. Manufacturer's Installation Instructions: Indicate special preparation of substrate, installation and attachment methods, and perimeter conditions requiring special attention.
- D. Maintenance Data: For users' operation and maintenance of system including:
 - 1. Methods for maintaining system's materials and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to components, finishes, and performance.
- E. Painting Schedule: For users' operation and maintenance of system including:
 - 1. Manufacturer of system's materials.
 - 2. Color selection.
 - 3. Sheen selection.
 - 4. Locations (including floor, room number, and room name).
- F. Closeout Submittals:
 - 1. 8-1/2" X 11" card, painted on one side, paint color formula on the other, and availability information and any "custom" property of the product for each paint color and texture used on the project.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years' experience on projects of similar size and complexity.

1.04 MOCK-UP

- A. Paint a 2-foot x 2-foot area of each surface to serve as a mock up and check match to existing finish.

- B. Locate where directed.
- C. Mock-up may remain as part of the work.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. As required by the manufacturer for a warrantable installation of the installed products to meet the Performance and Design Criteria.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Provide all paint and coating products used in any individual system from the same manufacturer; unless noted otherwise below.
- B. Paints:
 - 1. Basis of Design: The Sherwin-Williams Company; www.sherwin-williams.com
 - 2. Approved Manufacturers:
 - a. Benjamin Moore & Co.; www.benjaminmoore.com
 - b. Rodda Paint Co.; www.rodmapaint.com
- C. Substitutions for products by manufacturers other than those listed above: See Section 0160 - Product Requirements.
- D. Accent Colors: Architect will select deep toned colors for use on up to 15% of paint area. (Accent colors may require extra coats or special handling and need to strike and cut line on flat plane or edge between accent color and non-accent or contrasting color)

2.02 DESCRIPTION

- A. Surface preparation and field application of paints, stains, varnishes, and other coatings.

2.03 MATERIALS

- A. Interior Systems:
 - 1. PS-2 Interior Acrylic
 - a. Substrate: Ferrous Metals
 - b. The Sherwin-Williams Company
 - 1) Primer: Pro Industrial Pro-Cryl Universal Primer
 - 2) Finish Coat: Pro Industrial Acrylic Semi-Gloss
 - 2. PS-4 Interior Latex
 - a. Substrate: Gypsum Wall Board
 - b. The Sherwin-Williams Company:
 - 1) Primer: ProMar 200 Zero VOC Latex Primer, B28W2600
 - 2) Finish Coat: ProMar 200 HP Zero VOC Latex Eg-Shel, B20-1900 Series

3. PS-5 Interior Acrylic
 - a. Substrate: Interior Window Trim, Window Casing, and Trim
 - b. The Sherwin-Williams Company:
 - 1) Primer: PrepRite® ProBlock® Interior/Exterior Latex Primer, B51-600 Series
 - 2) Top Coat: Pro Industrial Semi-Gloss Acrylic, B66-650 Series
4. PS-7 Interior Latex
 - a. Substrate: Metal
 - b. The Sherwin-Williams Company:
 - 1) Primer: None.
 - 2) Top Coat: Pro Industrial Waterborne Acrylic Drywall Flat

2.04 ACCESSORIES

- A. All accessory materials required by the manufacturer for a warrantable installation of the installed products in a manner that meets the Performance and Design Criteria.
- B. Manufacturer's optional accessories required by the project:

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions meet the manufacturer's requirements before starting work.

3.02 PREPARATION

- A. Prepare surfaces to receive work in accordance with manufacturer's instructions.
- B. Existing Painted Surfaces:
 1. Remove all oil, grease, dirt, mildew and other contaminants from the surface with a commercially available cleaner designed for such work. Minimum surface preparation is Hand, or Power Tool Cleaning per SSPC-SP2 or SP3. Where paint is peeling or badly weathered, clean surface to sound substrate. Lightly abrade smooth, hard or glossy surfaces to achieve a dull, rough surface profile to promote maximum adhesion.
 2. Clean as recommended by coating manufacture to remove surface grease and foreign matter.

3.03 INSTALLATION

- A. General: Install all materials in accordance with manufacturer's instructions based on conditions present.

3.04 PROTECTION

- A. Protect installed work as required by the manufacturer to maintain product performance, design criteria and warranty.

3.05 SCHEDULE

- A. Interior
 - 1. Interior Ferrous Metals
 - a. System: PS-2
 - b. Sheen: Semi-Gloss
 - c. Color: As selected by Architect.
 - d. Prime Coat: factory primed, (1) coat (5.0 mils wet, 1.9 mils dry)
 - e. Finish Coat: (2) coats (4.0 mils wet, 1.4 mils dry per coat)
 - 2. Interior Non-Ferrous Metals
 - a. System: PS-3
 - b. Sheen: Semi-Gloss
 - c. Color: As selected by Architect.
 - d. Prime Coat: factory primed, (1) coat (5.0 mils wet, 1.9 mils dry)
 - e. Finish Coat: (2) coats (4.0 mils wet, 1.4 mils dry per coat)
 - 3. GWB Walls
 - a. System: PS-4
 - b. Sheen: to match existing.
 - c. Color: to match existing
 - d. Prime Coat: (1) coat (4.0 mils wet, 1.0 mils dry)
 - e. Finish Coat: (2) coats (4.0 mils wet, 1.7 mils dry per coat)
 - 4. Interior Window Trim, Window Casing, and Trim
 - a. System: PS-5
 - b. Sheen: match existing
 - c. Color: to match existing
 - d. Prime Coat: (1) coat (4.0 mils wet, 1.4 mils dry)
 - e. Finish Coat: (2) coats (6.0 mils wet, 2.2 mils dry per coat)
 - 5. Ducting and Exposed Steel Supports
 - a. System: PS-7
 - b. Sheen: flat
 - c. Color: match ceiling and walls
 - d. Prime Coat: none.
 - e. Top Coat: (2) coats.

END OF SECTION

SECTION 101100
VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Markerboards (Whiteboards).

1.2 ACTION SUBMITTALS

- A. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of panel joints.
 - 2. Include sections of typical trim members.
- B. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of motor-operated, sliding visual display units required for this Project.
- B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- C. Preinstallation Conference: Conduct conference at Project site.

1.5 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: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MARKERBOARD ASSEMBLIES

- A. Porcelain-Enamel Markerboards: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and 0.021-inch- thick, porcelain-enamel face sheet with low-gloss finish.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Claridge Products and Equipment, Inc.
 - b. PolyVision Corporation; a Steelcase company.
 2. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard moisture-barrier backing.
 3. Laminating Adhesive: Manufacturer's standard, moisture-resistant thermoplastic type.
 4. Size: see drawings for locations and sizes. There will be multiple sizes on the project.

2.2 MARKERBOARD ACCESSORIES

- A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- thick, extruded aluminum; standard size and shape.
1. Field-Applied Trim: Manufacturer's standard, snap-on trim with no visible screws or exposed joints.
- B. Chalktray: Manufacturer's standard, continuous.
1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures.

2.3 FABRICATION

- A. 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.
- B. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.
1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.4 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display surfaces and wall surfaces.
- B. 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.

END OF SECTION

SECTION 10 14 23
SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Room-identification signs.
 - 2. Code Signage

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For all sign types.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, tpestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.
- E. Sample warranty.
- F. Maintenance data.

1.3 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

1.4 SIGNS

- A. Interior Building Room Identification Signage:
 - 1. Match Existing in Appearance
 - 2. Material: Acrylic
 - 3. Thickness: 1/8-inch
 - 4. Letters: 1/32-inch minimum height raised.
 - 5. Braille: Grade 2, 1/32-inch minimum height raised.
 - 6. Edge: Square
 - 7. Refer to Schedule as shown on Drawings.

- B. Interior Code Signage:
 - 1. Material: Acrylic
 - 2. Thickness: 1/8-inch
 - 3. Letters: 1/32-inch minimum height raised.
 - 4. Edge: Square
 - 5. Refer to Schedule as shown on Drawings.

- C. Exterior Signage:
 - 1. Material: Acrylic
 - 2. Thickness: 1/8-inch
 - 3. Letters: 1/32-inch minimum height raised.
 - 4. Edge: Square
 - 5. Refer to Schedule as shown on Drawings.

1.5 ACCESSORIES

- A. 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:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish stainless-steel or hot-dip galvanized devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.

- B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.

1.6 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 - 2. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.

- B. Surface-Engraved Graphics: Machine engrave characters and other graphic devices into panel surface indicated to produce precisely formed copy, incised to uniform depth.
 - 1. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.

- C. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.

PART 3 - EXECUTION

1.7 INSTALLATION

- A. General: Install signs and visual display systems using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs and visual display systems 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 the accessibility standard.
 - 3. Before installation, verify that 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. Mounting Methods:
 - 1. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
 - a. Portland Cement Plastering Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface. Temporarily support sign in position until adhesive fully sets.
 - 2. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of 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.
 - 3. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

- C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION

SECTION 10 20 00
LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Sections:
 - 1. Section 07 25 00 – Weather Barriers
 - 2. Section 07 62 00 – Sheet Metal Flashing and Trim
 - 3. Section 07 90 05 – Joint Sealers

1.2 SUBMITTALS

- A. Manufacturer's information on materials, fabrication, finishes, and installation.
- B. Shop Drawings showing details of fabrication and installation.
- C. Recycled Content Certification.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle in accordance with manufacturer's instructions.

1.4 WARRANTY

- A. Manufacturer's Standard Warranty for Material and Workmanship: 5 years from the date of Substantial Completion.
- B. Manufacturer's Finish Warranty: 10 years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stationary Louvers:
 - 1. Basis of Design: ESD-635 manufactured by Greenheck,
 - a. Comparable products by one of the following are also acceptable. See Section 0160 - Product Requirements for submittal requirements.
 - 1) Airlite Company
 - 2) Ruskin
 - 3) Industrial Louvers
 - b. Substitutions for products by manufacturers other than those listed above: See Section 0160 - Product Requirements.
 - 2. Criteria
 - a. Frame:
 - 1) Depth: 6-inches
 - 2) Wall Thickness: 0.081-inch nominal
 - 3) Flanged Frame

- 4) Material: Heavy gauge extruded 6063-T5 aluminum
- b. Blades:
 - 1) Material: Heavy gauge extruded 6063-T5 aluminum
 - 2) Wall Thickness: 0.081-inch nominal
 - 3) Angle: approximately 35-degree angle
 - 4) Spacing: Approximately 3 1/4-inch centers.
- c. Bird Screen:
 - 1) 1/2-inch by 1/2-inch square wire cloth
 - 2) Aluminum
 - 3) Removable frame
 - 4) Mounted on inside
 - 5) 6063-T5 extruded aluminum frame
- d. Insect Screen:
 - 1) 16 x 18 mesh
 - 2) Fiberglass
- e. Size: Overall Dimensions: 24" width X 26" height
- f. Free Area: 45% minimum.
- g. Finish: 70% Kynar (PVFD)
 - 1) Color: to be selected from Manufacturer's full range of colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that openings to receive louvers are satisfactory for their installation.

3.2 INSTALLATION

- A. Install plumb and true in accordance with manufacturer's instructions, reviewed Shop Drawings, and as shown and specified.
- B. Apply continuous bead of sealant around exterior frames as shown in drawings. Sealant is specified in Section 07 90 05.

END OF SECTION

SECTION 11 14 00
BENCH TOP SPRAY BOOTH

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bench Top Spray Booth to be installed in Art Classroom.

B. Related Requirements

1. Section 07 62 00 – Sheet Metal Flashing and Trim
2. Section 12 32 00 – Manufactured Casework
3. Division 23 and drawings, for booth exhaust work.
4. Division 26 and drawings, for electrical point of connection work.
5. Work includes but is not limited to following:

- C. Provide all material, labor, equipment, power connections, and exhaust connections to prepare and install Spray Booth at the location shown on the plans and per the manufacturer's recommendations.

1.2 ACTION SUBMITTALS

- A. General Requirements: Submittals shall be in accordance with Division 01 Section "Shop Drawings, Product Data, and Samples".

- B. Product Data: Submit manufacturer's data for spray booth and all accessories and components.

C. Shop Drawings:

1. Showing shape, size, material, assembly, and all utility points of connection.
2. Provide top plan view and an elevation of each side of the booth.
3. Provide flue routing diagram, including roof penetration, roof anchorage, and extension 6' above the roof.
4. Coordinate shop drawings with other work involved.
5. Provide rough-in drawings for mechanical and electrical services where required.

- D. Manufacturer's Installation Instructions: Include installation templates for all utility connects and attachment devices.

E. Operations and Maintenance Data.

1. Submit Maintenance and Operations Manuals under the provisions of Division 01 Section "Operations and Maintenance Data".

- F. Warranties: Provide Sample of warranty with Shop Drawing Submittal.

1.3 WARRANTY

- A. Manufacturer's standard 1-year warranty from date of Substantial Completion.

1.4 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Package and store booth and all accessories as required to prevent damage before installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Paasche Airbrush Co., www.paascheairbrush.com, or approved. Paasche system is specified as a standard of quality, function, and appearance.
1. Paasche Airbrush Co
9511 58th Place
Kenosha, WI 53144
(800) 621-1907
 2. Conforms to OSHA, NFPA and EPA Regulations
 3. Product Substitution Procedures, Section 0125 - for Substitution Requests.

2.2 MATERIALS

- A. Bench Top Spray Booth with fan and motor: Basis of Design, Paasche BBF-4-T1, or approved.
1. Flow rate: approx. 1,100 C.F.M. @ 1/4" S.P. or 137 LFM.
 2. Booth Construction: 18 Gauge Galvanized Steel Sheet Metal Panels
 3. Inside Working Dimensions: 4' Wide X 2'6" Deep X 2' High
 4. Overall Dimensions: 4'2" Wide X 3'2" Deep X 4'8" High
 5. Motor: "1/4-1-TE" 1/4 H.P., 115 Volt, 1 Phase, 60 Cycle Explosion Proof Motor
 6. Fan: "B12-1/4" 12 inch Fan with Sparkless Blade & 1000 CFM capacity
 7. Frame: 48 NEMA Frame
 8. Duct: 12" dia. round. Single wall, galvanized sheet metal.
 9. Weather Canopy / Damper (Roof): WC-12
 10. Roof Flange: EF-12

2.3 ACCESSORIES

- A. Included Accessories
1. Extra set of Filters
 2. Belt Guard
 3. Draft Gauge
- B. Operations and Maintenance Additional Materials
1. Case of 50 filters – provided to Owner

2.4 FINISHES

- A. Unfinished Galvanized Steel

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Preparation: Prior to beginning installation of fume hood, check and verify that no irregularities exist that would affect quality of execution of work specified.
- B. Coordination: Coordinate the work of the Section with the schedule and other requirements of other work being performed in the area at the same time both with regards to electrical connections to the booth and the general construction work.

3.2 INSTALLATION

- A. Performance: Install booth, plumb, level, rigid, and adjacent furniture in proper location, in accordance with manufacturer's instructions and the approved shop drawings. Do not install any damaged units or accessories.
- B. Booth must be hardwired. All metal parts shall be grounded, including exhaust duct.
- C. Booth to be mounted on non-combustible surface.
- D. Calibrate flow rate per manufacturer guidelines.

3.3 ADJUST AND CLEAN:

- A. After installations are complete, adjust all moving parts for smooth operation.
- B. Remove all packing materials and debris resulting from this work, and turn over the booth to the Owner clean and polished both inside and out.
- C. Repair or remove and replace defective work, as directed by owner and/or his representative upon completion of installation.

3.4 PROTECTION:

- A. Provide reasonable protective measures to prevent equipment from being exposed to other construction activity and potential damage.

END OF SECTION

SECTION 12 32 00
MANUFACTURED CASEWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Cabinets
- B. Plastic-laminate countertops
- C. Casework hardware.

1.2 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants
- B. Section 09 29 00 – Gypsum Board Assemblies
- C. Section 09 22 00 – Non-Structural Metal Wall Framing

1.3 DEFINITIONS

- A. Grain Direction:
 - 1. Wood grained and directionally grained laminates shall run and match vertically within each cabinet unit and run vertically on all other cabinet surfaces.
- B. Exposed Surfaces:
 - 1. In casework, surfaces visible when drawers and opaque doors (if any) are closed; open cabinet interiors and interiors behind clear glass doors; exterior cabinet bottoms 42" or more A.F.F.; exterior cabinet tops 80" or less A.F.F. or seen from above;
 - 2. Exposed cabinet surfaces shall be: NEMA LD-3-2005 VGS High Pressure Decorative Laminate (HPDL).
 - a. Choose from Formica, Wilsonart, Pionite and Nevamar non-premium, non-specialty laminates in Formica "58" finish, Wilsonart "60" or "38" matte finish and Nevamar "T" textured finish.
- C. Semi-Exposed Surfaces:
 - 1. In casework, surfaces that become visible when opaque doors are open or drawers are extended; bottoms of cabinets less than 42" A.F.F.; exterior cabinet tops more than 80" A.F.F. and not seen from above. wall mounted shelving.
 - 2. Semi-Exposed cabinet surfaces shall be: Low pressure decorative laminate (LPDL).
 - a. Frosty white.

- D. Concealed Surfaces:
 - 1. Exterior or interior surfaces that are covered or not normally exposed to view.
 - 2. Surfacing material at manufacturer's option. No exposed (raw) cabinet surfaces are permitted.

1.4 SUBMITTALS

- A. Product Data: Provide component dimensions and construction details.
- B. Shop Drawings: Indicate casework locations, large scale plans, elevations, clearances required, rough-in and anchor placement dimensions and tolerances, and coordinate with other trades, including electrical.
- C. Samples:
 - 1. Hardware: exposed hardware and accessories; one unit for each type and finish.
 - 2. Submit one set of laminate color brochures from standard laminate manufacturers Wilsonart, Formica, Pionite, and Nevamar.
 - 3. Submit one edge color sample chain.
 - 4. Submit one set of interior colors samples.
- D. Closeout Submittals: Shop Drawings, Final Warranties, Color/Materials listing.
- E. Operation and Maintenance Data.

1.5 QUALITY ASSURANCE

- A. Unless otherwise indicated, comply with AWI Custom Grade for interior architectural woodwork, construction, finishes and other requirements:
- B. Manufacturer Qualifications:
 - 1. Architectural Woodwork Institute (AWI) Certified, Woodwork Institute (WI) Certified, per Architectural Woodwork Standards, or accepted by Architect.
 - 2. Minimum 10 years documented experience in manufacturing and installing casework and millwork in commercial projects of similar scope and quality.
- C. Installer Qualifications: Minimum 2 years' experience in work of this Section.
- D. Installation shall be: by casework manufacturer's authorized representative.
- E. Source Limitations: Obtain manufactured wood casework from single source manufacturer.

1.6 MOCK-UP

- A. Provide full size mock-up of casework.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.7 WARRANTY

- A. Warranty Period: Ten years from date of Substantial Completion.

1.8 REGULATORY REQUIREMENTS

- A. Conform to Regulatory Requirements specified by Division 01 Quality Control.
- B. Seismic Bracing:
 - 1. Design and install casework using seismic braces, anchors, and stiffeners to restrain overturning of casework, suitable for Seismic Zone 3.
 - 2. Include ICBO approved anchors.

1.9 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site. Attendance: Architect, Owner, Contractor, Installer, and related trades.
- B. Review: Project conditions, manufacturer requirements, delivery, and storage, staging and sequencing, and protection of completed work.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
 - 1. Deliver casework once painting, and similar requirements have been completed that will not damage casework. This includes ensuring spaces are enclosed and weather tight.
 - 2. All casework shall be blanket wrapped for protection during shipping.
- B. Storage and Handling:
 - 1. Casework must be protected from dust, dirt and/or other trades.
 - 2. Countertops are stacked, properly supported and spaced evenly to avoid warping. Large pieces are stacked first on the pallets with shorter pieces stacked on top.

1.11 FIELD CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install the casework until concrete, masonry, and drywall/plaster work is dry; ambient relative humidity is maintained between 25 - 55% prior to delivery and throughout the life of installation; and the temperature is controlled above 55
 - 2. Casework shall not be stored or installed in non-climate controlled conditions.
 - 3. If ambient conditions are not met at the time of requested delivery, the general contractor must provide the casework manufacturer a letter releasing manufacturer from any liability and responsibility from any warranty or damage resulting from not complying with required ambient conditions.
- 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 construction to receive countertops by field measurements before fabrication and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.12 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Product: Provide casework by Case Systems, Inc, www.casesystems.com.
- B. Substitutions for products by manufacturers other than those listed above: See Section 01 60 - Product Requirements.

2.2 MATERIALS

- A. Provide Plastic Laminate Faced Cabinets Manufactured with:
1. Particleboard Core:
 - a. M-2 CARB2 compliant for emission levels of urea formaldehyde, and shall meet or exceed all requirements as set by ANSI A208.1-2016.

Density	40-50 lbs/cu.ft
Modulus of Rupture	1885 psi
Modulus of Elasticity	290,100 psi
Internal Bond	58 psi
Face Screw Holding	202 pounds Min
 2. MR (Moisture Resistant)/FSC Core shall be:
 - a. Interior-Grade moisture resistant particleboard.
 - b. Meet or exceed M-2 Grade, according ANSI-A208.1-2016.
- B. Cabinet Joinery:
1. Concealed Interlocking Mechanical Fasteners or Dowel construction: For cabinet body components. Manufacturer's discretion on best suited joinery method for project.

2. Construction: Meets requirements in AWS Manual, Edition 2, including errata and appendix section.
- C. Surface Material:
1. Acceptable laminate color, pattern, and finish as selected by Architect from manufacturer's standards types and nominal thickness including:
 - a. General purpose vertical grade VGS HPDL. Choose from Formica, Wilsonart, Pionite and Nevamar non-premium, non-specialty laminates in Formica "58" finish, Wilsonart "60" or "38" matte finish and Nevamar "T" textured finish.
 - b. General purpose horizontal grade HGS HPDL. Choose from Formica, Wilsonart, Pionite and Nevamar non-premium, non-specialty laminates in Formica "58" finish, Wilsonart "60" or "38" matte finish and Nevamar "T" textured finish.
 - c. Cabinet decorative liner grade CLS, color: white
 - d. Non-decorative backer grade BKH
 - e. Low pressure decorative laminate, color: white
- D. Edge banding:
1. PVC
 - a. Shall be applied utilizing hot melt adhesive and radiused by automatic trimmers. Edging shall be available in a variety of color options.
- E. Adhesives:
1. PVA
 - a. Adhesive shall be mechanically applied.
 - b. ULEF, no VOC
 2. EVA
 - a. Adhesive shall be mechanically applied.

2.3 FABRICATION

- A. General Cabinet Body Construction:
1. Cabinet Box Style shall be Reveal Overlay Fronts.
 2. Cabinet Box Core shall be standard M2 particleboard.
 3. Bottoms and ends of cabinets, and tops of tall cabinets and tops and bottoms of wall cabinets (all structural components) shall be 3/4-inch thick.
 4. All panels shall be manufactured with balanced construction. Cabinet components may use CLS cabinet liner or BKH backer to balance VGS HPDL laminate at semi-exposed and non-exposed surfaces.
 5. Fixed interior components such as fixed shelves, dividers, and cubicle compartments shall be full 3/4" thick and attached with concealed interlocking mechanical fasteners.
 6. Fixed and adjustable shelves at open cabinets shall be 1" thick.
 7. Cabinet body exterior surfaces shall be considered Exposed Surfaces.
 8. Open cabinet interior surfaces and interiors behind clear glass doors shall be considered Exposed Surfaces.
 9. Closed cabinet body interior surfaces shall be considered Semi-Exposed Surfaces.

10. Visible cabinet bottoms (e.g. wall cabinet bottoms) shall be considered Exposed if 42" or more A.F.F., Semi-Concealed between 24" and 42" and Concealed below 24": A.F.F.
 11. Visible cabinet tops (e.g. wall cabinet tops, hutch cabinet tops, tall cabinet tops) shall be considered Exposed if 80" or less A.F.F. or if visible from above and Concealed if more than 80" A.F.F. and not visible from above.
 12. Cabinet edges:
 - a. Cabinet body front edge shall be: 3mm Thick PVC.
 - b. Top edge of wall, tall, and hutch cabinet ends shall be:
 - c. All other edges shall be: unfinished.
 13. Mounting stretchers are 3/4" thick structural components fastened to end panels and back by mechanical fasteners, and are concealed by the cabinet back.
 14. When the rear of a cabinet is exposed, a separate finished 3/4" thick decorative laminate back panel may be required.
 15. Backs of cabinets are 1/2" thick surfaced both sides for balanced construction and fully captured on both sides and bottom.
 16. A 5mm diameter row hole pattern 32mm (1-1/4") on center shall be bored in cabinet ends for adjustable shelves. This row hole pattern shall also serve for hardware mounting and replacement and/or relocation of cabinet components.
- B. Base Cabinet Construction:
1. A formed metal front brace, and steel corner gussets, may be utilized to achieve maximum clearance and provides support and secure fastening for the top in all four corners. Front face shall be powder coated black.
 2. A minimum 4" wide stretcher shall be provided below drawers and shall be mechanically fastened to the end panels.
- C. Tall Cabinet Construction:
1. All tall cabinets shall be provided with an intermediate fixed shelf to maintain internal dimensional stability under heavy loading conditions as well as an intermediate 3/4" thick stretcher located behind the back panel, secured between the cabinet ends with mechanical fasteners. The stretcher shall be secured to the shelf through the back with #8 x 2" plated flat head screws.
- D. Wall Cabinet Construction:
1. All wall cabinet bottoms shall be 3/4-inch thick core (type specified above), mechanically fastened between end panels and secured to the bottom back stretcher. A lower 3/4" thick stretcher shall be located behind the back panel and attached between the end panels with mechanical fasteners. The stretcher is also secured through the back and into the cabinet bottom. Cabinets wider than 36" shall include a vertical partition mid-cabinet for added bottom and shelf support.
 2. All wall cabinet tops shall be 3/4 -inch thick.
- E. Tall and Wall Cabinet Top Edges shall be unfinished if not visible from above or nominal 1mm PVC edgeband matching the cabinet box edge if visible from above.

- F. Tall, Wall and Hutch Tops shall be considered Exposed or Semi-Exposed based on visibility as previously defined. Semi-Exposed surfaces shall utilize BKL, LPDL or CLS. LPDL and CLS shall match the color selected for Semi-Exposed surfaces.
- G. Reveal above the top door and drawer front shall be a maximum of 6mm at Base cabinets and 15mm at Tall, Wall and Hutch cabinets.
- H. Toe Base of Cabinet:
1. Individual bases shall be constructed of: M-2 moisture resistant particleboard factory applied to base and tall cabinets and shall support and carry the load of the end panels, and the cabinet bottom, directly to the floor. The base shall be let in from the sides and back of the cabinet to allow cabinets to be installed tightly together and tight against a wall, also to conceal the top edge of applied vinyl base molding (not supplied by casework manufacturer). There shall be a front to back center support for all bases over 30" wide.
 2. Toe Base Height: 3-3/4" unless noted otherwise on the drawings to permit shimming to accommodate variances in the floor.
 3. Toe bases shall be securely attached to the base cabinet at the manufacturer.
- I. Drawer Fronts and Solid Doors:
1. All drawer fronts and solid door components shall be: 11/16" thick M-2 industrial particleboard surfaced both sides for balanced construction.
 2. Exterior of door and drawer fronts shall be surfaced with VGS HPDL, balanced with either VGS HPDL or CLS cabinet liner at Semi-Exposed interior surfaces and with VGS HPDL on Exposed interior surfaces. The interior surface of a glazed door is an Exposed Surface.
 3. Door and drawer front edge shall be: machine applied 3mm thick PVC radiused to eliminate sharp edges and corners.
- J. Drawer Boxes:
1. Drawer box core shall be M-2 industrial particleboard.
 2. Drawer box surface at finished interiors shall match semi-exposed interior finish.
 3. Drawer box sides, backs and sub-front shall be 1/2" thick, carried by a non-racking, non-deflecting 1/2" thick plant-on bottom mechanically fastened to the sides, sub-front and back 4" on center. The top edge shall be nominal 1mm (.020") PVC matching the drawer color. Drawer box corners shall be joined with fluted hardwood dowels and glue spaced at a minimum of 32mm on center.
 4. Side-mount slides are secured with 1/2" long screws driven into the drawer box sides. Drawer box fronts shall be removable and attached to drawer box sub-front with screws from inside of drawer. Screws shall be located a maximum of 1-1/2" from the inside corner of the sub-front and shall be spaced a maximum of 12" on center. Horizontal parting rails between drawers shall be 3/4" thick core, with balanced surfaces, secured to and further reinforcing cabinet ends. File drawer box shall have full-height sides supporting a heavy-duty support rail for hanging file folders.
- K. Doors:
1. Solid Doors shall be surfaced both sides for balanced construction.

- L. Shelves:
1. Adjustable:
 - a. Adjustable Shelf Core shall be: M-2 industrial particle board. Top and bottom surfaces shall be finished the same.
 - b. Adjustable shelves in closed cabinets shall be: 3/4" Shelves, 1" for shelves over 33" wide.
 - c. All adjustable shelves in open cabinets shall be: 1" thick, except for special use cabinets such as mail, cubical, instrument or locker type units.
 - d. Adjustable shelf edge on open cabinets shall be: nominal 1mm PVC at front edge
 - e. Adjustable shelf edge on closed cabinets shall be: nominal 1mm PVC at front edge
 - f. Adjustable shelf shall be set back a maximum of 15mm from the front of the cabinet.
 2. Fixed:
 - a. Fixed shelves shall be standard M2 particleboard. Top and bottom surfaces shall be the same.
 - b. Fixed shelves shall be 3/4" thick at closed cabinets, 1" thick at open cabinets.
 - c. Fixed shelf surfaces on closed cabinets shall be LPDL.
 - d. Fixed shelf surfaces on open cabinets shall be HPDL.
 3. Wall shelving on standards and brackets shall be:
 - a. Fixed shelves shall be standard M2 particleboard. Top and bottom surfaces shall be the same.
 - b. Edged all four edges with nominal 1mm PVC
 - c. Surfaced with LPDL
 4. Wire Shelves shall be white, plastic coated.
 5. Hardboard Shelves shall be 1/4" thick tempered hardboard. All hardboard shall have a "S2S" surface finish.
- M. Specialty Products:
1. Countertops:
 - a. High-pressure decorative laminate conforming to NEMA Standard LD3-2005 and ANSI A161.2-1998, bonded to 1" thick solid core countertop.
 - 1) HGS, HGL, or HGP HPDL selected from Formica, Wilsonart and Nevamar non-premium, non-specialty laminates in Formica "58" finish, Wilsonart "60" or "38" matte finish and Nevamar "T" textured finish
 - 2) For dry countertops, HPDL bonded to M-2 moisture resistant particleboard core with PVA rigid adhesives. Core shall be balanced with backing Grade BKL.
 - 3) For wet countertops and countertops adjacent to free-standing sinks, HPDL bonded to M-2 moisture resistant particleboard core with PVA rigid adhesives. Core shall be balanced with backing Grade BKL.
 - 4) All joints shall be secured with biscuits for alignment and tight joint fasteners.

- 5) Provide 4" high back splashes with thickness matching countertop thickness where shown and at all ends abutting walls and adjacent cabinets.
- 6) Exposed edges shall be 3mm PVC.

2.4 FINISHES

- A. Plastic Laminate Casework Colors:
1. High Pressure Laminate is available in non-premium, non-specialty and manufacturers' standard suede finishes from select laminate manufacturers, including:
 - a. VGS HPDL selected from Formica, Wilsonart, Pionite and Nevamar non-premium, non-specialty laminates in Formica "58" finish, Wilsonart "60" or "38" matte finish and Nevamar "T" textured finish
 - b. Color: Specialty and other manufacturer finishes are available with additional cost and longer lead times.
 2. LPDL, where specified, that meets performance requirements of ANSI/NEMA 3 LD – 2005 for GP-28.
 - a. Frosty White (Wilsonart 1573) or equivalent.
 3. Cabinet Liner, where specified, high-pressure cabinet liner conforming to ANSI/NEMA 3 LD – 2005, Grade CLS. Surface texture shall be similar to exterior finish.
 - a. White closely matched to LPDL color.
- B. Plastic Laminate Countertop Colors:
1. HGS, HGL, or HPL HPDL selected from Formica, Wilsonart, Pionite and Nevamar non-premium, non-specialty laminates in Formica "58" finish, Wilsonart "60" or "38" matte finish and Nevamar "T" textured finish
 2. Color: Specialty and other manufacturer finishes are available with additional cost and longer lead times.
- C. Accessories:
1. Hinges:
 - a. 5-Knuckle Reveal Overlay Hinge, Stainless Steel Finish,
 2. Pulls:
 - a. 8mm x 96mm Stainless steel wire pull.

2.5 ACCESSORIES

- A. Hardware:
1. Hinges:
 - a. Reveal Overlay 5-Knuckle Hinges shall be: .095" thick steel five-knuckle hospital-tip, institutional Grade (Grade 1 per ANSI/BHMA A156.9) quality with .187" diameter tight pin. Each hinge shall be secured with a minimum of nine No. 8 screws. Hinge shall permit door to swing 270 degrees without binding. Doors less than 48" in height shall have two hinges. Doors over 48" in height shall have three hinges.
 2. Pulls:
 - a. One pull shall be: located at the centerline of the drawer, regardless of width, to ensure ease of operation and maximize drawer slide life.

- 1) Stainless steel wire pull, 8mm diameter with 96mm O.C. mounting holes.
3. Drawer Slides:
 - a. Pencil drawers: Grade 1, side mount, full extension, 100lb load rated, zinc finish, ball bearing.
 - b. General purpose drawers: Grade 1, side mount, full extension, 100lb load rated, zinc finish, ball bearing.
 - c. Letter and legal file drawers less than 20" wide: Grade 1, side mount, full extension, 150lb load rated, zinc finish, ball bearing.
 - d. Lateral file drawers less than 30" wide and paper storage drawers: Grade 1, side mount full extension, 200lb load rated, zinc finish, ball bearing.
 - e. Lateral file drawers 30" or wider: Grade 1, side mount full extension, 200lb load rated, zinc finish, ball bearing.
4. Wall Shelving Hardware:
 - a. Regular duty wall single track and heavy-duty double track shelving hardware, including standards and brackets, are available in an anochrome finish.
 - b. Bracket Mounted Shelf Core shall be M-2 industrial particleboard
 - c. Bracket Mounted Shelf Edge shall be: nominal 1mm PVC.
 - d. Bracket Mounted Shelf Surface shall be LPDL
5. Shelf Clips:
 - a. Shelf clips shall be injected molded clear plastic, with a double pin engagement 32mm on center and shall have 3/4" and 1" anti-tip locking tabs. Shelf clips for all 1/4" hardboard shelves shall be: single pin plastic with anti-tip locking tabs.
6. Locks
 - a. Lock Locations:
 - 1) Locks at all doors.
 - 2) Locks at all drawers.
 - b. Lock Type:
 - 1) Olympus #100DR deadbolt door lock and #100DW deadbolt drawer lock
 - c. Keying:
 - 1) Locks keyed alike within a room, keyed differently between rooms.
7. Catches:
 - a. Chain Pulls shall be zinc plated, spring loaded door catch used to hold door securely shut.
 - b. Chain Stops shall be zinc plated, looped chain used to limit door swing as specified, mounting plate at each end of chain shall use (4) #7 x 5/8" screws to secure to cabinet door and end panel. They shall be on cabinets at adjoining walls and where casework and countertops can interfere with the door swing of the tall cabinet.
 - c. Elbow Catch shall be chrome plated, spring loaded, used to hold non-locking door securely shut.
 - d. Roller Catch shall have a heavy-duty, spring-loaded roller, with molded plastic bumper mounted at door top to keep door securely shut.
 - e. Magnetic Catch, shall have: white plastic housing with two 32mm spaced, elongated holes for screw-attachment to allow adjustability.

- f. One (1) magnetic catch at base and wall cabinets, two (2) roller catches at tall cabinets.
- 8. Metal Countertop Supports:
 - a. Powder coated, formed metal supports. Must provide attachment points between countertop and wall.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify adequacy of support framing.

3.2 INSTALLATION

- A. Casework shall not be: installed until concrete, masonry, and drywall/plaster work is dry.
 - 1. If ambient conditions are not met at the time of requested delivery, the general contractor must provide Case Systems a letter that releases manufacturer from any liability and responsibility from any warranty or damage resulting from not complying with required ambient conditions.
- B. Casework shall be: installed plumb and true and is to be securely anchored in place.
- C. The casework contractor shall verify all critical building dimensions prior to fabrication of casework.
- D. Provide all labor for unloading, distribution, and installation of casework and related items as specified.
- E. All casework shall be: securely anchored to horizontal wall blocking, not to plaster lathe or wall board.
- F. The casework manufacturer shall re-configure the casework arrangements to dimensions requiring 2-1/2" or less of filler at each end of wall-to-wall elevations, and to ensure a complete and satisfactory installation.

3.3 ADJUSTING

- A. All casework must be installed by casework installer plumb and level, adjust all doors, drawers and hardware to comply with manufacturers specifications and operate properly.

3.4 CLEANING

- A. Clean casework, countertops, shelves, and hardware.
- B. The casework installer shall remove all debris, sawdust, scraps, and leave casework spaces clean.

3.5 PROTECTION

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Protect in accordance with the manufacturer's recommendations.

END OF SECTION

SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

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 the following to complement other Division 23 Sections:
 1. Submittals.
 2. Coordination Drawings.
 3. Record Documents.
 4. Maintenance Manuals.
 5. Piping materials and installation instructions common to most piping systems.
 6. Concrete base construction requirements.
 7. Escutcheons.
 8. Dielectric fittings.
 9. Flexible connectors.
 10. Mechanical sleeve seals.
 11. Nonshrink grout for equipment installations.
 12. Field-fabricated metal equipment supports.
 13. Installation requirements common to equipment specification sections.
 14. Rough-ins.
 15. Mechanical Installations.
 16. Cutting and patching.
 17. Touchup painting and finishing.

1.3 GENERAL REQUIREMENTS

- A. Intent:
 1. The intent of the Contract Documents is for the Contractor to include all work necessary for the complete mechanical systems, tested and ready for operation.
 2. By submitting a proposal, the Contractor represents that it has made a thorough examination of the site, of the work, and all existing conditions and limitations, and that it has examined the Contract Documents in complete detail and has determined beyond doubt that the drawings, specifications, and existing conditions are sufficient, adequate and satisfactory for the construction of the work under the Contract.
 3. Where minor adjustments of the work are necessary for purposes of fabrication or installation of items, or resolution of conflicts between items within the intent of the Contract Documents, the Contractor shall make such adjustments with no added compensation. Where such adjustments

affect functional or aesthetic design of the work, they shall first be submitted to the Architect for review and approval.

- B. Conditions:
1. Conform to all Bidding Requirements, General Conditions and Amendments to the General Conditions, Supplementary Conditions and Special Conditions and General Requirements, Division 01, which govern the work specified herein.
 2. The Contractor is obligated to comply with the above in addition to the requirements of this Section.
 3. Modifications by this Section do not nullify any other portions of the above referenced conditions.
- C. Make complete mechanical installation, connecting to all equipment shown on the plans, or called for in the specifications. Mechanical contractor to provide any additional extra dampers and valves not shown on plans to obtain design criteria as required by the balancing contractor.
- D. Plans and Specifications: Plans and specifications shall be taken together.
1. Contractor shall provide all equipment, materials and work shown on the plans and/or called for in these specifications.
 2. Provide work specified and not indicated on plans, or work indicated on plans and not specified, as though mentioned in both.
 3. When discrepancies or conflicts occur within the documents, the Architect shall determine which takes precedence and the Contractor shall perform the selected requirement without additional cost.
- E. Mechanical Drawings:
1. Mechanical drawings do not attempt to show all aspects of building construction, which will affect the installation of mechanical systems. The mechanical drawings are diagrammatic and do not intend to show all offsets and fittings that may be required for a complete installation. Locations of equipment, pipes, valves, traps, ductwork, etc. shown on the drawings, shall be followed as closely as conditions will permit. Review all project drawings, including, but not limited to, architectural, structural and electrical drawings; and coordinate with all trades involved so there is no conflict with work of other trades and so Owner secures best arrangement of work consistent with use of space.
 2. Verify exact distances between points shown of drawings by actual measurement at site, as no extra cost will be allowed for differences between actual measurements and scaled measurements.
 3. Changes in design, configuration, or location of equipment, piping, or ductwork, advisable in the opinion of Contractor, shall be submitted to Architect for approval before proceeding with work, with written assurance from other trades that such changes will not interfere with their installation, nor cause any extra cost on their part. Such changes shall be made at no additional cost to Owner.
 4. Check location of all work of all trades and avoid interferences. Special attention is called to the following items; conflicts shall be reported to Architect for decision and direction:
 - a. Exact location of outlets shown on architectural details.
 - b. Location of suspended ceilings.

- c. Location of ducts, grilles, pipes, and other mechanical equipment so electrical outlets are clear of these items and in proper relation to same.

1.4 DEFINITIONS AND ABBREVIATIONS

- 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, crawl spaces, 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 spaces above hard or lay-in type 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 word "provide," as used in Division 23, means "furnish and install."
- G. The word "approved," as used in these specifications, means acceptance by the Architect.
- H. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the drawings, or other paragraphs or schedules in the specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.
- I. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted," mean directed by the Architect, requested by the Architect, and similar phrases.
- J. Mechanical Systems - Including but not limited to:
 - 1. Heating, Ventilation and Air Conditioning Systems.
 - 2. Temperature Controls System.
- K. Abbreviations:

AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
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 of Testing Materials
AWWA	American Water Works Association
AWS	American Welding Society
CISPI	Cast Iron Soil Pipe Institute
FM	Factory Mutual Engineering Corporation
IBC	International Building Code
IMC	International Mechanical Code
NEBB	National Environmental Balancing Bureau
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NREC	Washington State Non-Residential Energy Code
OSHA	Occupational Safety and Health Administration
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Inc.
UPC	Uniform Plumbing Code
UL	Underwriters Laboratories

1.5 CODES, PERMITS AND INSPECTIONS

- A. Codes: Work shall be installed as a minimum in conformity with applicable local ordinances and statutes. Standards and sizes, which exceed preceding requirements, shall be installed as drawn or specified. Nothing in the specifications shall be construed to permit deviation to less than the requirements of governing codes. Contractor is not relieved from furnishing and installing work shown or specified which may be beyond requirements of ordinances, laws, regulations, and codes.
- B. Codes and Standards: Applicable codes and standards shall include, but not necessarily be limited to:
1. Uniform Plumbing Code, by International Association of Plumbing and Mechanical Officials.
 2. International Mechanical Code, by International Code Council.
 3. International Building Code, by International Code Council.
 4. Requirements of OSHA, EPA and WISHA.
 5. National Fire Protection Association Codes.
 6. ASME codes for boiler and pressure vessels.
 7. SMACNA HVAC Duct Construction Standards, latest edition.
 8. All local and state amendments.
 9. Requirements of all agencies have jurisdictional authority over installation of mechanical systems.
- C. Permits, Fees and Inspections:
1. Contractor shall arrange and pay for all permits, fees and inspections required in connection with this installation. The Contractor shall present the Owner with properly signed certificates of final inspection before the work will be accepted.
 2. Contractor shall call for all inspections by local building official(s) when they become due and shall not cover any work until approved by these governing authorities.
 3. Contractor shall make all arrangements with utility companies for water, steam, gas and drainage services, etc., associated with the work and in-

clude required payments for meters, piping, services, connection charges and materials furnished and installed by utility companies. Work and materials shall be in strict accordance with rules of respective authorities.

- D. Underwriters Laboratory Approval: Where Underwriters Laboratories (UL) standards exist, all items of electrical equipment or items partially composed of electrical equipment shall carry Underwriters Laboratories (UL) label either for the entire unit or for the electrical portion of the equipment. If UL standards do not exist, equipment shall be provided that has been labeled by an independent testing agency that is recognized by the authority having jurisdiction.
- E. ASME Code Stamp: ASME code stamp required on all pressure vessels and relief valves. Certificate required from the Boiler Inspector showing approval of the equipment and its installation.

1.6 WORK INCLUDED

- A. Work under this division shall include providing all materials, labor, equipment, tools, appliances, hoisting, scaffolding, supervision and overhead for the proper execution and completion of the mechanical work.
- B. Should these specifications or references made therein fail to specify adequately an item of equipment or material required for proper completion of the work in accordance with present day practice, this deficiency shall not relieve Contractor from furnishing and installing same. Call such omissions to attention of Architect and use such equipment or material as approved by Architect.
- C. All new equipment and products as noted in Part 2 of each section shall be installed as per manufacturer's recommendations.

1.7 WORKMANSHIP

- A. This Contractor shall provide completed systems with a neat and finished appearance. If, in the judgment of the Architect, any portion of the work has not been performed in a workmanlike manner or is left in a rough, unfinished state, this Contractor will be required to remove, reinstall or replace same and patch and paint surrounding surfaces in a manner acceptable to the Architect, without increase in cost to the Owner.

1.8 SUBMITTALS, GENERAL REQUIREMENTS

- A. General: Follow the procedures for submittals or as described herein and specified in Division 01.
- B. General Requirements for Division 23 Submittals: Provide the following submittals as indicated in each Division 23 section. Additional submittal requirements may be included in the individual sections.
 - 1. Product Data: Submit manufacturer's product data for the items listed in the individual Division 23 sections. Product data shall demonstrate compliance with all specified features and requirements. Submittals for equipment shall include, but not be limited to, data indicating equipment

capacity meets the indicated values at specified conditions, equipment drawings indicating all dimensions, connection information, service space requirements, recommended piping and/or wiring diagrams, installation details and extended warranties either offered by equipment manufacturer or required by specifications.

2. Shop Drawings: Submit Contractor prepared drawings of Contractor fabricated mechanical systems. Drawings shall be prepared at 1/4" scale using Computer Aided Design (CAD) software unless indicated otherwise. Drawings shall show exact location of equipment, piping and ductwork, each section of shop fabricated duct or pipe and location of field joints, supports and building attachments, and seismic restraint locations.
 3. Reports and Certificates: Indicate and interpret test results for compliance with performance requirements. Provide performance certificates.
 4. Operation and Maintenance Data: Submit proposed Division 23 Operation and Maintenance materials for approval prior to inclusion in the comprehensive final bound edition. See Article in this section on Operation and Maintenance Manuals for materials required to be included.
- C. Number of Copies: Provide one additional copy of mechanical shop drawings and product data submitted over the number required in 01 Submittals, to allow for one copy of each submittal to be retained by the Mechanical Engineer. Additional copies may be required by individual sections of these Specifications.
- D. Format: Provide submittals arranged with numerical index and tabs in 3-ring notebook containing the total volume of material. All product data shall be submitted complete by system, partial submittals are not acceptable and may be returned unreviewed. Systems are defined here as plumbing systems (Division 22), fire suppression system (Division 21) HVAC system, and HVAC control system. Reference submittals, including title and location of project, Architect, Contractor, submission date, and specification paragraph number to indicate clearly the location, service, equipment identification numbers as shown on drawings, and function of each particular item. Where manufacturers' catalogs, pamphlets, or data sheets are submitted in lieu of prepared shop drawings, such submissions shall indicate specifically the item for which approval is required in red ink, and submissions showing general information only are not acceptable.
- E. Submittals not in conformance to above paragraphs will be returned unreviewed.

1.9 SUBMITTALS, BASIC MECHANICAL MATERIALS

- A. General: See Article in this section, Submittals, General Requirements for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals of the following:
1. Dielectric Unions
 2. Dielectric Flanges
 3. Dielectric Couplings
 4. Dielectric Nipples
 5. Braided Flexible Hose Connectors
 6. Rubber Flexible Connectors

7. Flexible Expansion Loops

- C. Shop Drawings: None required.
- D. Reports and Certificates: None required.

1.10 COORDINATION DRAWINGS

- A. Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
 - 1. Planned piping layout, including valve and specialty locations and valve-stem movement.
 - 2. Planned duct layout, including fan, coil, filter, duct silencer, and damper location.
 - 3. Clearances for installing and maintaining insulation.
 - 4. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
 - 5. Equipment and accessory service connections and support details.
 - 6. Other systems installed in same space as mechanical systems.
 - 7. Exterior wall and foundation penetrations.
 - 8. Fire-rated wall and floor penetrations.
 - 9. Ceiling and wall-mounted access doors and panels required to provide access to dampers and other operating devices.
 - 10. Sizes and location of required concrete pads and bases.
 - 11. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
 - 12. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
 - 13. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

1.11 SUBSTITUTIONS

- A. Substitutions will only be considered after project award. No substitutions will be considered during bid and/or negotiation periods.
- B. In all cases in this specification where an article is followed by the words "or equal," the Engineer is the sole judge of the quality of the proposed substitution.
- C. When the Engineer approves a substitution, the approval is given with the understanding that the Contractor guarantees the article or material substituted to be equal to or better in every respect than the article or material specified. The Contractor shall also assume complete responsibility that the article or material will fit the job as far as space, access and servicing requirements.

- D. Where several materials are specified by name for one use, select for use any of those so specified subject to compliance with specified requirements.
- E. Whenever item or class of material is specified exclusively by detail specification, trade name, manufacturer's name or by catalog reference, use only such item, unless written approval is given. Submit written requests in accordance with Division 01 substitution requirements.
- F. Make no substitutions for materials, articles or process required under contract unless written approval is obtained. See the Division 01 for project substitution requirements.

1.12 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 01. In addition to the requirements specified in Division 01, indicate the following installed conditions:
 - 1. Ductwork mains and branches, size and location, for both exterior and interior, locations of dampers and other control devices; filters, boxes, and terminal units requiring periodic maintenance or repair.
 - 2. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.). Valve location diagrams, complete with valve tag chart. Indicate actual inverts and horizontal locations of underground piping.
 - 3. Record drawings shall incorporate all accepted change orders and RFIs; reference number on drawings is not acceptable.
 - 4. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
 - 5. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
 - 6. Contract Modifications, actual equipment and materials installed.
 - 7. Record the locations and invert elevations of underground installations.

1.13 OPERATION AND MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 01 and the following requirements. Division 23 manuals shall be hard cover, 3-post binder, and indexed by systems. Pages shall be same size, with exception of allowable fold-out pages for control and flow diagrams. Cover shall be inscribed with name of project, Owner, description of contents, Architect, General Contractor, Mechanical Contractor, and date. In addition to the requirements specified in Division 01, include the following information in Division 23 materials:
 - 1. Product Data of all Division 15 equipment provided by the project as indicated in submittal requirements.
 - 2. Manufacturer's Equipment Installation and Start-Up Manuals for all equipment provided by the project. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 - 3. Manufacturer's Equipment Service Manuals for all equipment provided by the project, including parts list, troubleshooting list and maintenance pro-

cedures for routine preventative maintenance. Include disassembly, repair, and reassembly; aligning and adjusting instructions; servicing instructions and lubrication charts and schedules

4. Reports and Certificates of all Division 23 systems and equipment as required by specifications.
5. Material Safety Data Sheets (MSDS) for all applicable materials used for Division 23 installations.
6. Warranty Certificates for all equipment where extended warranties are either offered or required; provide supplier contact information.

1.14 QUALITY ASSURANCE

- A. Equipment Selection: Equipment allowed by the specifications but with different electrical characteristics, physical dimensions, capacities, and/or ratings than what is shown on the drawings may be furnished, provided such proposed equipment is approved in writing and connecting mechanical and electrical services, such as pipe and/or duct connection sizes, circuit breakers, conduit, motors, bases, and equipment spaces are revised to accommodate such equipment. All expenses shall be borne by the Contractor. Specified minimum energy ratings and/or equipment efficiencies must meet design and commissioning requirements.

1.15 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 prevent entrance of dirt, debris, and moisture.
- B. Protect stored mechanical equipment, ducts, pipes and tubes and other materials from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Pipes, ducts, mechanical equipment, and other materials that are damaged due to improper storage shall be replaced at the Contractor's expense.

1.16 SEQUENCING AND SCHEDULING

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical 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. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

- E. Some equipment may require temporary installation during one phase and require relocation to final location under another phase. Provide all associated labor and materials to accommodate this phasing.
- F. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 08.
- H. Use of the building HVAC systems, including those being provided under this contract, for temporary heating, ventilation or cooling during construction is prohibited. When system installation is complete and ready for start-up, approval to operate the system shall be obtained from the Owner or designated Owner's representative.

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:
 - 1. Dielectric Unions:
 - a. Capitol Manufacturing Co.
 - b. Eclipse, Inc.; Rockford-Eclipse Div.
 - c. Epco Sales Inc.
 - d. Hart Industries International, Inc.
 - e. Watts Industries, Inc.; Water Products Div.
 - f. Zurn Industries, Inc.; Wilkins Div.
 - 2. Dielectric Flanges:
 - a. Capitol Manufacturing Co.
 - b. Central Plastics Co.
 - c. Epco Sales Inc.
 - d. Watts Industries, Inc.; Water Products Div.
 - 3. Dielectric Couplings:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.
 - 4. Dielectric Nipples:
 - a. Grinnell Corp.; Grinnell Supply Sales Co.
 - b. Victaulic Co. of America.
 - 5. Braided Hose Flexible Connectors:
 - a. Flex-Hose Co, Inc.
 - b. Hyspan Precision Products, Inc.
 - c. Mason.
 - d. Mercer Rubber Co.
 - e. Metraflex Co.
 - 6. Rubber Flexible Connectors:
 - a. General Rubber Corp.
 - b. Flex-Hose Co., Inc.

- c. Mercer Rubber Co.
- d. Metraflex Co.
- e. Mason.
- 7. Flexible Expansion Loops:
 - a. Metraflex Co.
 - b. Flex-Hose.
- 8. Mechanical Sleeve Seals:
 - a. Calpico, Inc.
 - b. Metraflex Co.
 - c. Thunderline/Link-Seal.
 - d. Innerlynx

2.2 PIPE AND PIPE FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe 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 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for fluid type, temperature and pressure of piping system.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless indicated otherwise.
 - 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. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32.
 - 1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
 - 2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.
- D. Brazing Filler Metals: AWS A5.8.
 - 1. BCuP Series: Copper-phosphorus alloys.
 - 2. BAg1: Silver alloy.
- E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- F. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.

- G. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
 - 1. Sleeve: ASTM A 126, Class B, gray iron.
 - 2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
 - 3. Gaskets: Rubber.
 - 4. Bolts and Nuts: AWWA C111.
 - 5. Finish: Enamel paint.

2.4 DIELECTRIC FITTINGS

- A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.
- B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching 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.
- E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as 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.
- 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.

2.5 FLEXIBLE CONNECTORS

- A. Braided Hose Flexible Connectors: Stainless steel bellows with woven, flexible, wire-reinforcing protective jacket; 150-psig minimum working pressure and 250 deg F maximum operating temperature. Connectors shall have flanged or threaded-end connections to match equipment connected and shall be capable of 3/4-inch misalignment. Bronze braiding for copper tubing applications and stainless steel braiding for steel pipe applications.
- B. Rubber Flexible Connectors: Mason SFU for 3/4 to 2-inch NPS or equal by other specified manufacturers; Mason SFDEJ for 2-1/2-inch NPS and larger or equal by other specified manufacturers. Fiber-reinforced EPDM rubber body; capable of handling operating temperatures up to 250 deg F and pressures up to 150 psig. Joint type to match system specification.
- C. Flexible Expansion Loops: Stainless steel flexible hose and braid consisting of two flexible sections, two 90 degree elbows and one 180 degree return bend. Pipe connection material and joint type to match system specification, see application section of individual sections. Bronze braiding for copper tubing applications and stainless steel braiding for steel pipe applications. Provide pipe

guides as recommended by manufacturer. Loops installed hanging down shall have a drain plug. Units shall be double braided. Movement and/or loop lengths are indicated.

- D. Flexible Expansion Loops: Three equal length sections of annular corrugated stainless steel hose and braid, Provide with four 90 degree elbows and support per manufacturer's recommendations. Ends flanged, screwed, welded, sweat, or grooved. Suitable for operating temperatures up to 850 F. Designed for pressure testing to 1.5 times their maximum rated working pressure with a minimum 4 to 1 (burst to working) safety factor. Factory tested using air-under-water and hydrostatic pressure. Manufacturer: Flex-Hose Company.

2.6 MECHANICAL SLEEVE SEALS

- A. Description: Modular design, with interlocking EPDM rubber links shaped to continuously fill annular space between pipe and sleeve. Stainless steel connecting bolts and composite pressure plates.

2.7 PIPING SPECIALTIES

- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
 - 1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
 - 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 - 3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
 - 4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - a. Underdeck Clamp: Clamping ring with set screws.
- B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
 - 1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
 - 2. OD: Completely cover opening.
 - 3. Cast Brass: One piece, with set screw.
 - a. Finish: Rough brass.
 - b. Finish: Polished chrome-plate.
 - 4. Cast-Iron Floor Plate: One-piece casting.

2.8 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
 - 1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psig, 28-day compressive strength.

3.1 GENERAL MECHANICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:
1. Coordinate mechanical systems, equipment, and materials installation with other building components.
 2. Verify all dimensions by field measurements.
 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
 4. 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.
 5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 7. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
 8. Install systems, materials, and equipment to conform with approved 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. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
 9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
 10. Install mechanical 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.
 11. Install access panel or doors where units are concealed behind finished surfaces. Notify General Contractor on the number, location and size of access panels or doors.
 12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
 13. Replace all air filters with new filters upon Owner taking occupancy of the building or at a time mutually agreed upon between the Owner and Contractor.
 14. Do not install ductwork in elevator machine rooms, electrical and/or communication rooms unless it directly services that room.
- B. Locate wall, floor and ceiling fire ratings from architectural drawings for appropriate hourly rating of combination fire/smoke dampers or fire dampers shown on mechanical drawings.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 23 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: 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 approved 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. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation plus 1-inch clearance around insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- L. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- M. Install flexible connectors according to manufacturer's written instructions where indicated and specified in other Division 23 sections.
- N. Install couplings according to manufacturer's written instructions.
- O. Install Portable Instrument Connections in all piping systems where DDC temperature and/or pressure sensors and thermometers and/or pressure gauges are located.
- P. Do not route piping through elevator equipment rooms, unless specifically allowed by local authority.

- Q. Do not route piping over electrical panels, transformers, switchgear or other electrical equipment.

- R. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
 - 1. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
 - 2. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
 - 3. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
 - 4. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

- S. 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. Build sleeves into new walls and slabs as work progresses.
 - 3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
 - b. 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.
 - 1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.
 - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

- T. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

- U. Verify final equipment locations for roughing-in.

- V. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

- B. Ream ends of pipes and tubes and remove burrs.

- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
- E. 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. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
 - 2. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
 - 3. Align threads at point of assembly.
 - 4. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
 - 5. 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.
- F. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench to recommended torque values.

3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
 - 2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
 - 3. 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 provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

- D. 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.
- E. Install equipment giving right of way to piping installed at required slope.

3.6 PAINTING AND FINISHING

- A. Refer to Division 09 for paint materials, surface preparation, and application of paint.
- B. Apply paint to exposed piping, ductwork and supports according to the following, unless otherwise indicated:
 - 1. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer. Paint not required on interior galvanized supports.
 - 2. Exterior, Ferrous Piping and ductwork: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
 - 3. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
- C. Do not paint piping specialties with factory-applied finish.
- D. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions for all floor-supported units. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Concrete and reinforcement as specified in Division 03.

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.9 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 01. In addition to the requirements specified in Division 01, 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. Remove samples of installed Work as specified for testing.
 - 5. Install equipment and materials in existing structures.
 - 6. Upon written instructions from the Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.
- C. Cut, remove and legally dispose off-site of selected mechanical equipment, components, and materials, including but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the new Work.
- D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- E. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.
- F. Repair cut surfaces to match adjacent surfaces.

3.10 GROUTING

- A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placing of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases to provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's written instructions.

END OF SECTION 23 05 00

SECTION 23 05 29 – HANGERS AND SUPPORTS FOR MECHANICAL PIPING AND EQUIPMENT

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.
- B. Related Sections include the following:
 - 1. Division 23 Section "Vibration and Seismic Controls for Mechanical Piping and Equipment" for vibration isolation and seismic restraint devices for piping and equipment.

1.2 SUMMARY

- A. This Section includes hangers and supports for mechanical system piping and equipment.

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, and/or heavy-duty steel trapezes for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

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.

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 calculations for each multiple pipe support, trapeze, and seismic restraint by a qualified professional engineer.
 - 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.
 - 2. Comply with MSS SP-69.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Pipe Hangers:
 - a. B-Line Systems, Inc.
 - b. Tolco.
 - c. Anvil Corp.
 - d. Erico International Corp.
 - e. National Pipe Hanger Corp.
 - 2. Channel Support Systems:
 - a. B-Line Systems, Inc.
 - b. Anvil Corp.
 - c. Tolco.
 - d. Unistrut Corp.
 - 3. Thermal-Hanger Shield Inserts:
 - a. Carpenter & Patterson, Inc.
 - b. PHS Industries, Inc.
 - c. PT&P, Pipe Shields, Inc.
 - d. Rilco Manufacturing Co., Inc.
 - e. Value Engineered Products, 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. Material: Steel, structural quality, ASTM 570.
 2. Coatings: G90 galvanized coating. Threaded hardware, zinc plated.
 3. 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 Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.
 3. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
 4. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.
 5. All insulated pipe supports shall be load rated. Load ratings shall be established by pipe support manufacturer based upon testing and analysis in conformance with the latest edition of the following codes: ASME B31.1, MSS SP-58, MSS SP-69, and MSS SP-89.
 6. Load tests shall be made on both supporting materials and configurations. All tests shall be performed by an independent testing laboratory. Results of pertinent tests shall be available, on request, to the purchaser.

2.3 MISCELLANEOUS MATERIALS

- A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- B. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
- C. 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.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger requirements are specified in Sections specifying equipment and systems.
- B. 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 non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 2. 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.
 3. 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.
 4. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
 5. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
 6. 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.
 7. 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.
 8. 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.
 9. 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.
 10. 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.
 11. 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.
- C. 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.
- D. 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. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 4. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg f piping installations.

- E. 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. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 3. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 4. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 5. 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.
- F. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
 2. 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.
 3. Thermal-Hanger Shield Inserts shall be supplied and installed by the mechanical contractor on all insulated pipe and tubing.
- G. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
 2. 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.
 3. 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.

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. If concrete inserts cannot be used, install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- G. 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.
- H. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- I. 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.
- J. 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 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.
 - 3. 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.

4. Pipes NPS 8 and Larger: Include wood inserts.
5. Insert Material: Length at least as long as protective shield.
6. 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 where indicated.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

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. 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 48 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. This Section includes vibration isolators, vibration isolation bases, vibration isolation roof curbs.
2. This Section includes seismic restraint requirements for suspended pipes, ducts, and mechanical equipment with and without vibration isolation.

1.2 DEFINITIONS

- A. IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.
- C. OSHPD: Office of Statewide Health Planning & Development (for the State of California).
- D. SEI/ASCE 7: American Society of Civil Engineers; Minimum Design Loads for Buildings and Other Structures.

1.3 ACTION SUBMITTALS

A. General: See Section 23 05 00 for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
 - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by OSHPD.
 - b. Annotate to indicate application of each product submitted and compliance with requirements.
3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

B. Product Data: Provide submittals of the following:

1. Vibration isolators.
2. Anchor Bolts, Washers, and Bushings
3. Restrained Vibration Isolation Roof Curb Rails.
4. Seismic Restraint Devices
5. Vibration Isolation Equipment Bases.

- C. Shop Drawings: In addition to requirements set forth in Section 23 05 00, shop drawings for the listed systems shall also include detailing of riser supports, vibration isolation base details, seismic-restraint systems, and suspended elements. Provide submittals of the following piping systems within the entire building:
1. For Vibration Isolated Elements:
 - a. 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.
 - b. 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.
 - c. Seismic-Restraint Details: Detail fabrication and attachment of seismic restraints and snubbers. Show anchorage details and indicate layout, quantity, diameter, anchor depth of embedment and, if mounted on housekeeping pads, indicate anchor minimum edge distance requirements.
 - d. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other Division 22 Sections for equipment mounted outdoors.
 2. For Suspended Elements: Prior to installation, submit seismic restraint manufacturer's layout of all required bracing locations on contractor shop drawings. Layout to be signed and sealed by a qualified professional engineer. Layout to include manufacturer's bracing legend indicating:
 - a. Type of braced element.
 - b. Seismic restraint hardware call-out.
 - c. Minimum required vertical support rod diameter.
 - d. Maximum allowable brace spacing.
 - e. Brace reaction at full design load.
 - f. Minimum required seismic restraint anchorage.
 - g. Installation detail drawing number.
 - h. Anchorage installation detail drawing number.
- D. Design Calculations: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic and wind forces required to select vibration isolators, seismic and wind restraints, and for designing vibration isolation bases.
 - a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Division 23 Sections for equipment mounted outdoors.
 - b. To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.

- c. Pre-approval and Evaluation Documentation: By OSHPD, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the 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 vibration isolation bases and seismic restraints that are similar to those indicated for this Project in material, design, and extent. This professional engineer shall develop a Quality Assurance Plan.
- B. Testing Agency Qualifications (Owner will engage): An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
- C. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- D. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- E. Any device that provides seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, showing maximum seismic-restraint ratings. If preapproved 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.

1.6 FIELD QUALITY CONTROL

- A. Provide a Quality Assurance Plan that complies with SEI/ASCE 7, Appendix 11A for the following mechanical systems or equipment.
 - 1. Flammable, combustible, or highly toxic piping systems and their associated mechanical units in Seismic Design Categories C, D, E, or F.
 - 2. Installation of HVAC ductwork that will contain hazardous materials in Seismic Design Categories C, D, E, or F.
 - 3. Installation of vibration isolation systems where the maximum clearance (air gap) between the equipment support frame and restraint is less than or equal to 1/4-inch.

4. Installation of seismic restraint systems for Seismic Use Group II and III.
- B. The Contractor shall submit a written Contractor's statement of responsibility to the regulatory authority having jurisdiction and the Owner prior to the commencement of work. The Contractor's statement of responsibility shall contain the following:
1. Acknowledgement of awareness of the special requirements contained in the Quality Assurance Plan.
 2. Acknowledgement that control will be exercised to obtain conformance with the design documents approved by the authority having jurisdiction.
 3. Procedure for exercising control within the Contractor's organization, the method and frequency of reporting, and the distribution of the reports.
 4. Identification and qualifications of the person exercising such control and their position in the organization.
- C. The Owner shall employ a special inspector to observe the construction of all seismic systems in accordance with the Quality Assurance Plan.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Design seismic and vibration isolation systems, including drawings, calculations, and material specifications prepared according to current IBC and SEI/ASCE 7 for obtaining approval from authorities having jurisdiction. Seismic and vibration systems shall be selected for the approved Project equipment, piping and ductwork components.
- B. Wind-Restraint Loading:
1. Basic Wind Speed: 110 MPH.
 2. Minimum 10 lb/sq. ft. multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.
- C. Seismic-Restraint Loading:
1. Site Class as Defined in the IBC: E.
 2. Assigned Seismic Use Group or Building Risk Category as Defined in the IBC: II.
 - a. Component Importance Factor: 1.5 for all life safety systems and equipments required to function after an earthquake and all mechanical equipment that would impede egress from building. All systems and equipment that contain hazardous content. All other systems, equipment, piping and ductwork shall be $I_p=1.0$.
 3. Component Response Modification Factor (R_p) and Component Amplification Factor (A_p): From SEI/ASCE 7 (2005), Table 13.6-1, Seismic Coefficients for Mechanical and Electrical Components.
 4. Seismic Design Category: D.

2.2 MANUFACTURERS

- A. Vibration Isolation: Subject to compliance with requirements, provide products by the manufacturers specified.
 - 1. Amber/Booth Company, Inc.
 - 2. Kinetics Noise Control, Inc.
 - 3. Korfund/Vibration Mountings and Controls, Inc.
 - 4. Mason Industries, Inc.

- B. Seismic Restraint for Suspended Elements: Subject to compliance with requirements, provide products by the manufacturers specified.
 - 1. International Seismic Application Technology (ISAT).
 - 2. Kinetics Noise Control, Inc.
 - 3. Korfund/Vibration Mountings and Controls, Inc.
 - 4. Mason Industries, Inc. Tolco.

2.3 VIBRATION ISOLATORS

- A. Type V-1, Elastomeric Isolator Pads: Oil- and water-resistant neoprene or natural rubber, molded with a nonslip, ribbed or waffle-pattern steel load distribution plates of sufficient stiffness for uniform loading over pad area, factory cut to sizes that match requirements of supported equipment.
 - 1. Basis of Design: Mason Models W and WM.
 - 2. Material: Standard neoprene.
 - 3. Durometer Rating: 40.
 - 4. Thickness: 5/16 inch thick.
 - 5. Isolator shall be loaded to limit surface pressure to a maximum of 50 psi.

- B. Type V-2, Elastomeric Isolator Pads: Oil- and water-resistant neoprene or natural rubber molded with a nonslip, ribbed or waffle-pattern steel load distribution plates of sufficient stiffness for uniform loading over pad area factory cut to sizes that match requirements of supported equipment.
 - 1. Basis of Design: Mason Model Super W and Super WM.
 - 2. Material: Standard neoprene.
 - 3. Durometer Rating: 50.
 - 4. Thickness: 3/4-inch thick.
 - 5. Isolator shall be loaded to limit surface pressure to a maximum of 50 psi.

- C. Type V-9, Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.
 - 1. Basis of Design: Mason Model 30N.
 - 2. 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.
 - 3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

6. Elastomeric Elements: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
 7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.
- D. Type V-10, 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 and deflection scale.
1. Basis of Design: Mason Model PC30N.
 2. 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.
 3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Elements: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
 7. Adjustable Vertical Stop: Steel washer encapsulated in a molded neoprene rebound washer on lower threaded rod.
 8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.
- E. Type TR-1, Thrust Restraint: 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. Basis of Design: Mason Models WBI and WBD.
 2. Frame: Steel, fabricated for connection to threaded rods.
 3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 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.
- F. 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 psi and for equal resistance in all directions.
1. Basis of Design: Mason Model ADA.
- G. 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.

1. Basis of Design: Mason Model VSG.

2.4 ANCHOR BOLTS, WASHERS, AND BUSHINGS

- A. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer rating of 50 with a flat washer face.
 1. Basis of Design: Mason Model HG.
 2. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.
 3. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.
- B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
 1. Basis of Design: Hilti Kwik Bolt TZ Mechanical Anchor for seismic restraints.
 2. Basis of Design: Hilti Undercut HDA anchors for direct attachment to equipment 10 hp and greater.

2.5 SEISMIC-RESTRAINT DEVICES

- A. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in OSHPD pre-approval.
 1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- B. Type S-1, Seismic Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
 1. Basis of Design: Mason Model Z-1011.
 2. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and female-wedge or stud-wedge type.
 3. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer rating of 50.
- C. Type S-2, Suspended Elements:
 1. Design Requirements: Seismic restraint hardware to be furnished in manufacturer's pre-assembled "kits" labeled for installer cross reference with manufacturer's layout performed on contractor shop drawings. Kits to be labeled as to "kit number," "trade" and "floor." Kits to include:

- a. All required seismic bracketry correctly sized for attachment to vertical support rods.
 - b. Rod stiffeners as required based on rod diameter and length.
 - c. Correct anchorage hardware for connection to concrete deck, structural steel, or wood structural members.
 - d. Complete installation instructions.
2. Rigid seismic restraint brace arm assemblies: Designed for strut nut attachment to minimum 12 gage steel channel with pregalvanized zinc finish per ASTM A525, solid, punched or short slot per engineering calculations.
 - a. Basis of Design: Pre-engineered brackets with OSHPD pre-approval. Hinged seismic brackets.
 - b. Assembly: Brackets to be provided from manufacturer with integral 1/2" hex bolts and strut nuts.
 3. Cable seismic restraint brace arm assemblies: Minimum 7 x 19 pre-stretched galvanized steel aircraft cable appropriately sized for the system load.
 - a. Basis of Design: Pre engineered brackets with OSHPD pre-approval.
 - b. Design Requirements: Hinged seismic brackets.
 - c. Assembly: Brackets factory pre-tied to made-to-length aircraft cable, with integral method for length adjustment by installer.
 4. Cast-In Place Deck Inserts: For vertical supports and seismic restraint anchorage.
 - a. Basis of Design: Pre-engineered inserts with OSHPD pre-approval.
 - b. Design Requirements: For form pour slabs, for metal decks with concrete, internally threaded to accept threaded rod diameters, with an OSHPD approval or other enforcement agency approval. Coordinate installation locations with manufacturer's lay out of seismic restraint locations on contractor's shop drawings.

2.6 FACTORY FINISHES

- A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
 1. Epoxy Powder coating or electro-galvanized isolation on springs and housings. Zinc plate all bolts, nuts and washers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic and wind-control devices for compliance with requirements for 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 APPLICATIONS

- A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by OSHPD.
- B. Hanger Rod Stiffeners: Install hanger rod stiffeners where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic-Restraint Assemblies: Select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Division 03.
- B. Comply with requirements in Division 07 Section "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.
- C. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.
- D. Equipment Restraints:
 - 1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure
 - 2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
 - 3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- E. Piping Restraints:
 - 1. Comply with requirements in MSS SP-127.
 - 2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 - 3. Brace a change of direction longer than 12 feet.
- F. Ductwork Restraints:
 - 1. Comply with requirements of SMACNA "Seismic Restraint Manual Guidelines for Mechanical Systems."
 - 2. Use Seismic Hazard Level A.

- G. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- I. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- J. Attachments to Structure:
 - 1. Install cables so they do not bend across edges of adjacent equipment or building structure.
 - 2. Install seismic-restraint devices using anchor bolts that meet building code requirements for testing and approval.
 - 3. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and oversize mounting hole.
 - 4. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
 - 5. If specific attachment to structure is not indicated, anchor bracing to structure at flanges of beams at upper chords of bar joists, or at concrete members. Obtain approval of the structural engineer prior to installation.
- K. Drilled-in Anchors:
 - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
 - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
 - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
 - 4. Set anchors to manufacturer's recommended torque, using a torque wrench.
 - 5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 230500 "Common Work Results for HVAC".

3.5 ADJUSTING

- A. Adjust isolators after piping system 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. Adjust active height of spring isolators.
- D. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.6 (EXAMPLE) HVAC VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE SCHEDULE

EQUIPMENT DESCRIPTION	MARK	VIBRATION ISOLATOR TYPE	MINIMUM DEFLECTION (INCHES)	BASE/CURB TYPE	SEISMIC RESTRAINT DEVICE TYPE	NOTES
CONDENSING UNITS						
CONDENSING UNITS	CU-X	V-2	0.11	N/A	N/A	
AIR-COOLED CONDENSERS						
AIR-COOLED CONDENSERS	HP-X	V-2	0.11	N/A	N/A	
FA-COIL UNITS						
FAN-COIL UNITS	FCU-X	V-9	1.0	N/A	S-2	
FANS						
FANS	EF-1	V-9	0.75	N/A	S-2	
ENERGY RECOVERY UNITS						
ENERGY RECOVERY UNITS	L-X	V-9	1.0	N/A	S-2	

- A. Vibration Isolator and Seismic Restraint Schedule Notes:
 - 1. Seismic restraints are required for all systems and equipment. Seismic restraints for equipment without scheduled seismic snubbers shall be provided by the anchor bolts, vibration isolators, or devices as specified for suspended elements.
 - 2. Provide vibration isolators and seismic restraints for all equipment as specified, including, but not limited to, the specific equipment marks listed above. Where a piece of equipment is included on the project but is not listed above, provide vibration isolators and seismic restraints as specified and as described for similar equipment.

3. Internal vibration isolators, snubbers, and bases for custom air handling units and custom exhaust fans shall be provided and installed at the fan manufacturer's factory, except concrete for inertia bases will be field installed as specified in this section.
4. Provide vibration isolators as indicated for suspended piping attached to any piece of vibrating equipment 5 horsepower or larger within mechanical rooms or within 50 feet of equipment, whichever provides the greater length. For piping supported from the floor, provide isolators similar to those used on the equipment. Applicable vibrating equipment includes items that are not internally isolated such as chillers, pumps, and air compressors.
5. The indicated equipment will be provided with internal vibration isolators.

END OF SECTION 23 05 48

SECTION 23 05 53 – IDENTIFICATION FOR MECHANICAL PIPING AND EQUIPMENT

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.
- B. Related sections include the following:
 - 1. Division 09 for painting.

1.2 SUMMARY

- A. This Section includes the following mechanical identification materials and their installation:
 - 1. Equipment nameplates.
 - 2. Equipment markers.
 - 3. Pipe markers.
 - 4. Duct markers.
 - 5. Valve tags.
 - 6. Valve schedules.
 - 7. Warning tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Valve numbering scheme.
- C. 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: Two-ply engraved black plastic with lettering cut through to white background. Include contact-type, permanent adhesive.
 - 1. Terminology: Match mark numbers on equipment schedules as closely as possible.
 - 2. Size: Minimum 1-1/2 by 4 inches.
 - 3. Thickness: 1/16-inch.

2.2 PIPING IDENTIFICATION DEVICES

- A. Self-Adhesive Pipe Markers: Vinyl with pressure-sensitive, permanent type, self-adhesive back. 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. Full-band pipe markers extending 360 degrees around pipe at each location.
 - 4. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

2.3 DUCT IDENTIFICATION DEVICES

- A. Self Adhesive Duct Markers: Vinyl with pressure-sensitive, permanent-type, self-adhesive back. 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 HVAC system terms and abbreviate only as necessary for each application length.
 - 3. Arrows: Integral with HVAC system service lettering to accommodate both directions; or as separate unit on each duct marker to indicate direction of flow.

2.4 VALVE TAGS

- A. Valve Tags: Two-ply engraved black plastic with lettering cut through to white background.
1. Data: Service and identification number.
 2. 2-inch round, 1/16-inch thick, with 3/16-inch hole.
 3. Fastener: Brass chain or S-hook.

2.5 VALVE SCHEDULES

- A. Valve Schedules: For each piping system, on standard-size bond paper. Assign and 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 Frame: Mount valve schedule in frame with clear plastic cover, include mounting screws.

2.6 WARNING TAGS

- A. Warning Tags: Preprinted plasticized card stock with matte finish.
1. Size: 4 by 7 inches.
 2. Fasteners: Brass grommet and chain.
 3. Nomenclature: Large-size primary caption such as CAUTION: NONPOTABLE WATER, DO NOT DRINK.
 4. Color: Yellow background with 1/2-inch black lettering.

PART 3 - EXECUTION

3.1 APPLICATIONS, GENERAL

- A. Products specified are for applications referenced in other Division 23 Sections.

3.2 EQUIPMENT IDENTIFICATION

- A. Nameplate Installation: 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, and heaters.
 2. Pumps, compressors, chillers, condensers, and similar motor-driven units.
 3. Heat exchangers, electric coils, evaporators, cooling towers, heat recovery units, and similar equipment.
 4. Fans, blowers and air terminals.
 5. Air handling units.
 6. Packaged units.

- B. Equipment Marker Installation: Install 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 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.
 - 2. Locate markers where accessible and visible. Include markers for all scheduled equipment.

3.3 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows completely around pipe showing direction of flow. Apply to clean surface.
- B. Locate pipe markers where piping is exposed in finished spaces, mechanical spaces; accessible maintenance spaces such as removable accessible ceilings, 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, minimum one in each space.

3.4 DUCT IDENTIFICATION

- A. Install manufactured duct markers indicating service on each duct system. Install with flow arrows showing direction of flow.
- B. 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 connec-

tions; and air terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

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. 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.

END OF SECTION 23 05 53

SECTION 23 07 19 – DUCT INSULATION FOR MECHANICAL SYSTEMS

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.
- B. Related Sections include the following:
 - 1. Division 07 for firestopping materials and requirements for penetrations through fire and smoke barriers.
 - 2. Division 23 Section "Pipe Insulation for Mechanical Systems" for insulation for piping systems.
 - 3. Division 23 Section "Metal Ducts" for duct liner.
 - 4. Division 23 Section "Hangers and Supports for Mechanical Piping and Equipment."
 - 5. Division 23 Section "Air Duct Accessories."

1.2 SUMMARY

- A. This Section includes semirigid and flexible duct and plenum, insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

1.3 SUBMITTALS

- A. General: See Section 230500 for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.
- B. Product Data: Provide submittals of the following:
 - 1. Mineral Fiber Board Insulation.
 - 2. Mineral Fiber Blanket Insulation.
 - 3. Aluminum Jackets.
 - 4. Fire Barrier Duct Wrap with UL classification documentation.
- C. Shop Drawings: None required.
- D. Reports and Certificates: None required.

1.4 QUALITY ASSURANCE

- A. 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 labeled

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.
- B. Underwriters Laboratories Inc (UL)
1. UL 723, surface burning characteristic per ASTM E 84
 2. UL 1479, Through-Penetration firestop test.
- C. National Fire Code: NFPA 96: Ventilation Control and Fire Protection of Commercial Cooking Operations
- D. American Society for Testing and Materials (ASTM):
1. ASTM E119, Standard Method of Fire Tests of Building Construction and Materials.
 2. ASTM E814, Standard Method of Fire Tests of Through-Penetration Fire Stops.

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.

1.7 SCHEDULING

- A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Mineral-Fiber Insulation:
 - a. CertainTeed Manson.
 - b. Knauf Fiber Glass GmbH.
 - c. Owens-Corning Fiberglas Corp.
 - d. Johns Manville.

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.

2.3 FIELD-APPLIED JACKETS

- A. Aluminum Jacket: 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 is scheduled at the end of this Section.
 - 1. Finish: Embossed finish.
 - 2. Thickness: 0.04-inch thick.

2.4 ACCESSORIES AND ATTACHMENTS

- A. Bands: 3/4-inch wide, aluminum band, minimum 0.007-inch thick.
- B. 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.

2.5 VAPOR RETARDERS

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates. Perm rating not greater than 0.5 and all joints sealed.

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, 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. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
- 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. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.
- M. Install vapor-retarder mastic on supply and outside air ducts and plenums.
 - 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.
 3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- N. 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.
- O. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.
- P. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.
- Q. 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 anchor pins and speed washers.
1. 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 over compress insulation during installation.
 2. Impale insulation over anchors and attach speed washers.
 3. 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.
 4. 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.

5. 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.
 6. 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.
 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.
- B. Board Applications for Ducts and Plenums: Secure board insulation with anchor pins and speed washers.
1. 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 over compress insulation during installation.
 2. 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.
 3. 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.
 4. 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.
 5. 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.
 6. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

3.5 FIELD-APPLIED JACKET APPLICATION

- A. Apply 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. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.
3. Seal outdoor jacket watertight.
4. Round Ducts: Overlap seams 45 degrees from bottom.

3.6 DUCT SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.
- B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.
- C. Insulate the following plenums and duct systems:
 1. Supply-, return-, and outside-air ductwork.
 2. Outside-air ductwork and exhaust-air ductwork shall be insulated from isolation damper to the exterior of the building.
- D. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
 1. Metal ducts with duct liner, unless required to meet the Energy Code requirements.
 2. Factory-insulated flexible ducts.
 3. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
 4. Flexible connectors.
 5. Vibration-control devices.
 6. Testing agency labels and stamps.
 7. Nameplates and data plates.
 8. Access panels and doors in air-distribution systems.
 9. Toilet exhaust ducts in conditioned spaces.
 10. General exhaust ducts in conditioned spaces.
 11. Exposed ducts within a space that serves that space only.

END OF SECTION 23 07 19

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 01 Specification Sections, apply to this Section.
- B. Related Sections include the following:
 - 1. Division 07 for fire-resistant sealants for use around duct penetrations and fire-damper installations in fire-rated floors, partitions, and walls.
 - 2. Division 08 for wall- and ceiling-mounted access doors for access to concealed ducts.
 - 3. Division 08 for intake and relief louvers and vents connected to ducts and installed in exterior walls.
 - 4. Division 23 Section "Duct Insulation for Mechanical Systems" for duct insulation.
 - 5. Division 23 Section "Vibration and Seismic Controls for Mechanical Piping and Equipment" for vibration isolation and seismic restraints of metal ducts.
 - 6. Division 23 Section "Air Duct Accessories" for volume dampers, fire dampers, combination fire/smoke dampers, duct silencers, duct-mounted access doors and panels, turning vanes, screened openings, flexible connectors, and flexible ducts.
 - 7. Division 23 Section "Diffusers, Registers, and Grilles."
 - 8. Division 23 Section "Instrumentation and Control for HVAC" for automatic control dampers and operators.
 - 9. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for air balancing and final adjusting of manual-volume dampers.

1.2 SUMMARY

- A. This Section includes fabrication and installation of rectangular, and round metal ducts and plenums for heating, ventilating, and air-conditioning systems in pressure classes from minus 2- to plus 10-inch wg.

1.3 SYSTEM DESCRIPTION

- A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. 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 PERFORMANCE REQUIREMENTS

A. DUCT PRESSURE CLASSIFICATIONS

1. Rectangular Duct Static-Pressure Classifications: Construct ducts to the following:
 - a. Supply Ducts, unless indicated otherwise: 3-inch wg.
 - b. Return Ducts: 2-inch wg, negative pressure.
 - c. Exhaust Ducts: 2-inch wg, negative pressure.
 - d. Outside Air Intake Ducts: 2-inch wg, negative pressure.
2. Round Duct Static Pressure Classifications: Construct ducts to the following:
 - a. Supply Ducts, unless indicated otherwise: 2-inch wg.
 - b. Return Ducts: 2-inch wg, negative pressure.
 - c. Exhaust Ducts: 2-inch wg, negative pressure.
 - d. Outside Air Intake Ducts: 2-inch wg, negative pressure.

B. Pressure Classification:

1. Greater than 3-inch wg: Seal Class A; all transverse joints, longitudinal seams and duct wall penetrations.
2. 3-inch and below wg: Seal Class B; all transverse joints and longitudinal seams.

1.5 SUBMITTALS

A. General: See Section 23 05 00 for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.

B. Product Data: Provide submittals of the following:

1. Duct Liner and adhesives.
2. Joint Sealants.
3. Gaskets joint systems.

C. Shop Drawings: In addition to requirements set forth in Section 23 05 00, shop drawings for the listed systems shall also include duct sizes, top and/or bottom elevations, pressure classifications, combination fire/smoke dampers, fire dampers and smoke dampers, building structural components, connections to equipment, seam and joint construction, location of duct accessories, including dampers, turning vanes and access doors, and required service clearances. Provide submittals of the following metal duct systems:

1. Supply Air
2. Return Air
3. Exhaust Air
4. Duct Fittings

D. Coordination Drawings:

1. Comply with requirements in Section 01 33 00 and Section 23 05 00 for providing coordination drawings for areas as indicated on the drawings. Approved ductwork shop drawings shall be used to generate coordination drawings.

E. Reports and Certificates: Provide submittals of the following:

1. Duct Leakage Test Report.

2. Duct Cleanliness Tests.
3. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Fabricate ducts and fittings according to SMACNA "HVAC Duct Construction Standards--Metal and Flexible" unless otherwise indicated.
- B. Welding Standards: Qualify welding procedures and welding personnel to perform welding processes for this Project according to AWS D1.1, "Structural Welding Code--Steel," for hangers and supports; AWS D1.2, "Structural Welding Code--Aluminum," for aluminum supporting members; and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- C. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems" unless otherwise indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Keep metal ducts and duct liner dry and dust free during fabrication and storage at factory.
- B. Before shipment shrink-wrap all openings of ducts fabricated with duct liner. During shipment, protect all metal ducts from weather.
- C. Store all metal ducts in dry location on-site on elevated dunnage. Protect metal ducts from moisture, dirt, and dust.
- D. Retain shrink-wrap protection of openings (where required to be protected) until immediately prior to connection of that opening to erected duct system.
- E. On the event that any duct liner does get wet, dry duct liner within 48-hours using forced air heater. Ducts detected with moist fiberglass liner will be required to be replaced at no additional cost to the Owner.
- F. Remove dust from the inside of metal duct sections as they are erected. Cover all openings with 6-mil poly and duct tape at the end of each workday to prevent dust migration into ducts.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS

- A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
- B. Carbon-Steel Sheets: ASTM A 1008/A 1008M, cold-rolled sheets; commercial quality; with oiled, exposed matte finish.

- C. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 DUCT LINER

- A. Fibrous Glass Duct Liner: Comply with NFPA 90A and NAIMA AH124 "Fibrous Glass Duct Liner Standard." Can operated in temperatures up to 250-Degrees F and air velocities up to 5,000 fpm. ASTM C 1071 with coated surface exposed to airstream to prevent erosion of glass fibers. Coating contains EPA registered anti-microbial agent so it will not support the growth of fungus or bacteria, and is water repellent. Antimicrobial compound shall be tested for efficacy by the EPA for use in HVAC systems.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation; Insulation Group.
 - b. Johns Manville.
 - c. Knauf Insulation.
 - d. Owens Corning.
 - 2. Thickness: See Duct Schedule.
 - 3. Density: Minimum 2 lb per cubic foot.
 - 4. Maximum Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
 - 5. Fire-Hazard Classification: Maximum flame-spread rating of 25 and smoke-developed rating of 50, when tested according to ASTM E 84 and UL 723.
 - 6. Minimum Noise Reduction Criteria (NRC): 0.55 for 1/2-inch, 0.70 for 1-inch, 0.90 for 1-1/2-inch and 1.0 for 2-inch tested per ASTM C 423 using Type A mounting.
 - 7. 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.
 - a. Tensile Strength: Indefinitely sustain a 50-lb-tensile, dead-load test perpendicular to duct wall.
 - b. Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into airstream.
 - c. Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.
- B. Natural-Fiber Duct Liner: 85 percent cotton, 10 percent borate, and 5 percent polybinding fibers, treated with a microbial growth inhibitor and complying with NFPA 90A or NFPA 90B.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bonded Logic, Inc.
 - b. Reflectix Inc.
 - 2. Maximum Thermal Conductivity: 0.24 Btu x in./h x sq. ft. x deg F) at 75 deg F mean temperature when tested according to ASTM C 518.

3. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to ASTM E 84; certified by an NRTL.
4. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

2.3 SEALANT AND ADHESIVE MATERIALS

- A. Joint and Seam Sealants:
 1. Joint and Seam Sealant: Water-based vinyl or acrylic copolymer mastic formulated to withstand temperatures from minus 20 to plus 180 Degrees F, minimum of 65 percent solids, water resistant, VOC: maximum 75g/L (less water).
 2. Flanged Joint Gasket Material: Elastomer butyl.
- B. Duct Liner Adhesive: Water-based vinyl copolymer adhesive formulated to withstand temperatures from minus 20 to plus 160 Degrees F. Comply with NFPA 90A and ASTM C 916

2.4 HANGERS, SUPPORTS AND RESTRAINTS

- A. Comply with Division 23, Section "Vibration and Seismic Controls for Mechanical Piping and Equipment."
- B. Building Attachments: Concrete inserts, stud-wedge or female wedge, mechanical-anchor bolts, or structural-steel fasteners appropriate for building materials. Powder actuated concrete fasteners are not allowed.
 1. If concrete inserts cannot be used, install mechanical-anchor (stud-wedge or female wedge type) bolts in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions. Concrete inserts and mechanical-anchor fasteners shall be made of steel. Stainless steel for outdoor applications.
- C. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.
 1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rod or galvanized rods with threads painted after installation.
 2. Straps and Rod Sizes: Comply with SMACNA "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel width and thickness and for steel rod diameters.
- D. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- E. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.
 1. Supports for Galvanized-Steel Ducts: Galvanized steel shapes and plates.

2.5 RECTANGULAR DUCT AND FITTING FABRICATION

- A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA "HVAC

Duct Construction Standards--Metal and Flexible," based on indicated static pressure class, unless indicated otherwise. Comply 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 classification.
 2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
 3. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - a. Prefabricated transverse joints shall comply SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," for static-pressure class, leakage rating.
 - 1) Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a) Duct Mate Industries, Inc.
 - b) Ward Flange.
 4. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 5. Material Thickness: For SMACNA "HVAC Duct Construction Standard – Metal and Flexible," but not less than 26 gauge.
- B. 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 unbraced panel area, unless ducts are lined.
- C. Elbow Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
- D. Branch Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Conical or Bellmouth.

2.6 SHOP APPLICATION OF LINER IN RECTANGULAR DUCTS

- A. Adhere a single layer of indicated thickness of duct liner with 90 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness is not allowed.
- B. Apply adhesive to liner facing in direction of airflow not receiving 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 liners in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.
- F. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12-inches transversely around perimeter; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
- G. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profile or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - 1. Fan discharge.
 - 2. Intervals of lined duct preceding unlined duct.
- H. Terminate liner with duct buildouts installed in ducts to attach dampers, turning vane assemblies, and other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct wall with bolts, screws, rivets, or welds. Terminate liner at fire dampers at connection to fire-damper sleeve.

2.7 ROUND DUCT FABRICATION

- A. Fabricate supply ducts of galvanized steel according to SMACNA "HVAC Duct Construction Standards--Metal and Flexible," unless indicated otherwise.
- B. Double-Wall (Insulated) Ducts: Fabricate double-wall (insulated) ducts with an outer shell and an inner liner. Dimensions indicated on internally insulated ducts are inside dimensions.
 - 1. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
 - 2. Outer Shell: Base outer-shell metal thickness on actual outer-shell dimensions. Fabricate outer-shell lengths 2 inches longer than inner shell and insulation, and in metal thickness specified for single-wall duct.
 - 3. Insulation: 1-inch-thick fibrous-glass insulation, unless otherwise indicated. Terminate insulation where internally insulated duct connects to single-wall duct or uninsulated components. Terminate insulation and reduce outer duct diameter to inner liner diameter.
 - 4. Solid Inner Liner: Fabricate round inner liners with solid sheet metal of thickness listed below:
 - a. Ducts 3 to 8 Inches in Diameter: 28-gauge with standard spiral seam construction.

- b. Ducts 9 to 42 Inches in Diameter: 26-gauge with single-rib spiral seam construction.
 5. Maintain concentricity of liner to outer shell by mechanical means. Retain insulation from dislocation by mechanical means.
- C. Elbow Configuration:
1. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
 - a. Round Elbows, 8 Inches and Smaller: Fabricate stamped elbows for 45- and 90-degree elbows and pleated elbows for 30-, and 60-degree elbows. Stamped elbows shall be 20 gauge thick minimum with two-piece welded construction. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with mitered construction.
 - b. Round Elbows, 9 through 12 Inches: Fabricate segmented (mitered) or pleated elbows for 30, 45, 60, and 90 degrees. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with mitered construction.
 - c. Round Elbows, Larger than 12-Inches: Segmented (mitered) elbows for all bend angle configurations.
 - d. Round Elbows, Segmented (mitered) Two-Piece 90-Degree: Use only where specifically indicated. Fabricate with single turning vane.
- D. Branch Configuration:
1. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are not permitted.
 - a. 90-degree Tee Fittings:
 - 1) Main to Branch (branch greater than $\frac{2}{3}$ the diameter of main or 12-inch diameter branch): Use 90 degree conical tee fitting. 90-degree conical taps or 90-degree lateral fittings can be used for all others.
 - 2) 45 degree lateral tee and 45-degree elbow in lieu of 90-degree tee fitting or tap on supply ductwork where space allows.
 - b. 45-degree Tee Fittings:
 - 1) Main to Branch (branch greater than $\frac{2}{3}$ the diameter of main or 12-inch diameter branch): Use 45-degree lateral fitting. 45-degree lateral taps or 45-degree lateral can be used for all others.

2.8 ROUND SUPPLY AND EXHAUST FITTING FABRICATION

- A. 90-Degree Tee Fittings and Taps: Fabricate to comply with SMACNA "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal seam straight duct.
- B. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from body onto branch tap entrance.
- C. Round Elbow Construction: Fabricate in die-stamped, pleated, or mitered construction as indicated above. Fabricate bend radius of elbows to one and one-

half times elbow diameter. Unless elbow construction type is indicated otherwise, fabricate elbows as follows:

1. Mitered Elbow Pieces: Welded construction with 5-pieces for 90-degree elbow, 4-pieces for 60-degree elbow and 3-pieces for 45-degree elbow.
 2. Metal Thickness, Pressure Classes from Minus 2- to Plus 2-inch wg:
 - a. Ducts 3 to 26 Inches in Diameter: 24-gauge.
 - b. Ducts 27 to 36 Inches in Diameter: 22-gauge.
 - c. Ducts 37 to 50 Inches in Diameter: 20-gauge.
 3. Metal Thickness, Pressure Classes from Minus 2- to 10-inch wg:
 - a. Ducts 3 to 14 Inches in Diameter: 24-gauge.
 - b. Ducts 15 to 26 Inches in Diameter: 22-gauge.
 - c. Ducts 27 to 50 Inches in Diameter: 20-gauge.
- D. Double-Wall (Insulated) Fittings: Fabricate double-wall (insulated) fittings with an outer shell and an inner liner. Dimensions indicated on internally insulated ducts are inside dimensions.
1. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
 2. Outer Shell: Base outer-shell metal thickness on actual outer-shell dimensions. Fabricate outer-shell lengths 2 inches longer than inner shell and insulation. Use the same metal thicknesses for outer duct as for un-insulated fittings.
 3. Insulation: 1-inch-thick fibrous-glass insulation, unless otherwise indicated. Terminate insulation where internally insulated duct connects to single-wall duct or uninsulated components. Terminate insulation and reduce outer duct diameter to nominal single-wall size.
 4. Solid Inner Liner: Fabricate round inner liners with solid sheet metal of thickness listed below:
 5. Maintain concentricity of liner to outer shell by mechanical means. Retain insulation from dislocation by mechanical means.
- E. Elbow Configuration:
1. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
 - a. Round Elbows, 8 Inches and Smaller: Fabricate stamped ~~die-formed~~ elbows for 45- and 90-degree elbows and pleated elbows for 30-, and 60-degree elbows. Stamped ~~Die-formed~~ elbows shall be 20 gauge thick minimum with two-piece welded construction. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with mitered construction.
 - b. Round Elbows, 9 through 12 Inches: Fabricate segmented (mitered) or pleated elbows for 30, 45, 60, and 90 degrees. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with mitered construction.
 - c. Round Elbows, Larger than 12-Inches: Segmented (mitered) elbows for all bend angle configurations.
 - d. Round Elbows, Segmented (mitered) Two-Piece 90-Degree: Use only where specifically indicated. Fabricate with single turning vane.
- F. Branch Configuration:
1. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are not permitted.
 - a. 90-degree Tee Fittings:

- 1) Main to Branch (branch greater than $\frac{2}{3}$ the diameter of main or 12-inch diameter branch): Use 90 degree conical tee fitting. 90-degree conical taps or 90-degree lateral fittings can be used for all others.
 - 2) 45 degree lateral tee and 45-degree elbow in lieu of 90-degree tee fitting or tap on supply ductwork where space allows.
- b. 45-degree Tee Fittings:
- 1) Main to Branch (branch greater than $\frac{2}{3}$ the diameter of main or 12-inch diameter branch): Use 45-degree lateral fitting. 45-degree lateral taps or 45-degree lateral can be used for all others.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL

- A. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts, fittings, and accessories.
- B. Provide access panels every 50 feet on all medium pressure ductwork for inspection and duct clearing.
- C. Construct and install each duct system for the specific duct pressure classification indicated.
- D. Install round ducts in lengths not less than 12 feet, unless interrupted by fittings.
- E. Install ducts with fewest possible joints.
- F. Install fabricated fittings for changes in directions, changes in size and shape, and connections.
- G. Install couplings tight to duct wall surface with a minimum of projections into duct.
- H. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.
- I. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- J. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- K. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.
- L. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work. Allow for post-construction access to air terminals, volume dampers, and other components requiring maintenance and/or readjustment.

- M. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures, unless ductwork is intended to serve these spaces.
- N. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches.
- O. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated combination fire/smoke damper or fire damper sleeve, and firestopping sealant. Fire, smoke and combination fire/smoke dampers are specified in Division 23 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 07 Section "Firestopping."

3.2 UNDERSLAB DUCT INSTALLATIONS

- A. Verify undamaged conditions of duct before enclosure with fill or encasement.
- B. Install underslab ducts according to SMACNA "HVAC Duct Construction Standards--Metal and Flexible" and as indicated.
- C. Protect ducts from damage by equipment used in placing concrete on or around ducts.
- D. Protect duct openings.

3.3 SEAM AND JOINT SEALING

- A. General: Seal duct seams and joints according to the duct seal class described in SMACNA "HVAC Duct Construction Standards--Metal and Flexible" corresponding to the pressure class given below.
- B. Pressure Classification:
 - 1. 3-inch wg and Greater: Seal Class A; all transverse joints, longitudinal seams and duct wall penetrations.
 - 2. Below 3-inch wg: Seal Class B; all transverse joints and longitudinal seams.
- C. Seal externally insulated ducts before insulation installation.

3.4 HANGING, RESTRAINING, AND SUPPORTING

- A. Install rigid round and rectangular metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards--Metal and Flexible."
- B. Install duct seismic restraints as indicated in Division 23, Section "Vibration and Seismic Controls for Mechanical Piping and Equipment."

- C. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Support vertical ducts at a maximum interval of 16 feet and at each floor.
- E. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.
- F. Install concrete inserts before placing concrete.
- G. Install mechanical-anchor fasteners after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

3.5 CONNECTIONS

- A. Unless indicated otherwise, connect metal ducts to rotating equipment with flexible connectors according to Division 23 Section "Duct Accessories."
- B. For branch, outlet and inlet, and terminal unit connections, comply with SMACNA "HVAC Duct Construction Standards--Metal and Flexible," unless indicated otherwise.

3.6 FIELD QUALITY CONTROL

- A. Leakage Test:
 - 1. Disassemble, reassemble, and seal segments of systems as required to accommodate leakage testing and as required for compliance with test requirements.
 - 2. Conduct tests, in presence of Architect, at static pressures equal to maximum design pressure of system or section being tested. If pressure classifications are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing. Test ducts in shafts prior to shaft enclosure.
 - 3. Determine leakage from entire system or section of system by relating leakage to surface area of test section.
 - 4. Maximum Allowable Leakage: Comply with requirements for Leakage Classification 3 for round ducts, Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2-inch wg (both positive and negative pressures), and Leakage Classification 6 for pressure classifications from 2- to 10-inch wg.
 - 5. Remake leaking joints and retest until leakage is less than maximum allowable.
 - 6. Leakage Test: Perform tests according to SMACNA "HVAC Air Duct Leakage Test Manual." Submit test report.
- B. Duct System Cleanliness Tests:
 - 1. Visually inspect duct system to ensure that no visible contaminants are present.
 - 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

- a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
- C. Duct system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Leakage Test: Perform tests according to SMACNA "HVAC Air Duct Leakage Test Manual." Submit test report for the following:
 1. Ductwork constructed with a duct static pressure classification greater than 3-inch w.g.

3.7 ADJUSTING

- A. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for detailed procedures.

3.8 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 3. Remove and reinstall ceiling to gain access during the cleaning process.
- 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 outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components 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, actuators, and turning vanes 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.
- 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 drainage and cleanup for wash-down procedures.
 7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel.
- B. Intermediate Reinforcement:
1. Galvanized-Steel Ducts: Galvanized steel.
- C. Liner:
1. Supply-Air Ducts: Fibrous glass, 1 inch thick. Use perforated metal liner for all supply ducts above 2500 fpm.
 2. Return-Air Ducts: Fibrous glass, 1 inch thick, unless noted otherwise.
 3. Exhaust Air: Fibrous glass, 1 inch thick, unless noted otherwise.
 4. Outdoor Return-Air and Fan Plenum: Fibrous glass, 2 inches thick, unless noted otherwise.
 5. Transfer Ducts: Fibrous glass, 1 inch thick, unless noted otherwise.

END OF SECTION 23 31 13

SECTION 23 33 00 – AIR DUCT ACCESSORIES

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.
- B. Related Sections include the following:
 - 1. Division 08 Section "Access Doors and Frames" for wall- and ceiling-mounted access doors and panels.
 - 2. Division 08 Section "Louvers and Vents" for intake and relief louvers and vents connected to ducts and installed in exterior walls.
 - 3. Division 23 Section "Metal Ducts" for ductwork, duct liner and duct sealants.
 - 4. Division 23 Section "Diffusers, Registers, and Grilles."
 - 5. Division 15 Section "Testing, Adjusting, and Balancing for HVAC" for final positioning of manual-volume dampers.
 - 6. Division 28 Section "Fire Detection and Alarm" for duct-mounted fire and smoke detectors.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Backdraft dampers.
 - 2. Manual-volume dampers.
 - 3. Roof ventilation hoods.
 - 4. Turning vanes.
 - 5. Duct-mounted access doors.
 - 6. Flexible ducts.
 - 7. Flexible connectors.
 - 8. Screened openings.
 - 9. Duct accessory hardware.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Backdraft dampers.
 - 2. Manual-volume dampers.
 - 3. Duct-mounted access doors and panels.
 - 4. Flexible connectors.
 - 5. Flexible ducts.
 - 6. Roof ventilation hoods.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:

1. Special fittings and manual-volume-damper installations.
 2. Fire- and smoke-damper installations, including sleeves and duct-mounted access doors and panels.
- C. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.
- 1.4 QUALITY ASSURANCE
- A. NFPA Compliance: Comply with the following NFPA standards:
1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
 2. 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, are packaged with protective covering for storage, and are identified with labels describing contents.
1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Backdraft Dampers:
 - a. Ruskin.
 - b. American Warming & Ventilating.
 - c. Greenheck.
 2. Roof Ventilation Hoods:
 - a. Penn Ventilator.
 - b. Cook.
 - c. Greenheck.
 - d. Ruskin.

2.2 SHEET METAL MATERIALS

- A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
- B. Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.

- C. Aluminum Sheets: ASTM B 209, Alloy 3003, Temper H14, sheet form; with standard, one-side bright finish for ducts exposed to view and mill finish for concealed ducts.
- D. Extruded Aluminum: ASTM B 221, Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT DAMPERS

- A. Description: Suitable for horizontal or vertical installations as indicated.
- B. Counterbalance Type: Extruded aluminum with counterbalanced blades; blades begin to open at minimum 0.01 inches w.g. and be fully open at minimum 0.05 inches w.g. Designed for maximum 3500 feet per minute spot velocity and up to 4-inches w.g. back pressure.
 - 1. Frame: Minimum 0.125 inches thick extruded aluminum, braced at corners.
 - 2. Blades: Minimum 0.070 inches thick extruded aluminum. Blade seals extruded vinyl, mechanically attached.
 - 3. Bearings: Corrosion resistant, long life synthetic.
 - 4. Linkage: 1/2-inch diameter tie bar with stainless steel pivot pins; mounted on blades. Adjustable counterbalance.
- C. Top-of-Blade Hinged Type: Extruded aluminum heavy duty backdraft dampers; blades begin to open at minimum 0.12 inches w.g. and be fully open at minimum of 0.20 inches w.g. Designed for maximum 3500 feet per minute spot velocity.
 - 1. Frame: Minimum 0.125 inches thick extruded aluminum, braced at corners.
 - 2. Blades: Minimum 0.70 inches thick extruded aluminum. Blade seals extruded vinyl, mechanical attached.
 - 3. Bearings: Corrosion resistant, long life, synthetic.
 - 4. Linkage: 1/2-inch diameter tie bar with stainless steel pivot pins; mounted on blades.

2.4 MANUAL-VOLUME DAMPERS

- A. General: 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 Classifications 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.

- B. Steel Standard Volume Dampers: Multiple- or single-blade, opposed-blade design unless indicated otherwise, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.
 - 1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 16 gauge 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: 16 gauge thick, galvanized, sheet steel.
 - 3. Blade Axles: Galvanized steel.
 - 4. Tie Bars and Brackets: Galvanized steel.

- C. Steel Low-Leakage Volume Dampers: Multiple- or single-blade, opposed-blade design unless indicated otherwise, low-leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.
 - 1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 16 gauge 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: 16 gauge thick, galvanized, sheet steel.
 - 3. Blade Seals: Vinyl.
 - 4. Tie Bars and Brackets: Galvanized steel.

- D. Jackshaft: 1-inch diameter, galvanized steel pipe rotating within a 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 of a multiple-damper assembly.

- E. Damper Regulators: 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 ROOF VENTILATION HOODS

- A. General Description: Louvered penthouse, low silhouette hood, or low silhouette aluminum spun housing, curb base, and accessories. Rated for 20 psf wind/snow load.

- B. Housing: Heavy-gauge, removable, louvered or spun-aluminum, dome top and outlet baffle; square, one-piece, hinged, aluminum base.

- C. Accessories:
 - 1. Insect Screens: Removable 1/8-inch mesh, aluminum or brass wire.

 - 2. Backdraft Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base, factory set to close when fan stops. Provide where indicated.

 - 3. Roof Curbs: Prefabricated, heavy-gauge, galvanized steel; mitered and welded corners; 2-inch thick, rigid, fiberglass insulation adhered to inside walls; built-in cant and mounting flange for flat roof decks; and 2-inch wood nailer. Size as required to suit roof opening and fan base.

2.6 TURNING VANES

- A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch-wide, curved blades set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into side strips suitable for mounting in ducts.
- C. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.7 DUCT-MOUNTED ACCESS DOORS

- A. General: Fabricate doors and panels airtight and suitable for duct pressure class. 14-inch by 14-inch, unless indicated otherwise.
- B. Frame: Unless indicated differently, minimum 24-gauge thick galvanized, sheet steel, with bend-over tabs and foam gaskets.
- C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include piano hinge and cam latches. Multiple cam latches used on doors greater than 12-inches in height.
- D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.
- E. Insulation: 1-inch-thick, fibrous-glass.

2.8 FLEXIBLE CONNECTORS

- A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1. Fabricate designed to meet UL 214, NFPA 90A, airtight and waterproof.
- B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-inches wide attached to two strips of 3-inch-wide, minimum 24-gauge thick, galvanized, sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected ducts.
- C. Extra-Wide Metal-Edged Connectors: Factory fabricated with a strip of fabric 5-3/4 inches wide attached to two strips of 3-inch-wide, minimum 24-gauge thick, galvanized, sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected ducts.
- D. Transverse Flanged Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 4-3/8-inch-wide, 24-gauge thick, galvanized, sheet steel or 0.032-inch aluminum sheets formed for flanged type connection. Select metal compatible with connected ducts.

- E. Conventional, Indoor System Flexible Connector Fabric: Woven nylon/polyester blend with vinyl coating.
 - 1. Minimum Weight: 22 oz./sq. yd..
 - 2. Tensile Strength: 240 lbf/inch in the warp, and 220 lbf/inch in the filling.

- F. Conventional, Outdoor System Flexible Connector Fabric: Glass fabric double coated with a synthetic-rubber, weatherproof coating resistant to the sun's ultraviolet rays and ozone environment.
 - 1. Minimum Weight: 24 oz./sq. yd..
 - 2. Tensile Strength: 500 lbf/inch in the warp, and 500 lbf/inch in the filling.

2.9 FLEXIBLE DUCTS

- A. General: Comply with UL 181, Class 1, UMC Standard 6-1, and NFPA Standards 90A and 90B.

- B. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-inch-thick, glass-fiber insulation around a continuous inner liner. Rated for maximum pressures of 6-inches w.g. positive and 1-inch w.g. negative.
 - 1. Reinforcement: Steel-wire helix encapsulated in inner liner.
 - 2. Outer Jacket: Glass-reinforced, silver Mylar with a continuous hanging tab, integral fibrous-glass tape, and nylon hanging cord.
 - 3. Inner Liner: Polyethylene film.

- C. Flexible Ducts, Uninsulated: Spiral-wound steel spring with reinforced flame-proof vinyl sheathing. Rated for maximum pressures of 10-inches w.g. positive and 2-inches w.g. negative and maximum velocity of 4000 fpm.

2.10 SCREENED OPENINGS

- A. Screened Openings: 16-gauge steel angle frame enclosing 1/2-inch mesh, 14-gauge galvanized steel wire screen.

2.11 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 length to suit duct insulation thickness.

- B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch, zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

- C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches to suit duct size.

- D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

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.
- B. Related Sections include the following:
 - 1. Division 08 for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
 - 2. Division 23 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers and grilles.
 - 3. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for balancing diffusers and grilles.

1.2 SUMMARY

- A. This Section includes ceiling-, floor-, sill- and wall-mounted diffusers 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, sill, or floor.

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 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.

- A. NFPA Compliance: Install diffusers and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Air Systems Components; Krueger.
 2. Titus.
 3. Price Companies.

2.2 MANUFACTURED UNITS

- A. Diffusers and grilles are scheduled on Drawings.

2.3 SOURCE QUALITY CONTROL

- A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

2.4 CEILING DIFFUSERS

- A. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.
- B. Ceiling Compatibility: Provide diffusers with border styles that are compatible with ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems, which will contain each type of ceiling air diffuser.
- C. Types: Provide ceiling diffusers of type, construction, capacity, and with accessories and finishes as indicated.
 1. Ceiling Diffuser – Modular Core (MC)
 - a. Material: 22-gauge steel modular core, back pan shall be one piece stamped 22-gauge steel.
 - b. Diffuser Construction: Fixed louver directional modules, which can be easily repositioned without tools in the field for one, two, three or four way discharge. Each module shall be removable.
 - c. Finish: White, anodic acrylic paint.

- A. Performance: Provide supply grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.
- B. Wall Compatibility: Provide grilles with border styles that are compatible with wall systems, and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall construction, which will contain each type of wall grille.
- C. Types: Provide supply grilles of type, construction, capacity, and with accessories and finishes as indicated.
 - 1. Supply Grille – Louvered
 - a. Materials: 20 gauge steel or 0.050 aluminum frame with heavy duty aluminum blades
 - b. Grille Construction: 1-1/4-inch wide border, corners assembled with full penetration resistance welds. Screw holes countersunk. Double deflection solid airfoil blades, front blades parallel to the long dimension, spaced on 3/4-inch centers. Blades shall extend through the side frame on each side. Blades shall be individually adjustable, held in place with tension wire, adjustable without loosening or rattling.
 - c. Finish: White, anodic acrylic paint.

2.6 EXHAUST/RETURN GRILLES

- A. Performance: Provide exhaust and return grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.
- B. Ceiling Compatibility: Provide grilles with border styles that are compatible with ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems, which will contain each type of grille.
- C. Wall Compatibility: Provide grilles with border styles that are compatible with wall systems, and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall construction, which will contain each type of wall grille.
- D. Types: Provide exhaust and return grilles of type, construction, capacity, and with accessories and finishes as indicated.
 - 1. Exhaust/Return Grille – Louvered
 - a. Materials: 22-gauge roll formed steel frame and blades or 0.040 minimum extruded aluminum frame and blades.
 - b. Grille Construction: 1-1/4-inch wide border, corners assembled with full penetration resistance welds. Screw holes countersunk. Blades at 35 degree deflection at 1/2-inch spacing. Blades fixed in place, parallel to the long dimension of the grille.

- c. Finish: White, anodic acrylic paint or aluminum colored paint.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers 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 and grilles level and plumb, according to manufacturer's written instructions, project 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. Duct-Mounted Supply and Exhaust/Return Grilles: Mount to duct branch with 16-gauge steel angle collar. Mounting screws to match grille frame. Screws shall not protrude more than 1/4-inch past angle collar.
- D. Install diffusers 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 and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

- A. After installation of diffusers and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers and grilles that have damaged finishes.

END OF SECTION 23 37 13

SECTION 26 00 10
BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the electrical work.
- B. Coordinate electrical work with related work shown and specified elsewhere.
- C. Work Included: The Contractor shall perform all the Work required (including the furnishing of all supervision, labor, services, tools, materials and equipment and the performance of all operations and incidentals necessary) for a complete, safe and reliable electrical installation, adjusted, tested and ready for operation. The electrical work (new and modification of existing) is generally described as follows:
 - 1. Scheduling and coordination of all phases/sequences of the project.
 - 2. Maintaining, modifying, and temporary work to accommodate all phases/sequences of the project.
 - 3. Demolition.
 - 4. Modifications to existing buildings.
 - 5. Power distribution system circuit breakers, disconnect switches, fuses, feeders, etc.
 - 6. Grounding.
 - 7. Wiring devices and special purpose receptacles.
 - 8. Lighting fixtures.
 - 9. Lighting controls, sensors and devices.
 - 10. Branch circuit wiring system for lighting, outlets, equipment, etc.
 - 11. Disconnecting means, switches, receptacles, motor starters, control devices, etc. (installation only if furnished with the equipment), and final power and line voltage (120 volt

or greater) control connections to equipment and devices provided by the Owner, General Contractor or other Sub-Contractors, including the following:

- a. HVAC equipment, and their line voltage control devices,
 - b. Plumbing systems equipment and their line voltage control devices,
 - c. Heat tape and freeze protection,
 - d. Appliances.
 - e. Motorized doors, etc.
 - f. Domestic water pump.
12. Line voltage (120 volt or higher) control stations, devices, conduit, boxes, wiring, etc. (installation only if furnished with mechanical equipment).
 13. Ancillary systems raceways, boxes, cables, etc.
 14. School clock, intercom & paging system modifications.
 15. Fire detection and alarm system modifications.
 16. Telecommunications (e.g. voice, data/computer network, cable television) patch panels, terminal blocks, outlets, conduit, supports, cables, etc.
 17. Supports.
 18. Pull strings and ropes.
 19. Moisture, fire and dust stopping and sealing.
 20. Temporary construction power & lighting.
 21. Testing and completing.
 22. Obtaining and paying for all required licenses, permits, inspections and fees.
- D. Work not included: The following electrical system related work will be provided by the Owner, General Contractor, other Subcontractors, or Systems Contractors working directly with the Owner:
1. Mechanical Contractor: Mechanical equipment and systems low voltage control wiring, conduits, devices, etc. See mechanical specification sections and schedule on drawings.
 2. Owner: Appliances.

3. Owner: Payment of plan review charges.

1.03. ALTERNATES

- A. See Section 01 23 00 for description of Alternates. Include work associated with each alternate in the alternate bid price.

1.04. EXISTING CONDITIONS

- A. Before submitting bid, examine existing site (and building or equipment) conditions to determine effect on execution of the electrical work and include costs in bid.
- B. Existing circuits indicated on the plan are based on what was shown on the original building construction drawings and may not be exactly how the actual construction was done. The contractor shall expect that an extensive amount of circuit tracing to determine how the actual circuits are installed will be required.
- C. Damaged electrical and telecommunications (telephone, computer/data, television, fiber, copper, etc.) cables shall be replaced in their entirety. Splicing will not be allowed.
- D. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

1.05. SPECIAL AREAS

- A. Telecommunications rooms shall be treated as clean room type environments. Food, drink, dirt, dust, metal shavings and the like shall not be permitted in telecommunications rooms.

1.06. PLAN REVIEW AND PERMITS

- A. The Contractor shall arrange for inspections and pay for all required licenses, permits, inspections, plan reviews and any other fees (except the owner will pay for L&I plan review fee).

1.07. DEFINITIONS

- A. The term "Contractor" used throughout Division 26, 27 and 28 and all its sections of these specifications and on the electrical drawings shall be understood to mean the Electrical Contractor. All other work shall be called out by name.
- B. "Approved" means approved by the Architect. "For approval" means for the Architect's approval.
- C. "Furnish" means to supply and deliver to the Project, ready for installation and in operable condition.

- D. "Install" means to incorporate in the work in final position, complete, anchored, connected, and in operable condition.
- E. "Provide" means furnish and install.
- F. "As directed" means as directed by the Architect.
- G. "Concealed" means hidden from sight in trenches, walls, chases, ceilings, etc.
- H. "Exposed" means within sight; that is, not concealed as defined above, and installed on the surface of walls, ceilings, etc.
- I. "C.O." means conduit only; that is, without cable (except, provide pull string or rope).
- J. "F.O.I.C." means Furnished by Others (e.g. general contractor, other subcontractors, equipment suppliers, Owner, systems contractors working directly with the Owner, etc.), Installed by Contractor.
- K. "N.I.C." means Not in Contract.
- L. See telecommunications section 27 05 00 for additional definitions.
- M. Definitions of all other terms, etc. are in accordance with AIA, ANSI, IEEE, IES, NEMA, etc. standard definitions.

1.08. DRAWINGS & SPECIFICATIONS

- A. The electrical plan drawings are general in form and do not attempt to show complete details or list every item of the electrical systems, the building construction or the various equipment (new or existing); however, the routing of raceways and circuits, and the locations of equipment, devices, fixtures, etc. represent the desired finished arrangement; except, as governed by structural or mechanical conditions or obstructions.
- B. Specifications are, in some cases, written in an abbreviated form. Words such as shall, shall be, the Contractor shall, and similar mandatory phrases are supplied by inference.
- C. Investigate the structural and finish conditions affecting the work. Refer to the architectural, structural and mechanical drawings, supplier shop drawings and submittals, etc. for additional details, equipment ratings, dimensions, location and swing of doors, location and size of partitions, cabinets, etc. and similar features. Verify all dimensions, equipment ratings, etc. with the actual before installation. Arrange the work accordingly.
- D. The intent of the drawings and specifications is to include all items necessary for the proper execution and completion of the Work; however, any item or detail not specifically mentioned in the specifications or shown on the drawings, but which is necessary to produce the intended results shall be included.
- E. The Contractor shall bring to the Engineer's attention any discrepancies, inconsistencies, conflicts, errors, or omissions within the Contract Documents, between the Contract Documents

and field conditions, and any design and layout changes required due to specific equipment selection, etc. prior to equipment and material purchasing and installation. If Contractor purchases any equipment or materials and performs any construction activity, and it knows or reasonably should have known that the documents contain a discrepancy, inconsistency, conflict, error or omissions, corrective work shall be at the Contractor's expense.

- F. Verify all equipment and device locations with the Owner and Architect prior to rough-in.
- G. Verify exposed raceway routing with the Owner, Architect and Engineer prior to rough-in.

1.09. SUBMITTALS

- A. Provide submittals for the equipment, boxes, devices, fixtures, special raceways, systems and their components, etc. as directed in the various sections of the specifications.
- B. Prepare detail layout drawings to a larger scale than the contract drawings in areas where the work is of sufficient complexity to warrant additional detailing.
- C. Submittal drawings shall be on standard size sheets no larger than the contract drawings.
- D. Submit M.S.D.S. (Manufacturer's Safety Data Sheets) for all chemicals or hazardous materials. All chemicals and hazardous materials to meet NIOSH Permissible Exposure Levels (P.E.L.) and OSHA Time Weighted Average (T.W.A.) requirements before commencing work.
- E. If requested by the Owner, provide samples of materials for evaluation.
- F. Submittals shall provide sufficient detail so compliance with the drawings and specifications can be ascertained. Clearly identify each item by manufacturer, brand, trade name, number, size, rating, or whatever other data is necessary to properly identify and review materials and equipment. Catalog pages containing more than one product shall be marked with arrows to indicate the proposed product.
- G. Obtain approval before purchasing any products. Items not in accordance with the drawings and specifications will be rejected.
- H. Forward all submittals to the Architect, together, at one time, in folders with tabs and index for each section. Each tabbed section shall be provided with a front page. Individual or incomplete submittals are not acceptable.
- I. The Contractor shall establish quantities, check drawings and data, verify space requirements, dimensions, and possible interferences prior to submittal.
- J. The Architect and Engineer will review each submittal, mark to indicate action taken, and return. Compliance with specified characteristics is the Contractor's responsibility.
- K. Approval of submittals does not release the Contractor from a proper installation, compliance with the drawings, specifications, codes, standards, etc. or coordination of the work.

- L. Allow two weeks turnaround time for each submittal from the time of receipt at the engineer's office, except the engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until the related submittals are received.

1.10. SUBSTITUTE PRODUCTS APPROVAL

A. During Bidding:

1. Substitutions for equipment and materials other than that specified will be considered if equal (or better and/or higher) in quality, ratings and function; and similar in type, style, size and appearance.
2. Submit written requests to Owner, Architect and Engineer.
 - a. If received no later than 7 work days prior to Bid opening, requests will be considered, but not thereafter.
 - b. Bidders will be informed by Addendum of any approved items.
 - c. No responses will be provided for rejected items.
3. Requests shall be accompanied by complete specifications, samples, record or performance, certified tests by impartial, recognized laboratories, and other such information as required to clearly represent the proposed substitution.
4. Lighting fixture substitution requests shall include photometric data.
5. Final decisions as to quality and suitability of proposed substitutions rest solely with the Owner, Architect and Engineer, and will be based on proof submitted.
6. The cost of changes required in order to incorporate the proposed substitution, such as revisions to controls, raceways, wiring, openings, appurtenances, etc., shall be included in the bid. Any cost reduction resulting from substitutions shall benefit the Owner through a reduced bid.
7. When Owner, Architect and Engineer approve a proposed substitution, it is with the understanding that Bidder certifies that substitute articles or materials are equal to or better than those specified and that no exception is taken with any of the performance objectives, service or warranty requirements or features herein specified.

B. After Bidding:

1. Substitute products requests will not be considered.
2. Product substitutions are allowed solely under the conditions stated in Division 1 Section "Product Requirements."

1.11. RECORD DOCUMENTS

- A. Submit record documents at completion of the project in accordance with the specific submittal requirements listed elsewhere in these documents.
- B. Provide "as-built" drawings in both full size reproducible form and in software form as AutoCAD .dwg type files.
- C. All record documents in software form shall be provided on a single CD-ROM. Include the necessary program(s) to read test results. Separate submittals for the various disciplines will not be accepted.

1.12. "AS BUILT" DRAWINGS

- A. The Contractor shall continuously maintain a marked job set of as-built drawings as the work progresses, to indicate deviations from the original design, including change orders. Maintain records of all concealed wiring and of actual equipment, device, etc. locations. Provide dimensions from accepted reference lines as needed. The as-built drawings shall be kept on-site and available for inspection by the Owner.
- B. Include any detailed equipment, raceway, wiring, etc. diagrams and layouts prepared by Contractor or his subcontractors, suppliers, etc.
- C. At substantial completion, Contractor shall modify one complete set of reproducible copies, with all "as built" information and submit these drawings to the Owner for approval. Each sheet shall be marked "CORRECTED TO AS BUILT"; or, if there are no changes, drawings shall be marked "NO CHANGES, INSTALLATION PER PLAN".
- D. After approval, Contractor shall transfer all "as built" information from the marked job set and other information as appropriate to AutoCAD .dwg type files. (Consultant/Engineer will provide construction drawings AutoCAD files to contractor.) Utilize the layering scheme, font types, line types, title block, etc. provided in the AutoCAD drawing files. All drawings shall be noted as "As-Built" with a stamp and date. After adding the "as-built" information, return the AutoCAD files to the Consultant/Engineer for inclusion into the final project record set.
- E. "As-built" drawings for all portions of the work shall be combined into a single set matching the contract documents. Separate submittals for the various disciplines will not be accepted.

1.13. OPERATION AND MAINTENANCE MANUALS

- A. Following installation of the electrical systems, but prior to acceptance of the work, Contractor shall submit to Architect one loose-leaf volume with information systematically segregated and indexed for easy reference to be reviewed by the Owner, Architect and Engineer. This submittal copy will be returned to the Contractor, and the material can be used in preparation of final volumes. After approval of preliminary copy, but prior to project completion, submit 3 finished copies.
- B. Format shall be 8¹/₂" x 11" size with neat, clean copies, drawings (accordion folded), etc. Manuals shall have a typewritten index, and divider sheets with identification tabs between categories. Manuals shall be in hard cover 3 ring binders with titles permanently embossed on the cover face and the spine. The front of each volume shall be imprinted with the project name, title (e.g. "Electrical Equipment and Devices Operating Instructions and Maintenance Manual"), Owner, Architect, Electrical Engineer and Contractor.
- C. Manuals shall include:
 - 1. Record documents (see above); except, full size reproducible bond paper copy of drawings to be provided separately.
 - 2. Submittals, updated to "as built" conditions.
 - 3. Test results; except, telecommunications equipment, cables, etc. test results shall be in a separate binder.
 - 4. Description of systems configuration and operation including component identification and interrelations, including diagrams and supplementary drawings where necessary.
 - 5. Installation, operation, maintenance and programming manuals covering the installed systems, equipment and materials.
 - 6. Maintenance instructions (frequency of service, type of service, etc.).
 - 7. Parts lists for all equipment; including recording information, recommended spares and anticipated useful life.
 - 8. Supplier's names, addresses, telephone and reference order numbers for all equipment and materials.
 - 9. Warranties and Bonds.
 - 10. Copies of final inspection certificates from the authorities having jurisdiction.
- D. Omit non-applicable data.

1.14. WARRANTY

- A. The complete installation shall be guaranteed for a period of one (1) year after date of project completion. For warranty purposes, the date of project completion shall be considered the date of final acceptance of the installation by the Owner certified in writing, and after Owner has received all project close-out requirements. All corrective work, if needed and requested by the Owner, shall be provided without cost to the Owner during the guarantee period.
- B. All corrective work performed by the Contractor in remedying defective work during the guarantee period following the Owner's acceptance of the project shall be subject to the same guarantee requirements of the original work for a period as specified from the date of completion of the corrective work.
- C. Corrective work shall include on-site service by the Contractor, subcontractor or supplier (e.g. fire alarm and telecommunications systems), and/or nearest technical service representative of the equipment manufacturer. Service shall be provided within 24 hours from the time of request for warranty service by the Owner.

1.15. TRAINING/INSTRUCTION AND ASSISTANCE

- A. After the installation is complete and operating, and prior to acceptance of the work, conduct a minimum of a one (1) hour training/instruction period at the site for each type of system to point out locations of service and maintenance and instruct the Owner's in the operation of all systems and equipment.
- B. The person(s) who conduct these instructions and demonstrations shall be a qualified representative(s) of the manufacturer with substantial training and operating experience on this equipment and project, and shall be versed in the operating theory as well as practical operation and maintenance work. Instructor(s) shall have the necessary educational and interpersonal skills, as well as proven ability to effectively perform the training. Their qualifications shall be submitted to the Owner before conducting the instruction period.
- C. Each period shall include preliminary discussion and presentation of information using the actual maintenance manuals required for this project. Contractor shall notify Owner and Engineer at least 48 hours in advance of readiness to conduct the instruction period. The actual time and date of instruction period shall be acceptable to the Owner and Engineer.
- D. All training material shall be furnished and supplied by the Contractor.

1.16. QUALITY ASSURANCE

- A. The Contractor and Contractor's personnel shall be experienced, thoroughly trained and completely familiar with the systems, equipment, devices, fixtures, materials, etc. and the required methods of installation.
- B. The Contractor shall provide, upon request, after bid opening and prior to notice to proceed, a company resume including a list of project personnel with years of experience and qualifications/certifications, a list of similar projects completed within the past 5 years with contact

information for the Owners and Engineers for each project and any other information which may be pertinent to the project. If requested, the Contractor shall provide a similar resume for sub-contractors.

- C. The Contractor shall provide proof, upon request, that all personnel are licensed according to Washington State RCW19.28.161.
- D. All materials, equipment and workmanship shall be properly inspected by the Contractor and shall at all times be subject to inspection by the Owner, Architect and Engineer. Contractor shall provide all samples, data and documents necessary for such inspection. Owner, Architect and Engineer shall be afforded full and free access at the jobsite and the shops and places of business of the Contractor for such inspection and to determine the status of the work. If Contractor covers all or any part of the work prior to any inspection or test specifically requested by Owner, Architect and/or Engineer, the cost of any necessary uncovering and replacing shall be borne by the Contractor.
- E. Neither the failure to make inspections or tests, nor to discover defective workmanship, materials or equipment, shall prejudice the rights of the Owner, Architect or Engineer thereafter to reject the work and/or require its correction.
- F. The completed installation shall comply with the more stringent of the requirements of the drawings and specifications, the authorities having jurisdiction, and all laws, ordinances, rules, regulations and requirements in effect at the site, including current editions of the following:
 - 1. NEC - National Electrical Code.
 - 2. National Electrical Safety Code.
 - 3. OSHA - Occupational Safety and Health Act (and its Washington State equivalent).
 - 4. ADA - Americans with Disabilities Act (and its Washington State equivalent).
 - 5. International Fire Code (and its Washington State equivalent).
 - 6. International Building Code (and its Washington State equivalent).
 - 7. Washington State Rules and Regulations for Installing Electrical Wires and Equipment (WAC 296-46).
 - 8. Washington State Safety Standards for Electrical Workers (WAC 296-45).
 - 9. Washington State Energy Code.
- G. The following standards establish the minimum requirements for the equipment and installation, unless exceeded by the requirements of the drawings or specifications:
 - 1. ANSI - American National Standards Institute.
 - 2. BICSI – Building Industry Consulting Service International
 - 3. ICEA - Insulated Cable Engineers Association.
 - 4. IEEE - Institute of Electrical and Electronics Engineers.
 - 5. NEMA - National Electrical Manufacturers Association.
 - 6. NEIS – National Electrical Installation Standards
 - 7. NFPA - National Fire Protection Association.
 - 8. NECA – National Electrical Contractors Association
 - 9. EIA - Electronic Industries Association.
 - 10. TIA - Telecommunications Industry Association.

- H. In addition, telephone/voice & computer/data pathways & wiring shall be in accordance with the following:
1. ANSI/NECA/BICSI 568-2001 – Installing Commercial Building Telecommunications Cabling.
 2. ANSI/TIA/EIA 526-7-98 – Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
 3. ANSI/TIA/EIA 526-14-A-98 – Optical Power Loss Measurements of Installed MultiMode Fiber Cable Plant
 4. TIA/EIA TSB-125 – Guidelines for Maintaining Optical Fiber Polarity Through Reverse-Pair Positioning.
 5. TIA/EIA TSB-140 – Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.
 6. ANSI/TIA/EIA 568-B.1 - Commercial Building Telecommunications Cabling Standard, General Requirements.
 7. ANSI/TIA/EIA 568-B.2 - Commercial Building Telecommunications Cabling Standard, Balanced Twisted Pair Cabling Components.
 8. ANSI/TIA/EIA 568-B.3 – Optical Fiber Cabling Components Standard.
 9. ANSI/TIA/EIA 569-B - Commercial Building Standard for Telecommunication Pathways and Spaces.
 10. ANSI/TIA/EIA 570-A – Residential Telecommunications Cabling Standard.
 11. ANSI/TIA/EIA 598-B – Optical Fiber Cable Color Coding.
 12. ANSI/TIA/EIA 606-A – Administration Standard for Commercial Telecommunications Infrastructure.
 13. ANSI/TIA/EIA 607-A - Commercial Building Grounding and Bonding Requirements for Telecommunications.
 14. ANSI/TIA/EIA 758 – Customer-Owned Outside Plant Telecommunications Cabling Standard.
 15. IEEE 802.3-2002 – IEEE Standard for Information Technology, Part 3: CSMA/CD.
- I. Nothing in the drawings or specifications shall be construed to direct or permit work not conforming to applicable laws, ordinances, rules, regulations, requirements or standards. Discrepancies or conflicts shall be brought to the attention of the Owner and Engineer promptly for resolution.
- J. The Owner and Engineer shall be advised prior to any inspection being requested. The Owner and Engineer shall be provided the opportunity to inspect the installation prior to wallboard, ceiling or finish installation. Any materials, equipment or workmanship that is not (in the opinion of the Owner, Engineer or Inspector) as it should be, shall be taken out and replaced without cost to the Owner.

PART 2 - PRODUCTS

2.01. GENERAL

- A. Coordinate the features of materials and equipment so they form an integrated system.
- B. Contractor shall make certain that all materials selected by him, his subcontractors or by his suppliers, conform exactly to requirements of the drawings and specifications. Transmittal of such specifications and drawing information to subcontractors, person manufacturing and/or supplying materials to the project, and rigid adherence thereto, is the Contractor's responsibility.
- C. All equipment, devices, luminaires, materials, etc. shall be UL (Underwriter's Laboratories, Inc.) listed, labeled and approved for the service intended where UL standards have been established. If no UL label is available, the label of a testing agency or conformance to national standards recognized and approved by the electrical inspector having jurisdiction is required.
- D. All equipment, devices, fixtures, materials, etc. shall be new and installed only if in first class condition.
- E. All equipment, devices, etc. and their components shall be designed for continuous duty without degradation of function or performance.
- F. In the event that any item is not available exactly as specified, the Contractor shall so notify the Owner and Engineer in writing prior to bidding as early as possible to allow ample time for an alternate item to be selected without delay to the project.

2.02. EQUIPMENT MANUFACTURERS

- A. Unless specifically noted otherwise, all references to manufacturer's or supplier's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality.
- B. All equipment, devices, materials, etc. shall be of a type manufactured by reputable recognized vendors. Each type or groups of items, system components, etc. having the same or similar function shall be the same manufacturer, make and quality throughout the facility.
- C. Approval of a manufacturer's name and/or type does not release the Contractor of the responsibility for providing materials which comply in all details with requirements in the contract documents.

2.03. SPARE CAPACITY

- A. Unless sizes and/or quantities are specifically indicated, provide at least 20% spare wiring capacity in all cabinets, panels and raceways.

2.04. LOCKS

- A. All equipment, panels, etc. shall be provided with suitable locks, keyed alike.
- B. Provide a minimum of 2 keys for each lock.

2.05. ENCLOSURES

- A. Equipment, devices, luminaires, boxes, etc. located indoors shall have general purpose (NEMA 1) enclosures, except:
- B. Equipment, devices, luminaires, boxes, etc. located outdoors shall be provided with weatherproof (NEMA 3R) enclosures. Surface finish shall be a rust inhibiting primer followed by an epoxy or polyurethane polyester top coat.
- C. Provide gaskets, seals, etc. as required to prevent the entrance of moisture, debris, insects, etc.
- D. Enclosures and boxes shall be fabricated from code gauge, or heavier, galvanized steel. Surface preparation and finish shall be manufacturer's standard unless noted otherwise.
- E. Include all necessary mounting, etc. accessories.

2.06. SUPPORT CHANNEL

- A. Channel, framing members, etc. shall be 12 gauge steel, galvanized, $1\frac{5}{8}$ inch channel width with all necessary accessories.
- B. Beam clamps shall be steel, minimum 500 lb load rated.
- C. Threaded rod shall be steel, minimum $\frac{3}{8}$ inch diameter.
- D. Rooftop mounted conduit support bases shall be nonmetallic, UV resistant, and approved for use on the roofing material. Provide minimum 6 inches of space between bottom of conduits and roof surface. Rooftop support bases shall be Cooper B-Line C Series (or equal) with suitable support channel.

2.07. EQUIPMENT BACKBOARDS

- A. Equipment backboards shall be $\frac{3}{4}$ inch plywood, void free, interior grade, good one side, fire resistant treated, bearing a quality mark indicating compliance with American Wood Preservers Assoc. (AWPA) standards.
- B. Paint with minimum two coats of light colored fire resistant paint on all sides and edges.

2.08. ANCHORS AND FASTENERS

- A. Anchors and fasteners used shall be of a type designed for use in the base material to which the item is to be attached. Attach to wood with wood or lag screws, to metal with machine screws or bolts and to concrete with carbon steel wedge or sleeve type expansion anchors or self-drilling metal anchors and machine screws or bolts.
- B. Pad and floor mounted equipment shall be secured with suitable hot dipped galvanized steel anchor bolts, washers, hex nuts, etc.
- C. Powder actuated fasteners, plastic expansion type anchors, nails and toggle bolts are not permitted.
- D. Anchors shall be non-corrosive or have suitable corrosion resistant coatings or treatment.
- E. Bolts, nuts, screws and other threaded devices shall have standard threads and heads, unless required for tamper-proof installation.

2.09. WIRE GUARDS

- A. Zinc plated heavy gauge (minimum 7 gauge) welded steel wire guards (or other approved means) shall be provided for impact protection on all gymnasium mounted devices, and still allow the device to function as intended.

2.10. IDENTIFICATION

- A. Provide nameplates for all equipment (e.g. switchboards, panels, disconnecting means, control panels, control stations, emergency systems, etc.) and other devices used for the control of circuits, equipment, etc. Nameplates shall adequately describe the function or operation of the identified equipment, devices, etc. and include the panel and circuit number(s) from which it is fed. Nameplate designations shall be consistent with the project documents. Submit proposed inscriptions for approval.
- B. Definite purpose devices shall be labeled with a description of the device's function, rating and include the panel and circuit number(s) from which it is fed.
- C. All equipment and outlets shall be labeled with the panel and circuit number(s) from which it is fed.
- D. Nameplates shall be laminated plastic, with lettering etched through the outer covering. Character size as appropriate for the application, approved by Engineer; except minimum $\frac{1}{8}$ inch. Nameplates shall be securely fastened with suitable adhesive or self tapping screws. Character and background colors shall conform to the following system color code:

<u>Background.</u>	<u>Char.</u>	<u>System</u>
Black	White	Power & Lighting
Red	White	Fire Alarm
Blue	White	Security
Orange	White	Data Cabling & Equipment Systems*
Green	White	Voice Cabling & Equipment Systems*
Purple	White	Television Cabling & Equipment Systems*

* These are sub-systems of the general telecommunications distribution system. All cabling and equipment for the general telecommunications distribution system shall be identified with nameplates, etc. consistent with the data cabling and equipment systems (e.g. orange and white).

- E. Identification tags shall be plastic, flexible type with a label. Identification tags shall be securely fastened with cable ties. Tags shall be mounted so as to be clearly visible.
- F. Labels shall be heavy duty adhesive type, clear background with black letters on light colored devices and clear background with white letters on dark colored devices; except, labels on devices connected to the emergency power system shall have red letters. Lettering shall be appropriately sized for the application, except minimum $\frac{1}{8}$ inch.

PART 3 - EXECUTION

3.01. CONSTRUCTION/WIRING METHODS

- A. Wiring methods shall be as follows:
 - 1. Service - PVC conduit below grade (with GRS conduit risers and RTRC fiberglass elbows) and GRS conduit above grade.
 - 2. Feeders - PVC conduit below grade (with GRS conduit risers and RTRC fiberglass elbows) and EMT above grade.
 - 3. Branch circuits - PVC conduit below grade (with GRS conduit risers and RTRC fiberglass elbows for conduits 2" and larger) and EMT above grade.
 - 4. Telecommunications - PVC conduit below grade (with GRS conduit risers and RTRC fiberglass elbows) and EMT above grade; except, suitable cables run "open" in accessible locations above t-bar ceilings or within attic space.
 - 5. Fire alarm, class 2 control, etc. - PVC conduit below grade (with GRS conduit risers and elbows) and EMT above grade; except, suitable cables run "open" in accessible locations above t-bar ceilings or within attic space.

- B. All wire and cable shall be enclosed within the raceway system; except, "open cable wiring" will be permitted for Class 2 signal and control, fire alarm, security, telecommunications, etc. cables approved for the purpose when run concealed in an accessible location above the ceilings or in the attic.
- C. Conduit and cable shall be run concealed in the walls (including within CMU and similar construction), above the ceiling, or below the floor with all devices, etc. flush mounted; except, in the Mechanical and Electrical Rooms, conduit drops to panels, equipment, etc. may be run exposed.
- D. Equipment shall be surface mounted unless noted otherwise.
- E. Devices, etc. shall be flush mounted unless noted otherwise.

3.02. CONTRACTOR CONTROL AND SUPERVISION

- A. Contractor shall supervise and direct the Work, using its best skill and attention, and shall perform the work in a skillful manner. Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the work, unless the Contract Documents give other specific instructions concerning these matters. Contractor shall disclose its means and methods of construction when requested by Owner.
- B. Performance of the work shall be directly supervised by a competent superintendent (and/or foreman) who is satisfactory to Owner and has authority to act for Contractor. The superintendent (and/or foreman) shall constantly supervise the work and check all materials prior to installation for conformance with the Contract Documents. The superintendent (and/or foreman) shall not be changed without the prior written consent of Owner.
- C. Contractor shall enforce strict discipline and good order among Contractor's employees and other persons performing the Work. Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. Contractor's employees shall at all times conduct business in a manner which assures fair, equal, and nondiscriminatory treatment of all persons.
- D. Inappropriate activity or comments by Contractor, Contractor's employees and other persons performing the work will result in immediate removal from the site.

3.03. GENERAL

- A. The installation shall be done in a neat and workmanlike manner and shall be suitable for the location. Conduit stub-ups, sleeves and ends left open for future connection, unused hubs in fittings and unused holes in boxes shall be plugged or capped to prevent the entrance of moisture and debris.
- B. For the actual fabrication, installation and testing use only persons thoroughly trained, experienced and completely familiar with the items required and with the manufacturers' recommended methods of installation. In acceptance or rejection of the work, no allowance will be made for lack of skill or experience.

- C. Circuits shall be run from equipment to equipment, outlet to outlet, luminaire to luminaire, device to device, etc. and all homeruns shall be run exactly as shown on the drawings unless permission is obtained from the Engineer to alter the arrangement.
- D. Changes in location (e.g. equipment and devices up to 10 feet, trench and raceway routing, cable tray locations, etc.) made before installation and deviations to avoid interferences shall be made without increase in Contract Sum.
- E. The Contractor shall conduct operations in a manner to avoid the risk of bodily harm to persons or damage to any property. Construction equipment and tools shall be in good operating condition and be designed to perform the work required. The Contractor shall continuously inspect all work to discover any unsafe conditions and be solely responsible for their correction.
- F. Use all means necessary to protect the equipment and materials and the work, materials, etc. of the other trades before, during and after installation. Do all cutting carefully to prevent damage to the work. Correct lifting, jacking and/or moving methods shall be used. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and Engineer without increase in Contract Sum.
- G. The Contractor shall provide all cutting, patching, core drilling, etc. as required for the work. Use only journeymen skilled in the necessary cutting or patching operation. Patching shall match adjacent work. Structural members shall not be cut without approval of the Architect. Where penetrations in structural members for conduits, cables, etc. are allowed, the holes shall be no larger than absolutely necessary.
- H. The premises shall be kept free from the accumulation of rubbish and debris caused by the work.
- I. The Contractor shall provide all backboards, hangers, supports, chases, anchor bolts, inserts, sleeves and other openings in the construction required for the electrical work.
- J. Wall, ceiling and floor penetrations by raceways (both inside and outside the raceway), cables, etc. shall be sealed to maintain the original moisture, dust and fire resistance to the approval of the Architect. Flash and counter-flash all roof penetrations.

3.04. PROTECTION OF PERSONS, FACILITIES & UTILITIES

- A. Provide devices and methods and proceed with sufficient caution to preclude damaging any facilities, utilities (e.g. power, water, sewer, natural gas, telecommunications, etc.) or similar, above ground or underground, concealed or exposed, known or unknown, located or not located. In the event unidentified utilities are encountered, notify the utility, Owner and Engineer.
- B. Unless otherwise provided by the drawings or specifications, do not cut or alter any existing utility or similar without authorization of the Owner and Engineer. The Contractor shall pay all costs, as determined by the Engineer, of remedial work necessitated by unauthorized or accidental cutting, patching, trenching, excavating, backfilling, etc. which damages and/or impairs the performance of existing utilities or similar (e.g. power, water, sewer, natural gas, telecommunications, etc.), above ground or underground, concealed or exposed, known or unknown, located or not located.

- C. All such work shall be verified with Owner and Engineer before execution of replacement, re-routing, relocation, repair or termination commences.
- D. Damaged electrical and telecommunications (telephone, computer/data, television, fiber, copper, etc.) cables shall be replaced in their entirety. Splicing will not be allowed.

3.05. COORDINATION AND SCHEDULING

- A. The Contractor shall coordinate the work and cooperate with the Owner, other trades and System Contractors to have the work completed to the best advantage, insure there are no interferences, provide reasonable opportunity for the other trades and Contractors to complete their work and to not delay the work.
- B. Contractor shall coordinate work to avoid disturbance to building operations and personnel, and to allow access for both persons to and within all portions of the facility and vehicles to the facility.
- C. Contractor shall schedule all equipment, utility, electrical, telecommunications, fire alarm, fire protection, etc. interruptions with the Owner in accordance with the scheduling requirements. Interruptions and closures shall not be extended overnight.
- D. Contractor shall schedule building closures, complete or partial, with the Owner in accordance with the scheduling requirements in Section 01500 (e.g. for x-raying).
- E. Any and all costs incurred for non-standard hours, double-shifts, overtime, etc. or any other costs associated with completing the project within the completion times required shall be included without increase in contract sum.

3.06. DELIVERY, STORAGE AND HANDLING

- A. All equipment and materials shall be stored neatly and out of the way. Conduit, fittings, cable, etc. shall be stored off the ground, protected from the weather in racks or bins or on shelves. Equipment, panelboards, fixtures, devices, etc. shall be stored indoors in a dry, warm area, free of dust and one in which condensation will not occur.
- B. Ship equipment in its original package to prevent damage or entrance of foreign matter. Perform all handling and shipping in accordance with manufacturer's recommendations and packing label instructions. Provide protective coverings during construction.
- C. Following installation, protect materials and equipment from corrosion, condensation, physical damage, and the effects of moisture. Keep openings in boxes or equipment closed when work is not being done in them during construction.
- D. Identify materials and equipment delivered to the site and storage organized to permit checking against approved material lists and submittals.

3.07. TEMPORARY POWER

- A. The Contractor shall provide all temporary power services, facilities, equipment, devices, material, etc. required for the construction; including adequate lighting, outlets, balancing, testing, etc. as may be necessary for the proper performance and inspection of the work.
- B. The temporary power system shall be provided in a neat and safe manner, in compliance with governing codes and good working practice.
- C. The temporary power system shall be removed when no longer required.

3.08. DEMOLITION

- A. Where portions of the building are to be removed, disconnect all power, lighting, ancillaries, and telecommunications, etc., systems that connect to other portions of the building, remove all below grade cables, cut below grade conduits flush with top of concrete and abandon remaining items in place for building demolition by general contractor, unless otherwise directed.
- B. Existing cables shall be removed or replaced. Provide pull strings in existing conduits being abandoned in place. Existing below grade conduits shall be cut off and capped flush with the floor. Existing concealed boxes shall be provided with suitable blank covers and/or wallplates.
- C. Label the ends of conduits abandoned in place with origin and destination description, and note locations on the as-built drawings.
- D. Where existing equipment, fixtures, devices, etc. are indicated to be replaced, remove and dispose of the existing and provide new in it's place.
- E. Contractor shall coordinate demolition with hazardous materials abatement work. Where electrical devices and wiring are contaminated with hazardous material, or where new raceways penetrate through hazardous materials, demolition shall be performed in accordance with Division 02.
- F. Dispose of fluorescent light tubes and lighting ballasts in accordance with Division 02 and applicable regulations.
- G. For all items indicated as to be removed or re-wired, Contractor shall remove all associated conduit, boxes, cables, etc. back to their point of origin &/or destination; except, concealed conduits & boxes may be abandoned in place &/or existing conduits & boxes may be re-used if in good condition & appropriate for the new installation, at the option of the Contractor. Existing cables shall be removed or replaced.
- H. Existing equipment, fixtures, devices, etc. to remain shall be protected as required during demolition and construction. In the event of damage, immediately make all repairs and/or replacements necessary to the approval of the Owner and Engineer without increase in Contract Sum.
- I. Existing equipment, fixtures, devices, etc. to be re-used in the new work shall be removed carefully, and protected as required during demolition and construction. In the event of damage,

immediately make all repairs and/or replacements necessary to the approval of the Architect and Engineer without increase in Contract Sum.

- J. Items not indicated shall remain "as is"; except, shall be re-connected as required if its circuit is interrupted during the demolition.
- K. Holes, openings, etc. where existing raceways, cables, boxes, outlets, etc. are removed and not replaced shall be patched to match adjacent surface.
- L. All surplus materials removed during the demolition shall be inspected by the Owner and those items selected shall remain the property of the Owner. All remaining surplus materials shall be removed from the site and disposed of by the Contractor without increase in Contract Sum.

3.09. INTERRUPTIONS

- A. Power, fire alarm, controls, telecommunications and other systems interruptions, whether to individual equipment or to the entire system, shall not be done without prior approval and scheduling with the Owner. Power, fire alarm and/or telecommunications interruptions required to facilitate construction work and that affect operation of the existing facility shall not be done during normal working hours. Some working of non-standard or longer than standard hours will be required, without increase in Contract Sum.
- B. As much as possible, items shall be pre-assembled and systems prefabricated to minimize the change-over time.
- C. Shutdowns will not be allowed to extend beyond the time Contractors personnel are present.
- D. Provide generator, temporary power, etc. for power outages lasting longer than 2 hours.

3.10. WORK SEQUENCE

- A. In order to minimize the interruptions to the individual systems and equipment, and to keep maximum power available to the facility; the work shall, in general, be done following the work schedule and sequence.
- B. The existing site shall be maintained and modified for demolition, temporary and new work until the schedule calls for its removal and the new system is installed, tested and fully operational.
- C. See Division 01 specifications for project schedule and work sequence.

3.11. LOCATIONS

- A. Locations and mounting heights of equipment, devices, etc. shall be consistent, and in accordance with the requirements of NFPA, ADA and the authority having jurisdiction.
- B. Devices and associated wallplates shall be located so as to not span different types of building finishes.

- C. In general, exposed raceways shall be mounted as unobtrusively as possible, tight against whiteboard trim, chair rails, in room corners, against ceilings, against chases, etc. and other breaks in the construction.
- D. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices, and the proposed routing of raceways. Obtain specific approval for the location of each from the Owner, Architect and Engineer before rough-in.
- E. Changes in location (e.g. equipment and devices up to 10 feet, conduit routing, etc.) made before installation and deviations to avoid interferences shall be made without increase in Contract Sum.

3.12. EQUIPMENT, LUMINAIRES AND DEVICES

- A. Equipment, luminaires, devices, etc. shall be installed plumb and true, and shall be square with the adjacent walls, ceilings, structural members and other equipment; in a horizontal or vertical position as intended. The location of similar items shall be consistent.
- B. Equipment, cabinets, boxes, fixtures, devices, etc. shall be accurately mounted and leveled and be firmly supported either directly or indirectly by a sound and safe structural member of the building in accordance with manufacturer's instructions, or as directed. Supports shall be neatly placed and properly fastened.
- C. The correct lifting, jacking and/or moving gear which will prevent damage shall be used.
- D. All bolts, nuts, screws and other fastenings shall be tightened in accordance with manufacturers or listing instructions and all covers replaced on equipment and boxes. All electrical connections, particularly those on bus work in panelboards, etc. shall be checked to ensure tightness and electrical conductivity.
- E. Follow manufacturer's installation details wherever available. Provide supports, boxes, mountings, wiring, fittings, etc. as required, standard or special. Wherever any conflict arises between manufacturer's instructions, codes and regulations, and these Contract Documents, follow Owner's decision.
- F. Following installation, protect materials and equipment from corrosion, condensation, physical damage, and the effects of moisture. Keep openings in boxes or equipment closed when work is not being done in them during construction.
- G. Provide gaskets, seals, etc. as required to prevent the entrance of moisture, debris, insects, etc. Check for proper fit.

3.13. SUPPORTS

- A. Provide all necessary supports, anchors, fasteners, and backing for all raceways, cable racks, boxes, enclosures, fixtures and equipment.

- B. Hangers and supports shall be made from standard structural shapes and hardware or systems of shapes, fittings and hardware designed for the purpose.
- C. Hangers and supports shall be adequately and safely attached to the building structure. Equipment or materials to be supported shall be securely fastened to the supporting means. Use size and number of attachments as required for a safety factor of at least four. In addition to the weight of the material, consideration shall be given to the weight of the support itself, the weight of materials within, vibration, external operational forces, shock load, etc.
- D. Brace all equipment, cable racks, etc. as required to meet the requirements of the International Building Code (IBC).
- E. Attach to wood with wood or lag screws, to metal with machine screws or bolts and to concrete with carbon steel wedge or sleeve type expansion anchors or self-drilling metal anchors and machine screws or bolts.
- F. Pad and floor mounted equipment shall be secured with suitable hot dipped galvanized steel anchor bolts, washers, hex nuts, etc.

3.14. CORROSION PROTECTION

- A. Maintain the integrity of factory provided corrosion protection. Repair damaged corrosion protection and touch-up paint all scratched, marred or damaged factory finish on equipment, devices, luminaires, enclosures, etc.; per manufacturer's instructions where available.
- B. Paint field cuts with a suitable cold galvanizing compound.

3.15. APPROVALS

- A. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices, and the proposed routing of raceways, cables, etc. Obtain specific approval for the location of each from the Owner, Architect and Engineer before rough-in.
- B. Prior to beginning installation of cables, obtain approval of concealed raceway installation from the Owner, Architect and Engineer.
- C. Prior to beginning installation of cables, obtain approval of the raceway installation from the Owner, Architect and Engineer.

3.16. CLEANING

- A. Remove trash, combustible material, and other debris from areas around equipment.
- B. Remove shipping materials, supports, spacers, etc. from equipment, devices, etc.

- C. Remove all debris from equipment, devices, etc. including all scraps of wire, plaster, dust, and other foreign material. Vacuum cabinet clean and wipe down with a clean, dry, lint-free cloth or soft bristled brush.
- D. Clean screens, louvers, baffles, etc. covering ventilation openings to ensure they are clear.
- E. Remove paint splatters and other spots, dirt, and debris.
- F. Touch up scratches to match original finish.
- G. Remove all traces of soil, dirt, dust, smudges, fingerprints and other foreign matter from visible surfaces of equipment, devices, luminaires, etc. Pay close attention to highly finished surfaces such as glass and polished metals. Wipe lamps clean.
- H. Maintain adequate ventilation during cleaning.
- I. Follow manufacturer's instructions. Failure to follow manufacturer's recommendations when cleaning equipment can result in damage from the use of improper cleaning methods or agents.

3.17. VISUAL AND MECHANICAL INSPECTION

- A. Verify that all equipment and their components are sized properly for the load and the types, sizes, etc. are in accordance with the contract documents, approved submittals, etc.
- B. Visually inspect equipment for physical damage. Repair physical damage, if practical and approved by the manufacturer. Consult Owner, Engineer and manufacturer for recommendations for suitable protective barriers to prevent future damage.
- C. Inspect molded and formed equipment and components (e.g. circuit breaker cases, fuses, starters, relays, insulators, supports, etc.) for cracks or other defects.
- D. Check all bolts, connections, cable terminations, etc. for tightness using a calibrated torque wrench or screwdriver. Refer to manufacturer's instructions and markings for proper torque values.
- E. Visually check the equipment, its components and associated raceways, conductors, etc. for proper grounding and bonding. Ensure that grounding and bonding terminal bars, bus bars, straps, and conductors are properly connected.
- F. Verify that cables do not contact live parts and that cables are properly secured to withstand the effects of fault currents.
- G. Check equipment anchorage, mounting, clearances, alignment and fit of components.
- H. Check that phase barriers are in place, if applicable.
- I. Visually check disconnect switch blade alignment, blade penetration, travel stops, and mechanical operation.

- J. Inspect each fuse holder to determine whether it seems to be adequately supporting the fuse and that the fuse holders are securely attached to the mounting base. Verify fuses are set tightly in the clips provided.
- K. Operate equipment and components (e.g. disconnect switches, circuit breakers, etc.) to insure smooth operation.
- L. Compare all circuits (internal and external) with wiring and/or control diagrams to verify they are installed correctly.
- M. Confirm correct operation and sequencing of electrical and mechanical interlock systems, if so equipped. Attempt closure on locked-open devices. Attempt to open locked-closed devices.
- N. Confirm that equipment nameplates and safety labels are provided.

3.18. TESTING

- A. The Contractor shall perform all tests required in the various sections of the specifications and in accordance with manufacturer's recommendations. Record test results and include in operation and maintenance manuals.
- B. The Owner and Engineer shall be notified one week prior to any testing so that the testing may be witnessed.
- C. All testing shall be performed by personnel that are trained in the specific task to be performed
- D. Do not proceed with tests until previously identified deficiencies are corrected.
- E. Test equipment in accordance with manufacturer's recommendations. Maintain test results for future comparisons. Include in operation and maintenance manuals.
- F. Upon completion, all equipment and systems shall be tested for functional operation, including all intended modes and sequences of operation.
- G. Readings of the voltage and amperage shall be taken on each phase at each panelboard and at the end of the longest branch circuit at no load and full load conditions.
- H. All systems shall test free from shorts and grounds and shall be without mechanical and electrical defects. If any test indicates a failure, in the opinion of the Engineer; the item shall be replaced or suitably repaired to the approval of the Owner, Architect and Engineer, and the test repeated without additional cost to the Owner.

3.19. ENERGIZING

- A. Energize equipment in accordance with manufacturer's recommendations.
- B. Energize equipment, feeders, circuits, etc. from the source end and working to the load. Close main devices, feeder devices, motor/branch circuit devices, etc. in sequence.

- C. Verify all temporary grounding, etc. connections are removed prior to energizing.
- D. Verify that all load disconnecting, etc. devices are open, padlocked and tagged prior to energizing.
- E. After energization, equipment shall be observed for unusual conditions such as vibration, noise, excessive temperature rise, etc.

3.20. CONTRACT CLOSE-OUT

- A. Upon completion of the work, and prior to final acceptance, the Contractor shall thoroughly check the installation. Checking shall consist of visual inspection and manual adjustment to confirm correct installation and arrangement and to assure the intended function, response and operability. Checking shall include, as a minimum, the following:
 - 1. Check that equipment, devices, etc. are of the correct type and rating.
 - 2. Check that all raceways, fittings, devices, boxes, enclosures, etc. are secure and that all conduit connections are tight.
 - 3. Check that all electrical connections are correctly tightened.
 - 4. Check that equipment, devices, panelboard circuit directories, etc. are correctly labeled.
 - 5. Check that equipment, fixtures, devices, etc. are clean with all unnecessary labels removed.
- B. Upon completion of the work, and before final acceptance and payment, the Contractor shall:
 - 1. Remove from the site and dispose of all surplus and discarded equipment, materials, rubbish, and debris which may have accumulated during the execution of the work.
 - 2. Submit approved "As Built" Drawings, Record Documents, Test Records, Manuals, etc.
 - 3. Submit written warranty statements for equipment, materials and installation.
 - 4. Conduct system tests.
 - 5. Obtain final inspections from the authorities having jurisdiction.
- C. Subsequent to final completion and testing operations, instruct Owner's authorized representatives as required in operation, adjustment and maintenance of equipment and systems.

End of Section 26 00 10

SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the electrical work.
- B. Coordinate electrical work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. SUBMITTALS

- A. Provide submittals for the following:
 - 1. Low voltage cables.

PART 2 - PRODUCTS

2.01. RACEWAYS

- A. Raceways, where required, shall be of the types listed below, unless noted otherwise:
 - 1. Electrical Metallic Tubing (EMT) - Concealed above grade and exposed in Utility Rooms and other Non-Public Areas not readily visible to building occupants, except as noted below.
 - 2. Surface Metal Raceway System (SMR) - Exposed in Public Areas, Offices, Rooms, Corridors and the like where readily visible to building occupants.
 - 3. Polyvinyl Chloride Conduit (PVC) - below grade, except as noted below.

4. Galvanized Rigid Steel Conduit (GRS) - Below grade conduit bends and risers.
 5. Galvanized Rigid Steel Conduit (GRS):
 - a. Below grade conduit bends (or may be fiberglass) and risers.
 - b. Above grade service entrance conduits.
 - c. Sewer Pump Station, above and below grade.
 - d. Exterior exposed conduits, above grade.
 - e. Within, or passing through, Classified (Hazardous) locations.
 - f. Conduits containing low voltage service and outside transformer secondary cables, above grade.
 6. Galvanized Rigid Steel Conduit, PVC Coated (GRS/PVC): Within the Sewer Pump Station wet and dry wells.
 7. Flexible Metal Conduit (FLEX) - final connections to vibrating equipment and for fixture whips. Also, FLEX may be substituted for EMT for branch circuits between wiring devices and boxes concealed inside frame walls and ceilings. FLEX shall not be used for any homeruns, conduit stub-ups into accessible ceiling spaces, nor for any exposed or surface conduit runs except as final connections to vibrating equipment.
 8. Type NM and MC Cable – is not allowed.
- B. Raceways shall be sized so that the cable fill does not exceed 40%; except, minimum conduit sizes shall be as follows:
1. $\frac{3}{4}$ inch – above grade branch circuits, ancillary systems circuits or similar, except as noted below.
 2. 1 inch – branch circuit homeruns.
 3. 1 inch – below grade.
 4. 1 inch – telecommunications circuits terminating in a single outlet.
 5. $1\frac{1}{4}$ inch - telecommunications circuits terminating in two devices.
 6. $\frac{3}{8}$ inch - fixture whips furnished by the manufacturer with the fixtures.

- C. PVC conduit shall be heavy-wall (Schedule 40), flame-retardant, suitable for use with 90°C cable, shall not distort from heat it will normally encounter and shall be resistant to low temperature and sunlight effects, impact and crushing.
- D. PVC conduit installed in shallow trenches (less than 24" deep) shall be same as above, except, heavy wall Schedule 80 grade.
- E. Rigid steel conduit shall be hot-dipped galvanized with threaded couplings and connectors. Below grade steel conduits shall be coated with a suitable asphalt (or equivalent) compound for corrosion protection.
- F. Rigid steel conduit shall be hot-dipped galvanized (coated with minimum of 40 mils of PVC within the Sewer Pump Station wet and dry wells) with threaded couplings and connectors. Below grade steel conduits shall be coated with a suitable asphalt (or equivalent) compound for corrosion protection.
- G. Electrical metallic tubing shall be electro-galvanized steel.
- H. Flexible metal conduit shall be helically wound galvanized steel, type FMC; except outdoors, liquidtight flexible metal conduit shall have a liquidtight, non-metallic, sunlight-resistant jacket over a flexible galvanized steel metal core, type LFMC. Flexible conduit connections shall be a minimum of 18 inches long.
- I. Wireways shall be lay-in type with standard knockouts, screw covers for full channel access and the necessary complement of fittings, connectors, supports, etc. Wireways shall be of sufficient size to accommodate the required number of conduits and cables. Where indicated, or considered necessary, steel barriers shall be installed to separate circuits.
- J. Conduit elbows and bends in conduits 2 inch diameter and smaller shall be not less than 6 times the conduit diameter and bends in larger conduits shall be not less than 10 times the conduit diameter; except, minimum 36 inch radius when containing 15 KV cables.
- K. Telecommunications (with or without cables), spare, c.o., etc. conduits shall be provided with pull rope below grade and pull string above grade.
- L. Below grade telephone, computer/data, communications, spare, c.o., etc. conduits shall be plugged at both ends and their location properly marked.
- M. Surface metal raceways shall be heavy-gauge zinc plated or galvanized steel; Wiremold or Mono-Systems series 700, 2000 or larger as required or approved equal. Color shall be manufacturer's standard color closest to matching surface color as possible.
- N. Surface metal raceway boxes and raceway to be added to the existing shall match the existing and be specifically designed for use with the existing raceway system.
- O. Surface metal raceways for Telecommunications wiring shall be heavy-gauge zinc plated or galvanized steel; Wiremold series 4000, or approved equal; except Wiremold series 2400 surface metal raceways may, at the option of the Contractor, be used for drops to a single outlet. Color shall be manufacturer's standard color closest to matching surface color as possible.

(Note: Mono-Systems Snapmold and Thomas & Betts surface metal raceways are approved as equal to Wiremold surface metal raceways, if provided with 2 inch bend radius fittings not reducing the cable fill capacity. Inserts into the raceway providing the 2 inch bend radius will not be allowed.)

2.02. RACEWAY FITTINGS

- A. Fittings for steel conduit shall be steel, galvanized or cadmium plated, threaded type. Couplings shall be galvanized steel. Locknuts and bushings shall be galvanized steel.
- B. Connectors, couplings, etc. for EMT shall be steel set-screw type; except, steel raintight compression type in potentially wet or damp locations (e.g. outdoors).
- C. Fittings, mounting brackets, etc. for surface metal raceways shall be grounding type, of the same manufacturer and specifically designed for the purpose and use with the particular type of raceway. Telecommunications surface metal raceway system fittings (and power surface metal raceway fittings when installed adjacent to the telecommunications raceway) shall have rounded corners to allow telecommunications cables a minimum 2 inch bending radius without reducing the raceway cable fill capacity. Fittings for non-standard angles less than 90° shall be field bent/fabricated as required. Angles, bends, etc. in raceways greater than 90° and inserts into the raceways providing the 2 inch bend radius will not be allowed. Color shall match raceways.
- D. Sleeves connecting surface metal raceways on opposite sides of walls shall be as detailed on drawings.
- E. Fittings for flexible metal conduit shall be of a type specifically designed for the purpose.
- F. Fittings for nonmetallic conduits shall be of same manufacturer and material as the conduit.
- G. End bells and/or insulated bushings shall be used on all underground conduit system terminations at vaults, junction boxes, padmounted equipment, etc. Conduit terminations at equipment, etc. shall be suitably sealed and/or plugged at both ends to prevent the entrance of moisture. Spare, c.o., etc. conduits shall be provided with removable gasketed covers at the high end to prevent the flow of moisture from one box to another.
- H. "Open" end of ancillary, telecommunications, spare, c.o., etc. conduits shall be provided with insulated bushings.
- I. "Open" ends of telecommunications conduits entering the telecommunications room shall be provided with bonding bushings & bonded to the ground bar.
- J. "Open" ends of telecommunications conduits stubbed to cable trays shall be provided with bonding bushings & bonded to the cable tray.
- K. Telecommunications conduits entering the telecommunications room floors shall extend up from the floor between 1" and 3".
- L. Telecommunications conduits entering the telecommunications room walls and ceilings shall extend a maximum of 2" into the room.

- M. Connectors at sheet metal enclosures shall have insulated throats.
- N. Openings in surface metal raceways, etc. through which cables are intended to pass shall be provided with suitable nonmetallic grommets before installing cable.
- O. Provide approved properly bonded expansion fittings (capable of expansion and contraction as required), deflection couplings, etc. wherever conduits pass over or through joints or other locations where raceways may be affected by dissimilar movements of the supporting structure.

2.03. BOXES

- A. The use of exposed boxes in areas readily visible to building occupants shall be kept to a minimum. Except in telecommunications raceways, use conduit outlet bodies (e.g. T, LB, LR, etc.) at conduit intersections unless specifically noted or approved otherwise.
- B. Boxes shall accommodate any devices to be installed and shall be sized as required by the applicable codes for number and size of conduits and cables entering and leaving; except minimum as noted below.
- C. Indoor boxes above grade in dry locations shall be standard stamped galvanized steel type, suitable for embedment in concrete and/or masonry where required.
- D. Exterior outlet boxes shall be recessed mounted boxes to allow for flush mount while-in-use covers, with back box, gaskets, mounting rings, covers and all necessary mounting accessories. Provide trim rings suitable for use with the type of siding specified. Boxes shall be Intermatic model WP1000RC or approved equal.
- E. Unless noted otherwise, boxes installed in wet or damp locations and outdoors shall be threaded rigid body type, cast aluminum or galvanized iron.
- F. Surface metal raceway system boxes shall be of the same manufacturer and specifically designed for the purpose and use with the particular type of raceway and/or device to be mounted onto the box. Color shall match raceways.
- G. Unless noted otherwise, larger size pull and junction boxes shall be fabricated from code gauge galvanized steel.
- H. Unless noted otherwise, larger size pull, splice and terminal boxes shall be fabricated from code gauge galvanized steel, with full access screw type cover unless noted otherwise. Sizes shall be as required, except minimum as indicated. Terminal boxes shall be provided with power distribution type terminal blocks, with main and branch lugs sizes and quantities as required.
- I. Switch, power outlet, device, etc. boxes shall be single or ganged to accommodate the required number of devices; except, flush mounted boxes shall be minimum 4 inches square for conduits 1 inch or less and $4\frac{1}{16}$ inches square for larger conduits. Boxes containing a single device shall be minimum $1\frac{1}{2}$ inches deep. Boxes containing multiple devices shall be minimum $2\frac{1}{8}$ inches deep. Flush mounted boxes shall be equipped with plaster rings and suitable wallplates. Surface mounted boxes shall have raised surface type covers.

- J. Telecommunications, etc. outlet boxes shall be minimum 4 inch square by $2\frac{1}{8}$ inches deep, equipped with single-gang plaster rings and proper wallplates. Provide a 1 inch EMT conduit up to an accessible location above the ceiling or to the telephone terminal board from each outlet box unless noted otherwise.
- K. Individual telecommunications (voice, data, television, combination voice/data/television, etc.) outlets in new walls and partitions shall be mounted in boxes, minimum 4 inch square by $2\frac{1}{8}$ inches deep, equipped with single-gang plaster rings; except:
 - 1. Surface mounted outlet boxes not containing a television receptacle may be $4\frac{5}{8}$ " high x $2\frac{7}{8}$ " wide x $2\frac{1}{4}$ " deep.
- L. Individual telecommunications outlets in existing non-fire rated frame walls where cables are "fished", screw on type low voltage cut-in type mounts (Caddy type MPLS or MPLS2 as required, or equal) without boxes may be used. Surface mounted boxes shall be surface metal raceway style to match the surface metal raceways. Flush mounted boxes shall be cut-in style where required.
- M. Telecommunications outlets mounted on face of surface metal raceway shall have a shallow box or extension mounted on the cover of the raceway, with access holes as required, of sufficient depth so cable connectors at rear of receptacles do not extend into the raceway and restrict the raceway cable capacity.
- N. Junction and pull boxes shall be sized as required by the NEC except the minimum size shall be 4 inch, square or octagonal as required, by $1\frac{1}{2}$ inches deep. Junction and pull boxes shall have full-access screw covers.
- O. Ancillary systems (e.g. fire alarm, security, etc.) outlet, device, junction, etc. boxes shall be in accordance with the requirements of the respective supplier; except, minimum as specified above.
- P. Boxes shall be equipped with mud rings where required and proper wallplates and/or covers.
- Q. Unused flush mounted boxes, including existing abandoned in place, shall have blank wallplates or ceiling box type covers. Color shall match existing surface paint color as close as possible with manufacturer's standard colors.
- R. Openings in boxes, etc. through which cables are intended to pass shall be provided with suitable nonmetallic grommets.
- S. Device, junction, etc. boxes (other than the surface raceway type) for fire alarm systems shall be substantially red in color, both inside and outside.
- T. Device, junction, etc. boxes (other than the surface raceway type) for emergency systems shall be substantially orange in color, both inside and outside.

2.04. WIRE AND CABLE

- A. Wire and cable sizes indicated and/or specified are minimums only and shall be increased as required due to NEC, system, load, voltage drop, etc. requirements.
- B. All wire and cable (power, control, ancillary systems, etc.) installed in below grade conduit shall be suitable for wet locations.
- C. All wire and cable (power, control, ancillary systems, etc.) shall be suitable for wet or dry locations, in conduit, above ground and underground.
- D. Ground electrode conductors shall be copper, bare below grade.
- E. Branch circuit cable, above grade feeder cable and equipment ground cable, where run in raceways, shall be single conductor copper with 600 volt type XHHW or THWN/THHN insulation. The minimum conductor size shall be #12 AWG; except, fixture whips provided as an assembly by the fixture manufacturer with the fixtures may be #14 AWG. Conductors shall be stranded, except #12 AWG lighting and general purpose receptacle branch circuit conductors are allowed to be solid.
- F. Line voltage (Class 1) control cable shall be single conductor stranded copper with 600 volt type XHHW or THWN/THHN insulation. The minimum conductor size shall be #14 AWG.
- G. Low voltage (Class 2) control cable shall be single conductor copper with 600 volt type XHHW or THWN/THHN insulation if installed in conduit. Low voltage (Class 2) control cable run "open" shall be multi-conductor copper with 300 volt insulation and an overall jacket, type CL2, listed as being resistant to the spread of fire; except in air handling plenums, cable shall be plenum rated, be listed as being resistant to the spread of fire and bear flammability testing ratings as cable type CL2P. The minimum conductor size shall be #16 AWG.
- H. Cords shall be multi-conductor stranded copper with a green insulated grounding conductor, 600 volt type SO insulation and an overall neoprene jacket. The minimum conductor size shall be #14 AWG.
- I. Fixture cable, where supplied by the Contractor, shall be stranded copper with 600 volt type PF insulation.
- J. Instrument cable, unless otherwise required by the particular instrument, shall be 2 conductor (twisted pair) solid copper with 300 volt PVC insulation, 100% aluminum polyester shield, stranded copper drain wire, and an overall PVC jacket. The minimum conductor size shall be #18 AWG.
- K. See section 27 05 00 for Telecommunications Systems cables.
- L. See Section 27 51 23 for School Clock & Intercom cables.
- M. See Section 28 31 00 for Fire Detection & Alarm System cables.
- N. Color coding for power cable shall be as follows:

1. 480Y/277 volt, 3 phase, 4 wire:
Phase A = brown, B = orange, C = yellow, N = gray;
 2. 208Y/120 volt, 3 phase, 4 wire:
Phase A = black, B = red, C = blue, N = white;
 3. 120/240 volt, 1 phase, 3 wire:
Phase A = black, B = red, N = white;
 4. 120/240 volt, 3 phase, 4 wire:
Phase A = black, B = orange, C = blue, N = white;
 5. Equipment ground cables shall be green.
 6. Switch legs shall be the same color as the phase conductors. Switch travelers shall be purple.
- O. Cable pulling lubricants shall be gel type, of the best quality and shall not have any damaging effect on the insulation. (Ideal Yellow 77 is not approved.)

2.05. CABLE SUPPORTS

- A. Supports for cables run "open" above ceilings and the like shall be wide base type J-hook assemblies capable of supporting up to 50 category 6A UTP cables, Erico CablCat series or equal. Support spacing shall not exceed 5 feet.
- B. Cable ties shall be utilized in panelboards, etc. to group and support conductors. Multi-wire branch circuits shall be grouped together as required. All cable shall be fanned-out to terminals and identified by labels; or, if terminated on circuit breakers or control devices, by typewritten indexes or nameplates.
- C. Cable ties shall be utilized in cable trays to group and support conductors. Cables for similar purposes shall be bundled together. Feeder conductors for each panel shall be bundled together along the entire length of the cables. Cables shall be arranged in cable trays in accordance with the requirements of NEC 392.
- D. Cord drops from ceilings or similar shall have suitable stainless steel basket weave support/strain relief grips, Kellems or approved equal. Cord connectors shall liquidtight type.

2.06. LOW VOLTAGE CONNECTIONS AND TERMINATIONS

- A. Taps and splices shall be kept to a minimum.
- B. Taps and splices in #8 AWG, and smaller, branch and fire alarm circuit cable shall be made with twist-on spring type wire nuts. Taps and splices in telecommunications cables, ancillary systems cables, larger branch circuit cables, feeder cables, control cables, etc. or below grade will not be allowed without specific approval from the Engineer.

- C. Taps and splices in #8 AWG and larger cable, where allowed, shall be made with proper size squeeze-type copper compression tap and splice connectors. (Mechanical set-screw type connectors will not be allowed.) Wrap completely with suitable electrical insulating tape or shrink-wrap in accordance with manufacturers instructions.
- D. Taps and splices in handholes shall be made with proper size squeeze-type copper compression tap and splice connectors. (Mechanical set-screw type connectors will not be allowed.) All splices and taps in handholes shall be watertight, suitable for direct burial use, with an abrasion, UV and impact resistant cover pre-filled with chemically cross-linked silicone elastomer and silicon oil gel sealant. The gel and its cover shall completely encapsulate the splice and/or tap area. Tyco Electronics GelWrap or equal.

2.07. PULL STRING AND ROPE

- A. Telecommunications (with or without cables), spare, c.o., etc. conduits shall be provided with pull rope below grade and pull string above grade.
- B. Pull string shall be resistant to rot and mildew and shall not deteriorate when exposed to oil, grease, etc.
- C. Pull rope shall be twisted polypropylene treated with ultraviolet stabilizers, minimum $\frac{1}{4}$ inch diameter. Rope shall be resistant to rot and mildew and shall not deteriorate when exposed to oil, grease, etc.
- D. Pull rope shall be flat, woven polyester tape, minimum 1800 tensile strength. Rope shall be pre-lubricated to reduce pulling tension and shall be durably printed with sequential footage markings. Rope shall be resistant to rot and mildew and shall not deteriorate when exposed to oil, grease, lubricants, etc. Where installed in underground conduits, the pull rope shall have a # 22AWG detectable tracer wire woven into the tape. Pull rope shall be Neptco Muletape, or equivalent.

PART 3 - EXECUTION

3.01. RACEWAYS

- A. Raceways shall be run concealed in the walls (including within CMU and similar construction), soffits (new and existing), above the ceiling or below the floor unless indicated otherwise; except, exposed within utility rooms and other similar type spaces. Raceways may be run exposed within public spaces, classrooms, offices, and the like only where indicated and with prior approval of the Owner and Architect. Exposed raceways shall be run as neatly and unobtrusively as possible, to the approval of the Owner, Architect and Engineer.
- B. Raceways shall be installed straight, plumb and true and shall be without kinks or sags.
- C. Exposed raceway runs shall be either parallel or at right angles to walls and structural members, as neatly and unobtrusively as possible (e.g. adjacent to window and door trims and base, at

wall/wall or wall/ceiling intersections, etc.). Exposed parallel or banked raceways shall be run together.

- D. Below grade conduits shall be direct buried between 24 and 30 inches below grade (except, conduits below the building concrete floor slab may be run immediately below the floor) and/or as required to bury conduits below footings, grade beams, etc., and spaced a minimum of 2 inches between conduits.
- E. Underground conduits extending into the building and at transformers, panels, etc. shall be suitably sealed or plugged at both ends. Sealant shall be removable. Ductseal is not acceptable.
- F. PVC conduit shall be solvent welded to prevent the entrance of moisture.
- G. Verify location, mounting heights, etc. of cable trays, surface metal raceways from the Owner and Engineer prior to installation. In general, surface raceways shall be mounted as unobtrusively as possible, tight against whiteboard trim, chair rails, in room corners, against chases, etc. & other breaks in the in the wall or ceiling.
- H. Junction boxes mounted above accessible ceilings shall be within 42 inches of the ceiling and shall have a minimum 12 inch clearance in front of the box.
- I. Raceways shall be located to not interfere with the removal of pipes or equipment for maintenance or repair. All raceways shall be kept a minimum of 6 inches away from items producing heat.
- J. Above grade raceways, fittings, etc. shall be securely supported from permanent structural members of building, either directly or indirectly. Raceways shall be fastened at intervals of 8 feet, nominally, and within 36 inches of each outlet, fitting, panel, etc. Caddy clips or wire ties using not less than No. 14 wire and "ladder-ties" which will prevent displacement, may be used only for concealed runs of EMT or GRS to 1¹/₂ inch. Single runs of exposed conduit shall be supported with steel pipe straps.
- K. Raceways, cable trays, etc. shall not be supported from ducts, plumbing or other piping or from other raceways. Support raceways, cable trays, etc. only from building structural elements.
- L. Bends in raceways shall be made without flattening, kinking or reducing the cross-sectional area of the raceway. Bends in parallel or banked runs shall be made from the same center line so that the bends are parallel.
- M. Bends or intersections in telecommunications cable tray shall be full radius style, made without flattening, kinking or reducing the cross-sectional area of the cable tray.
- N. All raceway cuts shall be made square with a proper cutting tool. The inside and outside of all raceway ends shall be reamed after cutting and/or threading to eliminate burrs and rough edges, then wiped clean. Joints shall be cut square and shall butt solidly into couplings. Running threads will not be permitted.
- O. Surface metal raceways shall be cut with a factory manufactured and/or approved cutting tool designed/made specifically for the purpose.

- P. Raceways shall be closely and tightly fitted in couplings, connectors, boxes, etc. to provide an electrically continuous low resistance ground fault return path. Threaded joints shall be made up with at least 5 threads fully engaged.
- Q. The raceway systems shall be complete (including the installation of bushings, grommets, etc.), snaked and cleaned, and approval of the installation is obtained from the Owner and Engineer, before installation of any wallboard where the raceway is concealed in walls and above ceilings.
- R. The raceway systems shall be complete (including the installation of bushings, grommets, etc.), snaked and cleaned, and approval of the installation is obtained from the Owner and Engineer, before or pulling any cable.
- S. Exposed raceways shall be painted.
- T. Below grade telecommunications, spare, c.o., etc. conduits shall have their location properly marked.

3.02. LABELING & IDENTIFICATION

- A. Junction boxes concealed in ceiling spaces and exposed in electrical, mechanical, utility rooms, and the like shall be marked with the panel and circuit numbers contained within. Marking shall be legibly hand-written with black indelible ink marker.
- B. In each junction and pull box, neutral conductors shall be grouped with associated phase conductors by taping the conductors together.
- C. Spare, C.O., etc. conduits shall be labeled with their destination.
- D. Color coding for power cable shall be as follows:
 - 1. 480Y/277 volt, 3 phase, 4 wire:
Phase A = brown, B = orange, C = yellow, N = gray;
 - 2. 208Y/120 volt, 3 phase, 4 wire:
Phase A = black, B = red, C = blue, N = white;
 - 3. 120/240 volt, 1 phase, 3 wire:
Phase A = black, B = red, N = white;
 - 4. 120/240 volt, 3 phase, 4 wire:
Phase A = black, B = orange, C = blue, N = white;
 - 5. Equipment ground cables shall be green.
 - 6. Switch legs shall be the same color as the phase conductors. Switch travelers shall be purple.

3.03. BOXES

- A. Boxes shall be installed plumb and true and be firmly supported either directly or indirectly by a sound and safe structural member of the building with approved anchors and fasteners, and shall be readily accessible for maintenance.
- B. Pull boxes or fittings shall be provided in conduit runs as required to prevent excessive stress on the cables during pulling and to allow the minimum required bending radius.
- C. Where an accessible ceiling space exists, locate above the ceiling; otherwise locate in an unobtrusive location to the approval of the Architect, Engineer and Owner.
- D. Pull boxes shall be provided at the transition between the surface metal raceway system and conduit or "open" cabling system. Where an accessible ceiling space exists, locate above the ceiling; otherwise locate in an unobtrusive location against the ceiling.
- E. Flush mounted switch, outlet, etc. boxes in common non-fire rated walls and facing into different rooms shall be offset a minimum of 6 inches to minimize sound transmission between rooms. Flush mounted switch, outlet, etc. boxes in common rated fire resistive walls and facing into different rooms shall be offset a minimum of 24 inches. Boxes mounted back-to-back will not be allowed. Raceways between boxes in adjoining rooms shall be filled as required to maintain the fire rating (where required) and minimize sound and dust transmission between rooms.
- F. Low voltage cut-in type mounts in a common wall and facing into different rooms shall be offset a minimum of 12 inches and shall be separated by a stud. Area between low voltage cut-in type mounts without boxes shall be filled with insulation or other suitable material to minimize sound and dust transmission between rooms.

3.04. WIRE AND CABLE

- A. All wire and cable shall be enclosed within the raceway system; except:
 - 1. "Open cable wiring" approved for the purpose shall be permitted for Class 2 signal and control circuits, fire alarm system cable, telecommunications cable, etc. when run concealed in an accessible location above the ceilings.
 - 2. Class 2 signal and control circuits, fire alarm system cable, telecommunications cable, etc. may be (or shall be where indicated) "fished" inside existing frame walls not being replaced or re-finished. Fished cables shall be provided with a suitable pull string, accessible at both ends.
- B. Floor and ceiling penetrations by "open" cables will not be allowed. Provide conduit sleeves, minimum 2" EMT, as required plus a spare (with fire and dust stopping and sealing) where "open" cable passes through floors, walls, partitions, etc.
- C. Inspect cable prior to installation to verify that it is identified properly on the reel or box identification label, that it is of proper gauge, containing correct number of pairs, etc. Note any buckling of the jacket which would indicate possible problems. Damaged cable or any other components failing to meet specification shall not be used in the installation.

- D. Conductors of different voltages, systems, functions, etc. shall not be combined in the same raceway or cable unless specifically noted otherwise.
- E. Wire and cable shall not be exposed to weather or mechanical damage longer than necessary. Cut ends of the cable shall be immediately sealed to protect from moisture. Duct tape is not an acceptable means of sealing.
- F. The contractor shall not receive cable from the supplier if it arrives onsite with the cable ends unsealed.
- G. Cable shall be unrolled from reels, or removed from cartons, and installed so as to not damage the insulation or cable sheath and in a manner which will prevent kinking, crushing or excessive tension on conductors and insulation. Use only guides, rollers, sheaves, etc. that are free-turning and clean. Cable shall not be dragged on the ground or over sharp edges or abrasive surfaces. Slack wire shall be provided at all pull points.
- H. All cables to be installed in a raceway shall be pulled together. The pulling means (fish tape, cable, rope, etc.) shall be of a type that will not damage the raceway.
- I. Telecommunications cables shall be installed without sharp bends (less than 2 inch radius) or pulling tension in excess of 20 pounds.
- J. Cable shall be installed or drawn into the raceway system only after all work of any nature that might cause injury to the cable is completed. The raceway system shall be complete, snaked and cleaned before pulling any cable.
- K. "Open" telecommunications cables, ancillary systems cables, low voltage control cables, etc. shall be bundled and be supported from permanent structural members of the building, either directly or indirectly, with suitable rings or hooks. Support spacing shall not exceed 5 feet. Cables shall not interfere with the removal of pipes or equipment for maintenance or repair. Support "open" cables a minimum of 6 inches above T-bar ceilings. All "open" cable shall be kept a minimum of 6 inches from pipes, ducts, and other items producing heat. Tape and cable ties are not approved methods of fastening cables.
- L. Cord drops from ceilings or similar shall have suitable stainless steel basket weave support/strain relief grips, Kellems or approved equal. Cord connectors shall liquidtight type.
- M. Provide conduits, boxes, etc. for all "open" cable wiring where penetrating from one floor to the next and through rated fire walls.
- N. Provide conduits, boxes, etc. for telecommunications and other ancillary systems (where required by the ancillary system provider) "open" cable wiring within walls up to an accessible location above the ceiling.
- O. Protect "open" cables during installation. Provide suitable covers on supports, structural members, etc. with sharp edges. Remove all added coverings, protection, etc. after installation of the cable.

- P. All cables shall terminate in an approved enclosure or fitting. Type MC cable shall be terminated at boxes, enclosures, etc. with a non-metallic anti-short bushing and an approved connector, and insure a proper bond by firmly tightening connectors to both the box or enclosure and the cable. The continuity of circuits, grounding, etc. shall not be dependant device connections (e.g. receptacles), where the removal of such devices would interrupt the continuity.
- Q. Provide wire/cable markers (Brady type or equivalent/better) identifying its circuit number and/or final destination on all cables/conductors (power, telephone/computer, and other ancillary systems) at panels, devices, junction points, etc.
- R. Cable pulling lubricants shall be used to minimize pulling stresses on cable pulled into raceways.
- S. All cable is subject to subtle damage that may degrade future performance, if abused during installation. In all cable installation, set reels and use sufficient pulleys and manpower so that cables are not pulled around corners or against material that might cause chafing.

OBSERVATION OF IMPROPER CABLING HANDLING TECHNIQUES MAY CAUSE THE CONSULTANT/ENGINEER AND/OR OWNER TO REQUIRE THE CONTRACTOR TO DISCARD AFFECTED CABLES, INCLUDING ANY OTHERS ALREADY INSTALLED BY THE PERSONNEL FOUND USING INCORRECT PROCEDURE.

- T. Conductor connections shall be made with connectors of the proper size and type. Compression connections shall be made with the correct die and number of crimps, or the correct tightening torque in the case of mechanical connectors, according to manufacturer's instructions and recommendations. Use suitable oxide inhibiting joint compound on all aluminum terminations. Termination of insulated conductors shall be made so that the stripped length of bare conductor is not longer than required for the terminal or connector. Care shall be taken to not nick conductors during insulation removal.
- U. At pulling points, the cables shall be neatly bundled by circuit.
- V. Taps and splices shall be kept to a minimum; and are not allowed in cables larger than #8 AWG, control cable, ancillary systems cable, etc. and below grade without prior approval from the Engineer.
- W. Field wiring shall not contact live parts.
- X. Cables shall not be supported by their terminations. Suitable cable ties and/or supports shall be utilized in switchboards, panelboards, terminal boxes, junction boxes, vaults, etc. to group and support conductors. All cable shall be fanned-out to terminals and identified by labels; or, if terminated on circuit breakers or control devices, by typewritten indexes or nameplates.
- Y. Insulated cable supports shall be provided to relieve any strain imposed by cable weight or movement, and to secure cable as required to withstand the effects of fault currents.

3.05. CABLE TESTING

- A. Branch lighting and general purpose receptacle circuits do not require an insulation test, functional tests only are required; except, all receptacles shall be tested for correct connection using a suitable receptacle tester.
- B. See specification section 27 05 00 Common Work Results for Communications for cable testing.

3.06. PENETRATIONS

- A. Wall, ceiling and floor penetrations by raceways (both inside and outside the raceway), cables, etc. shall be sealed to maintain the original moisture, dust and fire resistance to the approval of the Architect.
- B. Do not cut, notch or drill structural framing members for the installation of raceways without the Architect's approval in each case. Holes and penetrations where allowed in studs, joists and other structural members for raceways and cables shall be of a size to allow for a tight fit.
- C. Provide conduit sleeves as required, plus a spare of the same size, where "open" cable passes through floors, walls, partitions, etc.
- D. Provide sleeves connecting surface metal raceways on opposite sides of walls.
- E. Cut existing surface metal raceway covers on each side of new walls.
- F. Provide conduit sleeves where cable trays pass through fire-resistive walls, partitions, etc. Sleeves size and quantity shall provide the same capacity as the cable tray.
- G. Cable trays shall extend through non-rated partitions. Frame around opening as directed.
- H. Floor and ceiling penetrations by "open" cables and/or cable trays will not be allowed.
- I. Contractor shall x-ray or otherwise determine the exact location of existing structural components, conduits, piping, wiring, ducts and the like prior to making any new penetrations or openings (or expanding existing openings) in any floor, wall or ceiling.
- J. Flash and counter-flash all roof penetrations.

3.07. PULL STRINGS AND ROPES

- A. Provide pull ropes in all below grade telecommunications (with and without cables), spare, etc. conduits.
- B. Provide pull strings in all above grade telecommunications (with and without cables), spare, etc. conduits.
- C. Provide pull rope in all cable trays (with and without cables).
- D. Provide pull string with all cables fished inside existing walls.

3.08. ANCILLARY SYSTEMS

- A. The Contractor shall coordinate with ancillary systems suppliers and provide conduit, boxes, cables, etc. in accordance with their requirements; except, minimum as indicated and/or specified.

End of Section 26 05 00

SECTION 26 07 00
THERMAL AND MOISTURE PROTECTION

PART 1 – GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the moisture, fire and dust stopping and sealing work.
- B. Coordinate moisture, fire and dust stopping and sealing work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the Work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. SUBMITTALS

- A. Provide submittals for all moisture, fire and dust stop materials, complete with a description of where each type is proposed to be used.

PART 2 - PRODUCTS

2.01. GENERAL

- A. Coordinate the features of materials and equipment so they form an integrated system.

2.02. MOISTURE PROOFING

- A. Moisture proofing systems shall be designed and installed to allow the passage of cable, conduit or pipe through exterior walls, floors, etc. They shall provide a barrier seal to prevent the penetration of water and gases into the structure to be penetrated.

2.03. FIRE STOPPING AND SEALING MATERIALS

- A. Fire-stop systems shall be designed and installed to allow the passage of cable, conduit or pipe through fire rated walls or floors. They shall provide a barrier seal to prevent the penetration of fire, smoke, water, and gases, with a fire rating to match the rating of the architectural assembly or structure to be penetrated.
- B. Fire-stop systems shall consist of one or more of the following materials:
 - 1. Ablative (typical of silicone-based technology);
 - 2. Cementitious (Can be troweled like grout or mortar, but is specifically designed for the purpose. Grout shall not be permitted);
 - 3. Elastomeric (Flexible substance which resembles rubber);
 - 4. Endothermic (Absorbing heat energy.);
 - 5. Intumescent (Swelling under the influence of heat, pillows, etc.)
 - 6. Mechanical (Assemblies that allow additions or deletions)
- C. Fire-stop systems shall be qualified for the intended use.
- D. Fire-stop material within wall and floor sleeves and the like shall be intumescent bags. Fire-stop material around cable penetrations, within raceways (except wall and floor sleeves), etc. shall be intumescent bags or soft, pliable, non-hardening intumescent putty, with high dielectric strength (insulator). Material shall allow removal of the material(s)/system(s) for future cable additions and/or removals.
- E. Fire-stop products shall be as manufactured by "Nelson", "Dow Corning" or approved equal.

2.04. DUST SEALING MATERIALS

- A. Dust seal systems shall be designed and installed to allow the passage of cable, conduit or pipe through non-rated ceilings, walls, partitions or floors.
- B. Dust sealant around raceways and the like shall be top grade paintable silicone based or poly-sulfite caulk, or expanding foam type sealant.

- C. Dust sealant around cable penetrations, within raceways, etc. shall allow removal of the material for future cable additions and/or removals.

PART 3 - EXECUTION

3.01. INSTALLATION

- A. Provide all fire-stop sealing for all penetrations through fire-resistance-rated floors, walls and partition construction; including empty openings and openings containing cables, raceways, supports and other penetrating items as required, both new and existing where new cables, raceways and the like have been installed. Contractor is responsible for verifying the fire rating of the barrier to be penetrated.
 - 1. Provide all fire-stop sealing for all penetrations through fire-resistance-rated floors, walls and partition construction; including empty openings and openings containing cables, raceways, supports and other penetrating items as required, both new and existing where new cables, raceways and the like have been installed. Contractor is responsible for verifying the fire rating of the barrier to be penetrated.
 - 2. Install fire-stop systems in accordance with manufacturer-tested methods and to manufacturer's instructions. If required, extend fire-stop system through the full thickness of the wall or floor and through the full length of the sleeve.
 - 3. Seal openings with a removable fire-stop material after each shift. Do not leave unattended openings in building fire-resistance-rated walls, partitions and floors at any time during construction.
- B. Where sleeves or penetrations are installed through non-rated partitions, provide a dust seal to prevent dust from migrating between the spaces separated by the partition. Also, where fire stop material does not completely fill an opening (e.g. intumescent pillows), provide suitable dust sealant as required.
- C. Where existing sleeves or penetrations are re-entered for installation of new cables, Contractor shall modify/re-install or provide new fire stop material as required to maintain the original fire rating of the barrier.

3.02. MOISTURE PROOFING

- A. Conduit terminations at equipment, etc. shall be suitably sealed and/or plugged at both ends to prevent the entrance of moisture.

- B. Conduit penetrations through building exterior walls shall be suitably sealed and/or grouted to prevent the entrance of moisture.

End of Section 26 07 00

SECTION 26 20 00
ELECTRICAL TRANSMISSION

PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the electrical work.
- B. Coordinate electrical work with related work shown and specified elsewhere.
- C. Provide all materials necessary for the proper execution and completion of the work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- D. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. SUBMITTALS

- A. Provide submittals for the following:
 - 1. Wiring devices & wallplates.

PART 2 - PRODUCTS

2.02. CIRCUIT BREAKERS FOR EXISTING PANELS

- A. Circuit breakers shall be plug-on in loadcenters and bolt-on in panelboards, molded-case, thermal magnetic, quick make-quick break type with trip indicating handles. Branch circuit breakers for motor loads shall be HACR type. Branch circuit breakers for lighting loads shall be SWD type. Multi-pole breakers shall be single-handle, internal common trip. Tandem breakers shall not be used.
- B. Provide padlocking devices on circuit breakers where required.

- C. Provide approved handle ties between single pole circuit breakers for all multiwire branch circuits as required.
- D. Circuit breakers for installation in the existing panelboard(s) shall be of the same manufacturer, and be of a type manufactured specifically for that type, vintage and short circuit rating of the panelboard.

2.03. WIRING DEVICES

- A. Wiring devices shall be specification grade, all of the same manufacturer, white colored.
- B. Lighting switches shall be toggle, AC quiet type rated 20 amps, 120-277 volt. Key switches shall be lock type with nylon key guide and 1 key per switch.
- C. Equipment disconnect type switches shall be toggle, heavy duty manual motor controllers, horsepower rated, with the number of poles and ampere rating indicated and/or required.
- D. General purpose receptacles shall be 15 amp, 125 volt, AC, straight blade, 3-wire grounding type; except:
 - 1. Receptacles within the telecommunications rooms shall be rated 20 amps.
 - 2. Special purpose receptacles as noted for specific equipment.
 - 3. Single receptacles on an individual 20 amp branch circuit shall be rated 20 amps.
- E. Ground fault interrupter (GFI) type receptacles shall be duplex, Class A, 15 amp, 125 volt with end of life protection (either by rendering itself incapable of delivery power or by visual indication) and reverse line-load miswire protection. Provide individual ground fault interrupter type receptacles at each location indicated or as required. Feed-through type protection of multiple outlets will not be allowed.
- F. Special purpose receptacles shall be of the type, ratings and design for the use intended, NEMA configuration. Provide matching plugs where indicated.
- G. Flush mounted devices shall have smooth specification grade stainless steel wallplates.
- H. Surface mounted devices shall have raised surface type covers, galvanized steel.
- I. Weather-proof devices (other than receptacles) shall be equipped with stainless steel or cast metal covers and spring-loaded gasketed doors.
- J. Weather-proof receptacles shall be equipped with heavy duty die cast while-in-use covers. Covers shall maintain a weatherproof rating whether or not an attachment plug is inserted. Intermatic WP1000MC series, or approved equal.

- K. Definite purpose devices shall be labeled with a description of the device's function, rating and circuit identification.
- L. All outlets shall be labeled with the panel and circuit number(s) from which the device is fed. Labels shall be heavy duty adhesive type, clear with black letters on light colored devices and clear with white letters on dark colored devices. Lettering shall be appropriately sized for the application, except minimum $\frac{1}{8}$ inch. Labels on ceiling mounted devices shall be large enough to read from the floor. Labels shall be as manufactured by Kroy, Brothers, or approved equal. Self-adhesive circuit numbers, masking tape, plastic punch type "Dymo" labels, etc. are not acceptable.

2.04. EQUIPMENT IDENTIFICATION

- A. Provide nameplates for all equipment and other devices used for the control of circuits, equipment, etc. Include the panel and circuit number(s) from which it is fed.
- B. All distribution equipment (switchboard, panelboards, motor control centers, etc.) shall be provided with laminated plastic nameplates to identify the system color coding scheme for phase and neutral conductors as required.
- C. All distribution equipment (switchboard, panelboards, motor control centers, etc.) shall be provided with warning labels to warn personnel of potential arc-fault hazards.
- D. Definite purpose devices shall be labeled with a description of the device's function, rating and include the panel and circuit number(s) from which it is fed.
- E. All equipment and outlets shall be labeled with the panel and circuit number(s) from which it is fed.
- F. Labels shall be heavy duty adhesive type, clear with black letters on light colored devices and clear with white letters on dark colored devices. Lettering shall be appropriately sized for the application, except minimum $\frac{1}{4}$ inch. Labels on ceiling mounted devices shall be large enough to read from the floor. Labels shall be as manufactured by Kroy, Brothers, or approved equal. Self-adhesive circuit numbers, masking tape, plastic punch type "Dymo" labels, etc. are not acceptable.
- G. Nameplates shall adequately describe the function or operation of the identified equipment, devices, etc. and, where applicable, include the panel and circuit number(s) from which it is fed. Nameplate designations shall be consistent with the project documents. Submit proposed inscriptions for approval.

PART 3 - EXECUTION

3.01. TEMPORARY POWER

- A. The Contractor shall provide all temporary power services, facilities, equipment, devices, material, etc. required for the construction; including adequate lighting, outlets, balancing, testing, etc. as may be necessary for the proper performance and inspection of the work.
- B. During power interruptions, and if Contractor's equipment will not operate on the available power, the contractor shall supply all equipment needed, such as transformer(s), generator(s), etc. and pay all costs involved.
- C. The temporary power system shall be provided in a neat and safe manner, in compliance with governing codes and good working practice.
- D. The temporary power system shall be removed when no longer required.

3.02. LOCATIONS

- A. The mounting heights and location of similar equipment and devices shall be consistent, in accordance with the requirements of the ADA where applicable. Special purpose items shall be located conveniently for the purpose intended.
- B. Devices shall be located to not interfere with the removal of pipes or equipment for maintenance or repair. All devices shall be kept a minimum of 6 inches away from items producing heat.
- C. Disconnect switches, circuit breakers, etc. shall, in no case, be installed so that the grip of the operating handle, when in its highest position, is more than 6¹/₂ feet above the floor or working platform.
- D. Outlets (power, telecommunications, etc.) shall be mounted 18 inches to centerline above finished floor unless noted otherwise; except, outlets above counters, etc. shall be mounted 6 inches to centerline above the counter or 3 inches to centerline above the splashboard, whichever is higher.
- E. Locate light switches, etc. 6 inches from door casings (except on center in spaces less than 12 inches), 42 inches to centerline above finished floor. Where light switches are adjacent to countertops, install the switches at the same height as adjacent devices above the countertop.
- F. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices, and obtain specific approval from the Owner and Architect for the location of each prior to installing enclosures, boxes, raceways, etc.

3.03. EQUIPMENT AND DEVICES

- A. Equipment, devices, enclosures, etc. shall be installed plumb and true and shall be square with the adjacent walls, ceilings and structural members.

- B. Equipment, cabinets, boxes, etc. shall be accurately mounted and leveled and be firmly supported either directly or indirectly by a sound and safe structural member of the building in accordance with manufacturer's instructions, or as directed. Supports shall be neatly placed and properly fastened.
- C. The correct lifting, jacking and/or moving gear which will prevent damage to the equipment shall be used.
- D. Bolts, nuts, screws and other fastenings shall be tightened and all covers replaced on equipment and boxes. Electrical connections, particularly those on bus work in panelboards, etc. shall be checked to ensure tightness and electrical conductivity. Gaskets, seals, etc. shall be checked for proper fit.
- E. To minimize transformer noise, provide rubber sound isolation pads between the transformer enclosure and the floor. Back off nuts as directed at sound isolation pads, both internal and external, to float transformer on the isolation pads.
- F. Follow manufacturer's installation details wherever available. Provide boxes, mountings, wiring or fittings required, standard or special.
- G. The Contractor shall touch-up paint all scratched, marred or damaged factory finish on equipment, devices, enclosures, etc.

3.04. DEVICES

- A. Flush mounted switch, outlet, etc. boxes in common non-fire rated walls and facing into different rooms shall be offset a minimum of 6 inches to minimize sound transmission between rooms. Flush mounted switch, outlet, etc. boxes in common rated fire resistive walls and facing into different rooms shall be offset a minimum of 24 inches. Boxes mounted back-to-back will not be allowed. Raceways between boxes in adjoining rooms shall be filled as required to maintain the fire rating (where required) and minimize sound and dust transmission between rooms.
- B. Low voltage cut-in type mounts in a common wall and facing into different rooms shall be offset a minimum of 12 inches and shall be separated by a stud. Area between low voltage cut-in type mounts without boxes shall be filled with insulation or other suitable material to minimize sound and dust transmission between rooms.

3.05. TESTING

- A. Before testing, visually inspect equipment thoroughly, and perform mechanical operation and key interlock tests in accordance with manufacturer's instructions.
- B. Before energization, test all equipment in accordance with manufacturer's recommendations; except minimum as described below.
- C. Compare test results with factory-obtained results and results on similar equipment. Investigate variations. Consult manufacturer for recommendations.

- D. Upon completion, all equipment and systems shall be tested for functional operation, including all intended modes and sequences of operation.
- E. Record the values of each test, along with the description of the instrument, voltage level, temperature, time, and date of the test on the form included in the contract documents. Sign the results.

End of Section 26 20 00

SECTION 26 50 00
LIGHTING

PART 1 - GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- B. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the lighting and lighting control work.
- C. Coordinate lighting and lighting control work with related work shown and specified elsewhere.
- D. Provide all materials necessary for the proper execution and completion of the work as herein specified or called for on the drawings. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- E. Lighting control system work shall include all necessary set-up, programming, testing, commissioning, etc. for a complete and operational system, adjusted, tested and ready for operation.
- F. In the event that any item is not available exactly as specified, the Contractor shall so notify the Engineer in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. QUALITY ASSURANCE

- G. The lighting systems and all controls shall be in accordance with the Washington State Non-Residential Energy Code (NREC) and ASHRAE 90.1.

1.04. SUBMITTALS

- H. Provide submittals for the following:
 - 1. Lighting fixtures.
 - 2. Lighting control devices.

PART 2 - PRODUCTS

2.02. GENERAL

- A. Fixtures, luminaires, etc. shall include all necessary mounting and connecting accessories.
- B. Contractor & lighting fixture supplier shall verify description & catalog numbers in Lighting Fixture Schedule on the drawings match and mounting requirements are correct. Advise engineer of any conflicts or discrepancies.

2.03. LIGHTING

- A. Light Emitting Diode (LED) luminaires shall have at least 4000 initial delivered lumens, a luminous efficacy of at least 90 lumens/W, a color temperature of 3500 K, a CRI of at least 80, an estimated life of at least 50,000 hours at 70% lumen maintenance, and shall include a minimum 5-year warranty on the entire luminaire including the driver. The luminaire and LEDs shall have been tested in accordance with LM-79 and LM-80.

2.04. EMERGENCY LIGHTING

- A. Emergency lighting power units shall be self contained, designed to provide power to fixtures automatically upon interruption of normal electric power for a minimum of 90 minutes. Emergency power source shall be a rechargeable, maintenance free, sealed, spillproof pure lead or lead-calcium battery system. The units shall incorporate a regulated solid-state charger with filtered output and low voltage disconnect.
- B. Controls shall include circuitry to provide continuous self-diagnostic monitoring of the units operation, programmed discharge cycles, charger mode indicator light, unit malfunction indicator lights, and a test switch.

2.05. LIGHTING CONTROLS

- A. Occupancy sensors shall be combination passive infrared and ultrasonic type, 360° transmission, 2000 square feet coverage rated, with adjustable time delay, adjustable sensitivity, and an LED indicator. The sensors shall be able to detect the difference between a human body and the background space.
 - 1. Low voltage ceiling mounted occupancy sensors shall be Watt Stopper DT-300, Greengate OAC-DT-2000-R sensors, or approved equal.
 - 2. Ceiling mounted occupancy sensors for ceilings higher than 10 feet shall be high bay type.
 - 3. Low voltage occupancy sensors shall have an additional contact for connection to building HVAC system.

- B. Low voltage wall switches shall be of the same manufacturer and specifically designed for use with the low voltage sensors and relay/power packs.
1. Wall switches for on-off applications (manual-on applications) shall be momentary contact type, shall have similar appearance as adjacent line voltage toggle type switches, shall be Pass & Seymour 1250, Greengate GMDS-X, or approved equal.
 2. Wall switches for 0-10 volt dimming applications shall be Watt Stopper DCLV2, Greengate WBSD-010DEC, or approved equal.
 3. Color and faceplates shall match other wall devices, switches, and outlets as specified.
- C. Occupancy relays/power packs shall be manual-on type (except, corridors and bathrooms shall be automatic-on type), remote mounted, 120 or 277 volt AC input (as required), 24 volt DC output, with contacts rated minimum 20 amps. Relays/ power packs shall be capable of controlling and/or being controlled by up to minimum 3 sensors.
1. Occupancy sensor relays/power packs shall be of the same manufacturer and specifically designed for use with the occupancy sensors. Relays/power packs shall be Watt Stopper BZ-150 for up to 3 sensors, Greengate SP20-RD4 or approved equal.
 2. Provide additional power packs and/or auxiliary relay packs for areas requiring more than 3 sensors.
 3. Provide additional power packs (slave packs) to switch plug loads from the same occupancy sensor located in the room that controls the lighting loads, WattStopper, Greengate SP-R-20-120.
 4. Contractor shall provide label on ceiling grid where power pack is located. Typical for all power packs located above accessible ceilings.
- D. Motion sensor wall switches shall be ultrasonic or passive infrared type, wall mounted, ivory colored, 120-277 volt, rated minimum 1200 watt, with built-in light level sensor, adjustable sensitivity, adjustable time delay, switch (2 switches if dual control) for manual control and vandal resistant hard lens. Buttons on the face of the switches shall operate in toggle mode to manually turn on/off connected lighting loads. Motion sensor switches shall be Watt-Stopper type WI-200, Greengate ONW-D-1001-MV, for single switch/level, or approved equal.
- E. Daylighting photosensors shall be ceiling mounted, low voltage, 0-10V output for LED fixtures, accurate to +/- 5% over the footcandle range, and shall have a linear response. The light level control module shall be capable of dimming lights on or off (via a low voltage power pack), shall have adjustable setpoints, adjustable deadband to prevent cycling, and adjustable time delays. Lighting level controls shall be low voltage and operate with the same power pack as the occupancy sensors in the same room. Photosensors shall be Watt-Stopper LS-301, or approved equal.

2.06. WIRE AND CABLE

- A. Fixture whips provided as an assembly by the fixture manufacturer with the fixtures shall be #14 AWG.
- B. Fixture cable, where supplied by the Contractor, shall be stranded copper with 600 volt type PF insulation.

2.07. NAMEPLATES AND LABELS

- A. Provide nameplates for all lighting switches in classrooms as indicated on the drawings.
- B. Nameplates shall adequately describe the function or operation of the identified equipment, devices, etc. Nameplate designations shall be consistent with the project documents. Submit a sample of nameplates for approval.

PART 3 - EXECUTION

3.01. LOCATIONS

- A. The mounting heights and location of similar equipment and devices shall be consistent, in accordance with the requirements of the ADA where applicable. Special purpose items shall be located conveniently for the purpose intended.
- B. Disconnect switches, circuit breakers, etc. shall, in no case, be installed so that the grip of the operating handle, when in its highest position, is more than 6¹/₂ feet above the floor or working platform.
- C. Prior to rough-in, the Contractor shall mark or otherwise show the location of all equipment and devices locations, and obtain specific approval from the Owner and Architect for the location of each prior to installing enclosures, boxes, raceways, etc.
- D. Outlets shall be mounted 18 inches to centerline above finished floor unless noted otherwise.
- E. Locate light switches, lighting control stations, etc. 6 inches from door casings (except on center in spaces less than 12 inches), 42 inches to centerline above finished floor.

3.02. EQUIPMENT, LUMINAIRES AND DEVICES

- A. Equipment, luminaires, devices, etc. shall be installed plumb and true and shall be square with the adjacent walls, ceilings and structural members.
- B. Unless noted or indicated otherwise, orientation of luminaires within a space shall be consistent.
- C. Recessed luminaires:

1. Maintain code and manufacturer required clearances from combustible materials around luminaires.
 2. Maintain code and manufacturer required clearances from insulation around luminaires.
 3. Recessed luminaires in rated ceilings shall be enclosed or otherwise provided with an approved pre-manufactured fire rated barrier as required to ensure the integrity of the fire rated assembly. Maintain code and manufacturer required clearances around luminaires.
 4. Coordinate with general and insulation contractors, ceiling provider, etc.
- D. Equipment, cabinets, boxes, luminaires, devices, etc. shall be accurately mounted and leveled and be firmly supported either directly or indirectly by a sound and safe structural member of the building in accordance with manufacturer's instructions, or as directed. Supports shall be neatly placed and properly fastened.
- E. Occupancy sensors shall be mounted and aimed in accordance with manufacturer's recommendations. All necessary adjustments and settings shall be made in order to ensure the lights will operate when the room is occupied.
- F. The correct lifting, jacking and/or moving gear which will prevent damage to the equipment shall be used.
- G. All bolts, nuts, screws and other fastenings shall be tightened and all covers replaced on equipment and boxes. All electrical connections shall be checked to ensure tightness and electrical conductivity. All gaskets, seals, etc. shall be checked for proper fit.
- H. Follow manufacturer's installation details wherever available. Provide any special mountings, wiring or fittings required.
- I. Provide complete manufacturer's schematic drawings for each system. Any deviations between schematic drawings and contract documents shall be outlined in a separate cover letter. Said deviations will be subject to approval by the Engineer.
- J. Provide gaskets, seals, etc. as required to prevent the entrance of moisture, debris, insects, etc. Check for proper fit.
- K. Repair damaged corrosion protection and touch-up paint all scratched, marred or damaged factory finish on equipment, devices, fixtures, enclosures, etc.

3.03. SUPPORTS

- A. Provide all necessary supports and backing for all fixtures, boxes, enclosures, etc. Attach to wood with wood or lag screws, to metal with machine screws or bolts and to concrete with carbon steel wedge or sleeve type expansion anchors or self-drilling metal anchors and machine screws or bolts. Use size and number of attachments as required to support equipment, fixtures, etc. weight with a safety factor of at least four.

- B. Powder actuated fasteners, plastic expansion type anchors, nails and toggle bolts are not permitted.
- C. Brace all equipment, etc. as required to meet the requirements of the International Building Code (IBC).
- D. Fixtures, luminaires, etc. shall be accurately mounted and leveled and be firmly supported either directly or indirectly by a sound and safe structural member of the building in accordance with manufacturer's instructions, or as directed. Supports shall be neatly placed and properly fastened.
- E. Ceiling mounted recessed light fixtures, etc. shall be connected both to the ceiling system with proper "earthquake" clips and to the building structural system with a minimum of 2 suitable earthquake chains or "tie wires" at diagonally opposite corners.
- F. Follow manufacturer's installation details wherever available. Provide all supports, mountings, etc. required, standard or special.

3.04. WIRES AND CABLES

- A. Inspect cable prior to installation to verify that it is identified properly on the reel or box identification label and that it is of proper gauge, containing correct number of pairs, etc. Note any buckling of the jacket which would indicate possible problems. Damaged cable or any other components failing to meet specification shall not be used in the installation.
- B. All exposed cable shall be run in the raceway system, except where specifically approved otherwise. "Open" wiring will not be allowed.
- C. Cable shall be unrolled from reels, or removed from cartons, and installed in a manner which will prevent kinking, crushing or excessive tension on conductors and insulation. Slack wire shall be provided at all pull points.
- D. Cable shall be installed or drawn into the raceway system only after all work of any nature that might cause injury to the cable is completed. The raceway systems shall be complete (including the installation of bushings, grommets, etc.), snaked and cleaned, and approval of the installation is obtained from the Owner and Engineer, before pulling any cable.
- E. Cable pulling lubricants shall be used to minimize pulling stresses on cable pulled into raceways.
- F. All cable is subject to subtle damage that may degrade future performance, if abused during installation. In all cable installation, set reels and use sufficient pulleys and manpower so that cables are not pulled around corners or against material that might cause chafing.

OBSERVATION OF IMPROPER CABLING HANDLING TECHNIQUES MAY CAUSE THE CONSULTANT/ENGINEER AND/OR OWNER TO REQUIRE THE CONTRACTOR TO DISCARD AFFECTED CABLES, INCLUDING ANY OTHERS ALREADY INSTALLED BY THE PERSONNEL FOUND USING INCORRECT PROCEDURE.

- G. In general, communications cable cannot tolerate sharp bends or excessive pull tension during installation. Adhere to manufacturers recommended minimum bend radius and maximum pull tension for cables; except, not less than 2 inch bending radius and pulling tension in excess of 20 pounds.
- H. Replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, and over tightened bindings.

3.05. EQUIPMENT TESTING

- A. Before testing, visually inspect equipment thoroughly, and perform mechanical operation tests in accordance with manufacturer's instructions.

End of Section 26 50 00

SECTION 27 05 00
COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 – GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to the telecommunications systems work.
- B. Coordinate telecommunications systems work with related work shown and specified elsewhere.
- C. The existing campus system shall be maintained and modified for demolition, temporary and new work until the schedule calls for its removal and the new system is installed, tested and fully operational.
- D. Existing out building areas that are to remain shall be reconnected to the new system.
- E. The Contractor shall perform all the work required (including the furnishing of all supervision, labor, services, tools, materials and equipment and the performance of all operations and incidentals necessary) for a complete, safe and reliable telecommunications system installation, adjusted, tested and ready for operation. The work is generally described as follows:
 - 1. Scheduling and coordination of all phases/sequences of the project.
 - 2. Maintaining, modifying, and temporary work to accommodate all phases/sequences of the project.
 - 3. Modifications to existing building.
 - 4. Demolition.
 - 5. Removal of the existing telecommunications systems equipment, devices, cables, raceways, boxes, etc. where indicated.
 - 6. Telephone and data horizontal cabling infrastructure.
 - 7. Data cabling infrastructure to point of connection at patch panels.
 - 8. Supports and patch panels.

9. Equipment backboards.
10. Grounding.
11. Individual and/or combination voice and data stations/outlets and associated cables, etc.
12. Terminating all cables on both ends - voice, data, grounding, station, copper, etc.
13. Moisture, fire and dust stopping and sealing.
14. Nameplates and labeling.
15. Equipment, device, cabling, etc. identification and records.
16. Testing and completing.
17. As-built drawings.
18. Obtaining, and paying for all required licenses, permits, inspections, plan review and other fees, etc.

F. Work not included: The following electrical system related work will be provided by the Owner, General Contractor, other Subcontractors, or Systems Contractors working directly with the Owner:

1. Owner: telephone electronic equipment (answering system) and telephone handsets.
2. Owner: Installation of telephone & data patch cables, cross-connects & line cords.
3. Owner: Data network equipment: LAN switches, network switches, network controller, uninterruptible power supply (UPS) & battery cabinet.
4. Owner: Access point devices.

1.03. ALTERNATES

- A. Include work associated with each alternate in the alternate bid price.

1.04. DEFINITIONS

- A. The word "Telecommunications" refers to all forms of information transport and processing, such as voice (telephone), data (computer network), etc.
- B. The word(s) "Station" or "Station Outlet" refers to all combination telecommunications outlets.

- C. The word(s) "Station" or "Station Cables" refers to all CAT6A horizontal cables.
- D. The word "Backbone" refers to the cabling, connections, etc. between telecommunications rooms.
- E. The term "Contractor" used throughout this section of these specifications and on the telecommunications drawings shall be understood to mean the Telecommunications Contractor. All other work shall be called out by name.
- F. "Approved" means approved by the Architect. "For approval" means for the Architect's approval.
- G. "Furnish" means to supply and deliver to the Project, ready for installation and in operable condition.
- H. "Install" means to incorporate in the work in final position, complete, anchored, connected, and in operable condition.
- I. "Provide" means furnish and install.
- J. "As directed" means as directed by the Architect.
- K. "Concealed" means hidden from sight in trenches, walls, chases, ceilings, etc.
- L. "Exposed" means within sight; that is, not concealed as defined above, and installed on the surface of walls, ceilings, etc.
- M. "C.O." means conduit only; that is, without cable (except, provide pull string).
- N. "F.O.I.C." means Furnished by Others (e.g. general contractor, other subcontractors, equipment suppliers, Owner, systems contractors working directly with the Owner, etc.), Installed by Contractor.
- O. Definitions of all other terms, etc. are in accordance with AIA, ANSI, IEEE, IES, NEMA, etc. standard definitions.

1.05. DRAWINGS AND SPECIFICATIONS

- A. The telecommunications plan drawings are general in form and do not attempt to show complete details or list every item of the telecommunications systems, the building construction or the various equipment; however, the routing of raceways and circuits, and the locations of equipment, devices, fixtures, etc. represent the desired finished arrangement; except, as governed by structural or mechanical conditions or obstructions.
- B. Specifications are, in some cases, written in an abbreviated form. Words such as shall, shall be, the Contractor shall, and similar mandatory phrases are supplied by inference.

- C. Investigate the structural and finish conditions affecting the work. Refer to the architectural, structural and mechanical drawings, supplier shop drawings and submittals, etc. for additional details, equipment ratings, dimensions, location and swing of doors, location and size of partitions, cabinets, etc. and similar features. Verify all dimensions, equipment ratings, etc. with the actual before installation. Arrange the work accordingly.
- D. The intent of the drawings and specifications is to include all items necessary for the proper execution and completion of the Work; however, any item or detail not specifically mentioned in the specifications or shown on the drawings, but which is necessary to produce the intended results shall be included.
- E. The Contractor shall bring to the Architect's and Engineer's attention any discrepancies within the Contract Documents, between the Contract Documents and field conditions, and any design and layout changes required due to specific equipment selection, etc. prior to equipment and material purchasing and installation. Corrective work necessitated by discrepancies after purchasing and installation shall be at the Contractor's expense.
- F. Verify all equipment and device locations with the Owner and Architect prior to rough-in

1.06. SPECIAL AREAS

- A. Telecommunications rooms shall be treated as clean room type environments. Final cleaning shall include thorough cleaning of the room to a dust-free condition. After termination of cables and final cleaning, food, drink, dirt, dust, metal shavings and the like shall not be permitted in telecommunications rooms.

1.07. SUBMITTALS

- A. Provide product submittals for the following:
 - 1. Station cable.
 - 2. Workstation termination hardware.
 - 3. Patch panels.
 - 4. Telecommunications room termination hardware.
 - 5. Cable supports.
 - 6. Labels.
- B. The Contractor shall submit proposed procedures and equipment to be used in testing voice and data and fiber optic cabling along with samples of the reporting format from a past similar project.
- C. Provide qualification information for persons installing and testing the components (equipment, devices, materials, etc.) of each system, indicating their capabilities and experience. Include evidence of applicable registration or certification.

1.08. RECORD DOCUMENTS

- A. Submit "as-built" record drawings and operation and maintenance manuals at completion of the project in accordance with the specific submittal requirements listed elsewhere in these Specifications.
- B. Provide as-built documentation consistent with the contract documents as required, in AutoCAD 2010 .dwg files with as-built notations for all sheets. (Consultant/Engineer will provide construction drawings AutoCAD files to contractor.)
- C. Provide cable test results in both paper copy and software form (where available) on a CD-ROM; except, for station cables and intra-building voice backbone cables provide only a summary in paper copy and complete test results for individual station cables in software form. The CD-ROM shall include the necessary viewing software for all test reports.

1.09. "AS BUILT" DRAWINGS

- A. "As-built" drawings shall include cable ID codes for each outlet/receptacle and changes to cable routing, raceway system, telecom room layout, riser diagram, etc.
- B. Include any detailed equipment, raceway, wiring, etc. diagrams and layouts prepared by Contractor or his subcontractors, suppliers, etc.

1.10. WARRANTY

- A. The complete installation shall be guaranteed for a period of one (1) year after date of project completion. For warranty purposes, the date of project completion shall be considered the date of final acceptance of the installation by the Owner certified in writing, and after Owner has received all project close-out requirements. All corrective work, if needed and requested by the Owner, shall be provided without cost to the Owner during the guarantee period.
- B. The contractor shall provide the manufacturer 20-year Extended Product Warranty on the completed voice and data cable infrastructure end-to-end solution.
- C. The contractor shall provide any available third party or manufacturer warranties on the installation.

1.11. QUALITY ASSURANCE

- A. Contractor and Contractor's personnel shall be experienced, thoroughly trained and completely familiar with telecommunications infrastructure, systems, equipment, devices, materials, etc. and the required methods of installation.

B. Contractor Qualifications:

1. The Contractor shall be a "specialist", who is regularly engaged in the type of work specified herein. Award will be made only to a bidder who can provide satisfactory evidence that he has the technical ability, experience, tools, personnel and financial resources to successfully complete the project as specified herein. The Contractor shall have an experience base of at least five (5) years for installation of equipment and related wiring/cablings similar to those proposed on this project.
2. The Contractor shall be registered and certified with the manufacturer of the voice and data end-to-end solution, and shall be capable of providing the required warranty.
3. It is desirable, although not required, for the installer to employ on this project one or more certified technicians as follows:
 - a. Registered Communications Distribution Designer (RCDD), certified by the Building Industry Consulting Service International (BICSI).
4. The Contractor shall engage experienced testing technicians for the purpose of testing the cabling systems. If requested by the Owner, the Contractor shall submit qualifications of the cable testing technician(s) for Owner review and acceptance.
5. The Contractor shall be licensed and bonded in the State of Washington.

C. Manufacturer Qualifications: Engage firms experienced in manufacturing components and materials listed and labeled under the applicable TIA/EIA standards (accepted, proposed or draft).

D. Installation, equipment and materials shall be in accordance with all applicable codes, standards and regulations; including the latest editions and addenda of the following:

1. National Electrical Code (NEC), ANSI/NFPA 70, adopted and amended by RCW 19.28, WAC 296-4 and WAC 296-401: Laws, rules and regulations for installing network cabling and related components and equipment.
2. ANSI/NECA/BICSI 568-2006 – Installing Commercial Building Telecommunications Cabling.
3. ANSI/TIA/EIA 526-7-98 – Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
4. ANSI/TIA/EIA 526-14-A-98 – Optical Power Loss Measurements of Installed MultiMode Fiber Cable Plant
5. TIA/EIA TSB-125 – Guidelines for Maintaining Optical Fiber Polarity Through Reverse-Pair Positioning.

6. TIA/EIA TSB-140 – Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.
7. ANSI/TIA/EIA 568-C.0 – Generic Telecommunications Cabling for Customer Premises.
8. ANSI/TIA/EIA 568-C.1 - Commercial Building Telecommunications Cabling Standard.
9. ANSI/TIA/EIA 568-C.2 - Commercial Building Communications Cabling Standard, Balanced Twisted Pair Cabling Components.
10. ANSI/TIA/EIA 568-C.3 – Optical Fiber Cabling Components Standard.
11. ANSI/TIA/EIA 569-B - Commercial Building Standard for Telecommunication Pathways and Spaces.
12. ANSI/TIA/EIA 598-B – Optical Fiber Cable Color Coding.
13. ANSI/TIA/EIA 606-A – Administration Standard for Commercial Telecommunications Infrastructure.
14. ANSI/TIA/EIA 607-A - Commercial Building Grounding and Bonding Requirements for Telecommunications.
15. ANSI/TIA/EIA 758 – Customer-Owned Outside Plant Telecommunications Cabling Standard.
16. IEEE 802.3-2002 – IEEE Standard for Information Technology, Part 3: CSMA/CD.

PART 2 – PRODUCTS

2.01. GENERAL

- A. Coordinate the features of materials and equipment so they form an integrated system. Match components for optimum performance and appearance.
- B. Horizontal cabling infrastructure shall be selected and constructed as a complete end-to-end solution by Amp, Hubbell, Panduit or OCC.
- C. Unless sizes and/or quantities are specifically indicated, provide at least 20% spare wiring capacity in all cabinets, panels, cable trays and raceways.
- D. All telecommunications equipment, devices, materials, etc. shall be new and installed only if in first class condition.
- E. All wire and cable installed in below grade raceways shall be suitable for wet locations.

2.02. VOICE (TELEPHONE) AND DATA (COMPUTER NETWORK) STATION CABLES

- A. Voice and data station cable shall be 4 pairs, twisted, #23 AWG solid copper, nominal 100 ohm, Category 6 UTP (unshielded twisted pair) cable, 300 volt rated. Cable shall be tested and certified by the manufacturer at up to 500 MHz and shall provide positive ACR beyond 250 MHz. Cable shall support ANSI X3.263 (100 Mbps), ATM (155 and 622 Mbs), IEEE 802.3 1000Base-T (Gigabit Ethernet) and ANSI/TIA/EIA 854 1000Base-TX (Gigabit Ethernet). Cable shall conform to or exceed ANSI/TIA/EIA568 Category 6 Cabling requirements and ISO/IEC 11801 Edition 2.0 (Class E) cabling requirements. Additionally, the cable shall meet or exceed all the following performance criteria:

	@250 MHz	@500 MHz
1. Maximum Attenuation (dB/100M):	32.8	49.2
2. Minimum NEXT (dB):	41	37
3. Minimum PSNEXT (dB):	39	35
4. Minimum ELFEXT (dB):	20	14
5. Minimum PSELFEXT (dB):	17	11
6. Minimum RL (dB):	17.3	15.2
7. Minimum ACR (dB):	8.2	--
8. Minimum PSACR (dB):	6.2	--

- B. Cable shall consist of 4 insulated conductor pairs with a cross separator to physically isolate the pairs and to provide geometric stability. Cable shall not utilize bonded pairs. Cable shall be of a standard round design, with an overall jacket. Jacket shall be blue.
- C. Cable shall consist of 4 insulated conductor pairs with a cross separator to physically isolate the pairs and to provide geometric stability. Cable shall not utilize bonded pairs. Jacket color shall be blue for voice cables and yellow for data cables. [Port of Bellingham]
- D. Cable shall be riser rated, be listed as being resistant to the spread of fire and bear flammability testing ratings as communications cable type CMR.
- E. Cable shall be plenum rated, be listed as being resistant to the spread of fire and bear flammability testing ratings as communications cable type CMP.
- F. Cables installed in exterior or below grade conduits shall not be required to be UL listed and shall have a water-blocking gel, be suitable for wet locations and have a black jacket.
- G. All cables shall be of the same manufacturer, Amp 6A F/UTP, Berk-Tek LANmark-10G FTP, Hitachi Supra 10G, Hubbell NextSpeed Ascent FTP, Superior/Essex Category 6A ScTP or approved equal.

2.03. COPPER CABLE TERMINATION HARDWARE

- A. Voice & data station cable patch panels shall be standard foot print (strait), 24 port, 1 rack units in height, with modular jack openings, supplied with un-loaded modular jacks and transparent label holders. Modular jacks shall be type RJ-45, 8-position, non-keyed conforming to T568B specification in ANSI/TIA/EIA-568-C.2 standard for shielded Category 6. Patch panels shall provide a continuous ground path for each module. Panels shall be Amp, Hubbell, Leviton, OCC, Systimax or approved equal. Provide the number of patch panels/ports required plus 30% spare, except minimum as indicated on the drawings.
- B. Voice backbone patch panels shall be 24 port as indicated, rack mounted, category 3, modular to 110 type with 6 port modules and transparent label holders. Module jacks shall be 1 pair, 8 position, non-keyed conforming to TIA and ISO category 3 performance requirements. Patch panels shall be 1 or 2 rack units in height as indicated.
- C. Horizontal cable management panels shall be 1 or 2 rack units in height as indicated, mounted to the front of a standard 19 inch equipment rack.
- D. All patch panels, 110 blocks, clips, cable management, etc. shall be of the same manufacturer, Amp, Hubbell, OCC, or Systimax, and specifically designed for use together.

2.04. STATION HARDWARE

- A. Telecommunications outlets and station hardware shall consist of boxes, faceplates (wallplates), voice receptacles (jacks), data receptacles (jacks), blank inserts, labels, etc. as indicated. Faceplates, receptacles, connectors, etc. shall be heavy duty modular type, of the same manufacturer, Amp, Hubbell, Panduit, or OCC, and designed for use together.
- B. Voice and data receptacles shall be RJ45 jacks, die-cast metal body, non-keyed with gold plated spring wire contacts and 110 style wire terminations. Jacks shall meet ANSI/TIA/EIA-568 Standard for shielded Category 6 connecting hardware and be configured in accordance with designation T568B eight position jack pin/pair assignment.
- C. Faceplates (wallplates) shall be commercial grade, single or double gang, as required, high impact flame retardant thermoplastic, ivory colored, 4 port, with transparent label windows on top and bottom. Faceplates shall be labeled as directed. Provide blank inserts in all unused ports.
- D. Wall mount type telephone faceplates shall be 8 conductor, wired to TIA-568B, with 110 style wire terminations, stainless steel faceplate and telephone mounting posts.
- E. Surface mount type telephone boxes for use in Fire Alarm and Security Panels shall be 2 port, high impact flame retardant thermoplastic, ivory colored, with 110 style wire terminations and RJ-31X style jacks.
- F. Individual telecommunications outlets shall be mounted in flush wall mounted boxes or combination floor boxes, as indicated.

- G. Individual telecommunications outlets in new walls and partitions and in existing fire rated walls shall be mounted in boxes. Surface mounted boxes shall be surface metal raceway style to match the surface metal raceways. Flush mounted boxes shall be cut-in style where required.

2.05. CABLE SUPPORTS

- A. Supports for cables run “open” above ceilings and the like shall be wide base type J-hook assemblies. Supports shall be made of galvanized steel and have minimum 2” diameter.
- B. Supports for large bundles of cables (more than 50 cables) run open above ceilings, in crawlspaces and the like shall be wide base fabric loop, re-enterable assemblies, Erico Caddy CAT425, or approved equal.
- C. Supports for attachment to drop wires shall be capable of minimum 25 lb load capacity.
- D. Supports for attachment to T-bar grid will not be allowed.
- E. Bundle cables with double sided Velcro straps. Tie-wraps shall not be allowed.
- F. Support spacing shall not exceed 5 feet.

2.06. PULL STRING AND ROPE

- A. Pull string shall be resistant to rot and mildew and shall not deteriorate when exposed to oil, grease, etc.
- B. Pull rope shall be twisted polypropylene treated with ultraviolet stabilizers, minimum $\frac{1}{4}$ inch diameter. Rope shall be resistant to rot and mildew and shall not deteriorate when exposed to oil, grease, etc.

2.07. GROUNDING

- A. Ground cable shall be single conductor stranded copper with 600 volt type XHHW or THWN/THHN insulation. Conductor size shall be minimum # 6 AWG unless noted otherwise. Conductor insulation for # 2 AWG and smaller cables shall be green color; insulation for # 1 and larger cables may be black with green marking tape applied in telecommunications rooms.
- B. Ground lugs, clamps, nuts, washers, etc. shall be corrosion resistant high copper alloy or silicon bronze. Cable-to-cable connectors shall be copper, compression type.
- C. Cable lugs at ground bars, equipment, racks, etc. shall two-hole bolt-on compression type, long barrel, $\frac{5}{8}$ inch hole spacing for # 6 AWG and smaller cables, 1 inch hole spacing for # 4 AWG through # 1/0 AWG cable and $1\frac{3}{4}$ inch hole spacing for # 2/0 AWG and larger cable. Mounting bolts shall be $\frac{1}{4}$ inch, $\frac{3}{8}$ inch or $\frac{1}{2}$ inch diameter (as required), with hex head bolts, beveled or

spring type washers, lock washers and hex head nuts; Thomas & Betts 548 series or Burndy YA series (no exceptions).

2.08. NAMEPLATES AND LABELS

- A. Provide labels for the following:
 - 1. Voice and data station cables, at both ends, with the cable ID code.
 - 2. Ground cables, with cable origin and destination.
 - 3. Telecommunications faceplates, with the voice and data cable ID codes.
 - 4. Voice and data cable termination hardware, with the cable ID codes.
- B. Nameplates, labels, identification tags, etc. shall utilize identifier formats consistent with the ANSI/TIA/EIA 606-A standard. Submit proposed inscriptions to Owner for approval prior to construction.
- C. Font size, color and contrast for all labels shall be in accordance with the ANSI/TIA/EIA 606-A standard.
- D. All labels shall be neatly typed or generated with a mechanical labeling device.
- E. All labels shall be long lasting and durable, resistant to heat, moisture, solvents, oil, etc.
- F. Cable ID code, labeling scheme, etc. will be provided to the Contractor by the Owner and Engineer. Submit a sample of the proposed labels to Owner for approval prior to installation.

2.09. ANCHORS AND FASTENERS

- A. Anchors and fasteners used shall be of a type designed for use in the base material to which the item is to be attached. Attach to wood with wood or lag screws, to metal with machine screws or bolts and to concrete with carbon steel wedge or sleeve type expansion anchors or self-drilling metal anchors and machine screws or bolts.
- B. Pad and floor mounted equipment shall be secured with suitable hot dipped galvanized steel anchor bolts, washers, hex nuts, etc.
- C. Powder actuated fasteners, plastic expansion type anchors, nails and toggle bolts are not permitted.
- D. Anchors shall be non-corrosive or have suitable corrosion resistant coatings or treatment.

- E. Bolts, nuts, screws and other threaded devices shall have standard threads and heads, unless required for tamper-proof installation.

PART 3 - EXECUTION

3.01. DEMOLITION

- A. Telecommunications cables indicated as to be removed shall be removed from their point of origin to destination, except, modern CAT6 cables shall be pulled back to the nearest cable tray, coiled out of sight and labeled for future use.
- B. TELECOMMUNICATIONS CABLES INDICATED AS TO BE REMOVED AND RE-INSTALLED OR RELOCATED, SHALL BE PULLED BACK AND COILED IN A NEAT AND SAFE MANNER, BY QUALIFIED COMMUNICATIONS PERSONNEL, PRIOR TO ANY DEMOLITION WORK. CARE SHALL BE TAKEN TO PROHIBIT DAMAGE TO THE CABLES DURING CONSTRUCTION WORK. DEMOLITION OF TELECOMMUNICATIONS CABLES SHALL NOT BE PERFORMED BY DEMOLITION CONTRACTOR, GENERAL CONTRACTOR OR ELECTRICAL CONTRACTOR PERSONNEL.
- C. Where demolition work effects the building tenants and operations, coordinate work with the owner, tenants and respective service providers.

3.02. LOCATIONS

- A. Outlets shall be mounted 18 inches to centerline above finished floor unless noted otherwise; except, outlets above counters, etc. shall be mounted 6 inches to centerline above the counter or 3 inches to centerline above the splashboard, whichever is higher.

3.03. COORDINATION OF THE WORK

- A. Where work may affect District standards or operations, coordinate the work of this Section with Owner's Telecommunications Department.
 - 1. Meet jointly with the Owner's representative and representatives of the Telecommunications Department to exchange information and agree on schedules, and details of equipment arrangements and installation interfaces.
 - 2. Record the agreements reached in these meetings and distribute the records to all participants.
 - 3. Schedule the work to avoid unreasonable disturbance or interruption of University operations.

4. Adjust the arrangements and locations of equipment and cabling supports in affected rooms and spaces to accommodate and optimize the room or space arrangements.
- B. Schedule the work to avoid disturbance or interruption of Owner's operations in adjacent spaces and access pathways.
- C. Coordinate work schedule to facilitate installation of active electronic equipment and cut-over of services.

3.04. INTERRUPTIONS

- A. Telecommunications interruptions, whether to individual equipment or to the entire system, shall not be done without prior approval and scheduling with the Owner. Telecommunications interruptions that affect operation of the existing facility shall not be done during normal working hours. Some working of non-standard hours will be required, without increase in Contract Sum.
- B. Telecommunications services may be interrupted during the construction process provided that the facility is not occupied and services are returned prior to return of the building occupants.
- C. Reconnection of individual items shall be done 1 at a time.
- D. As much as possible, cables and equipment shall be pre-assembled, systems prefabricated and cable pre-installed to minimize the change-over down time.

3.05. WIRES AND CABLES

- A. Inspect cable prior to installation to verify that it is identified properly on the reel or box identification label, is of proper gauge, containing correct number of pairs, etc. Note any buckling of the jacket which would indicate possible problems. Damaged cable or any other components failing to meet specification shall not be used in the installation.
- B. Telephone/voice and computer/data cables shall be homerun to the Communications Room without splices or taps and terminated in patch panels in an equipment rack.
- C. All exposed power limited telecommunications cable shall be run in metal raceways, except where specifically approved otherwise.
- D. All concealed power limited telecommunications systems cable may be run "open" in accessible ceilings; except, where indicated otherwise and where penetrating through ceilings, floors, walls, draft-stops, etc.

- E. "Open" cables shall be bundled and supported from permanent structural members of the building, either directly or indirectly, with suitable hooks. Support spacing shall not exceed 5 feet. Protect "open" cables during installation in ceiling spaces. Cables shall not interfere with the removal of pipes or equipment for maintenance or repair. All "open" cable shall be kept a minimum of 6 inches from pipes, ducts, and other items producing heat. Support "open" cables a minimum of 6 inches above T-bar ceilings. Cables shall be bundled using double sided Velcro straps. Tape and tie-wraps are not approved methods of bundling or supporting cables.
- F. Floor and ceiling penetrations by "open" cables will not be allowed. Provide conduit sleeves, minimum 2" EMT, as required plus a spare (with fire and dust stopping and sealing) where "open" cable passes through floors, walls, partitions, etc.
- G. Cable shall be unrolled from reels, or removed from cartons, and installed in a manner which will prevent kinking, crushing or excessive tension on conductors and insulation.
- H. Slack cable shall be provided at both ends of the cable and at all major pull points to accommodate future changes to the cabling system. A minimum 10 feet shall be provided in the telecommunications room, coiled above the cable rack. A minimum 12 inches shall be provided at the outlet locations, coiled in the accessible ceiling space, where available, or in the surface mounted raceway system.
- I. Cable shall be installed or drawn into the raceway system only after all work of any nature that might cause injury to the cable is completed. The raceway systems shall be complete (including the installation of bushings, grommets, etc.), snaked and cleaned, and approval of the installation is obtained from the Owner and Engineer, before pulling any cable.
- J. Telecommunications cable shall be installed without sharp bends (less than 2 inch radius) or pulling tension in excess of 20 pounds.
- K. Cable pulling lubricants shall be used to minimize pulling stresses on cable pulled into raceways.
- L. All cable is subject to subtle damage that may degrade future performance, if abused during installation. In all cable installation, set reels and use sufficient pulleys and manpower so that cables are not pulled around corners or against material that might cause chafing.

OBSERVATION OF IMPROPER CABLING HANDLING TECHNIQUES MAY CAUSE THE CONSULTANT/ENGINEER AND/OR OWNER TO REQUIRE THE CONTRACTOR TO DISCARD AFFECTED CABLES, INCLUDING ANY OTHERS ALREADY INSTALLED BY THE PERSONNEL FOUND USING INCORRECT PROCEDURE.

- M. In general, communications cable cannot tolerate sharp bends or excessive pull tension during installation. Adhere to manufacturers recommended minimum bend radius and maximum pull tension for cables; except, not less than 2 inch bending radius and pulling tension in excess of 20 pounds.
- N. Cable lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit. After installation, exposed cable

and other surfaces must be cleaned free of lubricant residue. (Ideal Yellow 77 is not approved.)
Recommended Products:

1. Twisted-pair cable: Dyna-Blue, American Polywater
2. Optical fiber cable: Optic-Lube, Ideal

- O. Replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, and over tightened bindings.
- P. Replace or rework UTP cables with loosely twisted and over twisted pairs at terminals, and re-terminate UTP cables with sheath removed more than $\frac{1}{2}$ inch.

3.06. PULL STRINGS AND ROPES

- A. Provide pull ropes in all below grade telecommunications conduit and duct (with or without cables) and in all cable tray.
- B. Provide pull string in all above grade telecommunications conduits (with or without cables), except pull strings shall not be permitted in plenum ceiling spaces.

3.07. CABLING CONFIGURATION

- A. Cable installation in the telecommunications closets shall conform to the requirements of the TIA/EIA Standards and the project documents. All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance purposes such as access boxes, ventilation mixing boxes, network equipment, access hatches to air filters, switches, electrical outlets, electrical panels and lighting fixtures. Avoid crossing areas horizontally just above or below any riser conduit. Lay and dress cables to allow other cables to enter the conduit/riser without difficulty at a later time by maintaining a working distance from these openings.
- B. Cable shall be routed as close as possible to the ceiling, floor, or corners to insure that adequate wall or backboard space is available for current and future equipment and for cable terminations. Cables shall not be supported from existing electrical conduit or other equipment. Minimum bend radius shall be observed.
- C. Bundle all similarly routed cables together, and attach by means of support saddles screwed to the backboard, then routed vertically and/or horizontally via "square" corners over a path that will offer minimum obstruction to future installations of equipment, backboards, or other cables. Observe cable bend radius.
- D. Cables shall be bundled together by means of Velcro straps. Do not over tighten Velcro straps on station cables. Tie-wraps shall not be used as a means of support or bundling.

3.08. VOICE AND DATA STATION CABLE TERMINATION

- A. Terminate all voice and data station cables on patch panels and at stations in accordance with ANSI/TIA/EIA Standards and accepted industry practice. Bundle together and support cables at the equipment rack in a neat and workmanlike manner. Reduce untwisting of copper pairs by stripping back only as much cable jacket as is required to perform connecting hardware terminations, except maximum $\frac{1}{2}$ inch.

3.09. GROUNDING

- A. Ground/bond all sections of the telecommunications raceway system to the Telecom Grounding Busbars with a minimum # 12 AWG cable. The ground wire shall be run alongside the telecommunications cables and bonded to physically isolated raceway system components throughout the facility (i.e., conduit sleeves, consolidation panels, telecommunications cable tray, access point enclosures, etc.), except 1" conduit stubs less than 10 feet in length from outlet locations up to ceiling spaces are not required to be grounded.
- B. Ground/bond all equipment racks, cable rack, etc. in the Telecom Room to the Telecom Grounding Busbars with minimum #6 AWG cable.
- C. Ground/bond the primary protector(s) in the Telecom Rooms to the Telecom Grounding Busbars with minimum #6 AWG cable.
- D. Ground/bond sections of cable racks together with manufacturer recommended hardware, except, bonding jumpers are not required between sections of cable rack which are UL Listed as equipment grounding conductors.
- E. Before grounding connections are made, contact surfaces shall be thoroughly cleaned and anti-oxidant solution applied.
- F. Connections shall be both mechanically and electrically secure. Torque connecting hardware in accordance with the manufacturer's instructions and recommendations.
- G. Torque connecting bolts at telecommunications grounding busbars to 35 ft/lbs.
- H. Tests shall be made to verify the continuity of the ground system and all ground fault return paths.

3.10. OUTLETS

- A. Outlet boxes shall be securely attached to walls or structural/framing members with approved anchors and fasteners. Use of adhesive tape for this purpose shall not be permitted.

3.11. TESTING

- A. All testing shall be performed by personnel that are trained and certified in the specific task. The Contractor shall perform end-to-end installation performance tests of the cabling plant. The Contractor shall submit for approval a proposal describing the test procedures, test result forms, and timetable for fiber optic, and all copper wiring.
- B. The Owner and Engineer shall be notified one week prior to any testing so that the initial testing may be witnessed.
- C. For phased projects, the contractor shall submit one (1) copy of the test result documentation at the completion of each phase to the Engineer for review. Preliminary test reports shall be provided in electronic format – paper copies shall not be required.
- D. The Contractor shall submit three (3) final copies of the test result documentation for all required tests (including fiber optic OTDR tracing printouts and distance test results), and provide verification that all cable tests have been completed. Test reports shall be submitted on a CD-ROM and shall include viewing software for viewing the test report files. Documentation shall identify each cable with the designated identification description. Cables that do not meet the minimum standards as specified, at any of the required tests, shall be replaced at the Contractors expense.
- E. Provide cable test results in both paper copy and software form (where available) on a CD-ROM; except, for station cables and intra-building voice backbone cables provide only a summary in paper copy and complete test results for individual station cables in software form. The CD-ROM shall include the necessary viewing software for all test reports.
- F. Copper Voice/Data Cable Testing:
 - 1. All voice and data station drop cables shall be tested in accordance with the “permanent link” configuration as defined in ANSI/TIA/EIA 568. The entire link (termination hardware, jacks, cables, etc.) shall pass all tests to ANSI/TIA/EIA Category 6 specifications and ISO/IEC Class E parameters, at up to 90 meters in length.
 - 2. All data station drop cables, cross-connect and patch cables, etc. from outlet jack to equipment jacks shall be tested in accordance with the “channel” configuration as defined in ANSI/TIA/EIA 568. The entire channel (terminations, jacks, cables, etc.) shall pass all tests to ANSI/TIA/EIA Category 6 specifications and ISO/IEC Class E parameters, at up to 100 meters in length.
 - 3. Each wire/pair shall be tested for, minimum:
 - a. Wiremap (polarity, pair reversals, continuity, shorts and grounds);
 - b. Cable length (record all lengths);
 - c. NEXT (near end cross talk);

- d. PSNEXT (power sum NEXT);
 - e. ELFEXT (equal level far end cross talk);
 - f. PSELFEXT (power sum ELFEXT);
 - g. Attenuation;
 - h. ACR (attenuation/cross-talk ratio);
 - i. PSACR (power sum ACR);
 - j. Return Loss.
4. Test procedures shall be based on ANSI/TIA/EIA 568 utilizing a commercial UTP cable tester that meets or exceeds the specified accuracy requirements defined as Level III for use with Category 6 and Class E cabling systems. Each tester shall be certified as calibrated within three (3) months of testing.
5. Test results which pass within the margin of error of the tester shall not be acceptable. In the event that a cable passes the test within the margin of error, the Contractor shall determine problem(s) and make corrections as required (including replacement of the cable and/or other components if necessary) at Contractor's expense without increase in Contract Sum. After correction(s), Contractor shall repeat tests.
- G. After all testing has been completed, the Contractor shall verify functional operation of each receptacle (e.g. each voice receptacle has dial tone, each active data receptacle connects to the data equipment, etc.).
- H. For all tests not meeting criteria as determined by the Owner and Engineer, Contractor shall determine problem(s) and make corrections as required (including replacement of the cable and/or other components if necessary) at Contractor's expense without increase in Contract Sum. After correction(s), Contractor shall repeat tests.

End of Section 27 05 00

SECTION 27 51 23
SCHOOL CLOCK, INTERCOM & PAGING SYSTEM

PART 1 – GENERAL

1.01. APPLICABLE PROVISIONS

- A. The General, Supplementary and other Conditions of the Contract, modifications to the General Conditions, the Drawings, and the applicable provisions of the other Divisions are hereby made a part of this Division and all its sections.

1.02. SUMMARY

- A. The requirements of this Section and the other Division 26, 27 and 28 Sections apply to all the school clock, intercom and paging system work.
- B. Modify and expand existing system as required for the new work. Provide new devices, cables, programming etc. as required for the new work. Program existing controller to match existing functions with new room numbers.
- C. Coordinate school clock, intercom and paging system work with related work shown and specified elsewhere. Coordinate with project schedule.
- D. Instruct the Owner's staff in operating the system and recommended maintenance procedures.
- E. Provide equipment, devices and all necessary accessories for a complete school clock, intercom and paging system. Provide all materials necessary for the proper execution and completion of the Work. Required items not specifically mentioned in the specifications or indicated on the drawings shall be provided as necessary to produce the intended results.
- F. In the event that any item is not available exactly as specified, the Contractor shall so notify the Owner in writing as early as possible to allow ample time for an alternate item to be selected without delay to the project.

1.03. QUALITY ASSURANCE

- A. School clock, intercom and paging system provider shall be an authorized factory representative of the specified equipment to ensure proper specification adherence for system programming, operation, final connection, test, turnover, warranty compliance, and after-market service.
- B. School clock, intercom and paging system shall be installed by, or under the direct supervision of, a qualified representative of the system provider. Contractor and Contractor's personnel shall be experienced, thoroughly trained and completely familiar with school clock, intercom and paging systems and the required methods of installation.
- C. Programming, testing, etc. shall be by a qualified representative of the manufacturer.

- D. All components shall be UL listed and labeled, and the central telephone switching system registered with the FCC for connection to the telephone network.
- E. All features and functions shall be factory-standard features and/or options offered by the manufacturer. Systems which rely upon unique or specially developed circuitry are not acceptable.
- F. The System Vender shall employ factory-trained technicians skilled in maintenance of paging systems, and shall maintain a service organization with spare parts in stock within 100 miles of the Project site. The service organization shall be licensed as required by the local jurisdiction to perform work on control-voltage systems. The service organization shall have the equivalent of 5 years' experience in servicing similar systems, and shall be capable of responding to service calls within 24 hours. Furnish references upon request.
- G. The new system components shall be compatible and match the existing Bogen Multicom – 2000 system, or approved equal. The system provider shall be Dimensional Communications, or approved equal.

Dimensional Communications
1220 Anderson Road
Mount Vernon, WA 98274
Contact: (360) 424-6164

1.04. SUBMITTALS

- A. Submit complete documentation for the school clock, intercom and paging system equipment, devices, materials, etc. showing the model number, type, rating, size, style, manufacturer's names, and manufacturer's catalog data sheets for all items. Include data on features, rating, and performance.
- B. Submittals shall include complete school clock, intercom and paging system riser and wiring diagrams, plan drawings, etc. (Consultant/Engineer will provide construction drawings AutoCAD files to contractor). Include dimensioned plan and elevation views, diagrams, and other details of components as appropriate.
- C. If requested by the Owner, provide samples of materials for evaluation and/or temporary use on existing system.

1.05. OPERATING & MAINTENANCE MANUALS

- A. Submittal information submitted for review, up-dated to record any changes.
- B. Operating Instructions: Supply a detailed narrative description of the system operation. Indicate expansion capability, application conditions and limitations of use. Include manufacturer's installation and operating instructions.

- C. Maintenance Instructions: List replacement parts, including source. Indicate recommended maintenance and testing procedures, and the intervals involved for each. List all individual system components requiring periodic maintenance. Detail trouble-shooting procedures. Include a service directory with names and telephone numbers for use in obtaining service.

1.06. RECORD DOCUMENTS

- A. Submit "as- built" record drawings and operation and maintenance manuals at completion of the project in accordance with the specific submittal requirements listed elsewhere in these Specifications.
- B. Provide as-built documentation consistent with the contract documents as required, in Auto-Cad Version .dwg files with as-built notations for all sheets. (Consultant/Engineer will provide construction drawings AutoCAD files to contractor.)

PART 2 - PRODUCTS

2.01. GENERAL

- A. The existing system is Bogen Multicom 2000.
- B. Modify and expand existing system as required for the new work.
- C. Coordinate the features of materials and equipment so they form an integrated system.

2.02. INTERCOM AND PAGING SYSTEM

- A. The new system components shall be compatible and match the existing Bogen Multicom – 2000 system, or approved equal.
- B. During Bidding:
 - 1. Substitutions for equipment and materials other than that specified will be considered if equal (or better and/or higher) in quality, ratings and function; and similar in type, style, size and appearance.
 - 2. Submit written requests to Owner, Architect and Engineer.
 - a. If received no later than 7 work days prior to Bid opening, requests will be considered, but not thereafter.
 - b. Bidders will be informed by Addendum of any approved items.
 - c. No responses will be provided for rejected items.

3. Requests shall be accompanied by complete specifications, samples, record or performance, certified tests by impartial, recognized laboratories, and other such information as required to clearly represent the proposed substitution.
- C. All equipment components shall be furnished and installed by the intercommunication system contractor as part of this bid. All system infrastructure, including cable, speaker and clock/speaker back boxes will be provided in this bid by the system contractor and installed by the electrical contractor as part of this bid.
- D. The paging system shall provide at least the following features and functions plus any additional standard features. The system shall contain the software and hardware for a loud speaking paging system.
- E. Provide for paging access from authorized administrative and staff area multi-line telephones.
- F. Provide for the instantaneous distribution of emergency all-call announcements simultaneously to all locations equipped with loudspeakers by dialing a predetermined code number. Emergency announcements originating at any authorized telephone shall have priority over all regular system functions. This code must be functional with the Owner-provided telephone system.
- G. The paging system shall be modular in design to and facilitate simple expansion with minimum time and expense.
- H. The system shall provide relay drivers and auxiliary contacts.
- I. System shall consist of remote speakers and all associated equipment, power supplies, materials and wiring as required to amplify paging output from the telephone system.
- J. The intercom system functions will be integrated in the building telephone system provided by others.

2.03. MATERIALS

- A. Provide new materials to match existing Bogen Multicom-2000 system, as required.

2.04. WALL MOUNTED SQUARE GRILLE/ENCLOSURE

- A. The square speaker grille shall be constructed of heavy gauge cold rolled steel, and shall have a baked semi-gloss white enamel finish, except field painted to match building surface or trim color (verify exact color with Architect). The grille shall have a square opening with a separate sub-plate for mounting to an enclosure.
- B. The grille shall be 12-5/8" square. The grille shall accommodate an 8" loudspeaker
- C. The grille shall be SG-8, or approved equal.

- D. Where flush mounted, the grille shall be mounted to a metal protective enclosure constructed of heavy gauge cold rolled steel with the interior undercoated and jute patch lined to prevent mechanical and acoustical resonance.
- E. The enclosure shall be Lowell P68X, or approved equal.

2.05. CONE SPEAKER/TRANSFORMER ASSEMBLY

- A. The speaker shall be an 8" permanent magnet cone-type having a viscous-damped cone, and a ceramic magnet weighing at least 6 ounces.
- B. The speaker assembly shall be equipped with a dual-winding (25-volt/70-volt) line matching transformer. It shall provide 1/8, 1/4, 1/2, 1, 2 and 4 watt power taps for both 25-volt and 70-volt operation.
- C. The speaker assembly shall be Bogen S86T725, or approved equal.

2.06. DIGITAL SECONDARY CLOCKS

- A. Digital clocks shall be provided in all areas and shall be 2.5" LED type Bogen, RAK Time or Sapling red, or approved equal, 24 VAC

2.07. CLOCK/SPEAKERS GRILLE AND ENCLOSURE

- A. The digital clock/speaker grille shall include a faceplate with white painted finish, integral clock mounting bracket, and integral speaker mounting bracket. The combination wall boxes shall be 16-gauge minimum. Boxes shall be installed flush as indicated on the drawings. Lowell DC802-DF Grill. Lowell RE1175 Back Box, or approved equal.

2.08. CABLE

- A. General: All cable shall be suitable for Class 2 Circuit use. Minimum conductor size shall be #18 AWG. Cable shall be rated CL2, CL2R or CL2P. CL2 cable shall not be used for riser cables. Cable installed in environmental air spaces shall be plenum rated. All paging cable type and color shall be as specified in section 271511, Communication Structured Cabling Systems.
- B. Paging cable shall be one pair #18 gauge solid conductors with an overall vinyl jacket. Cable shall be run in a separate conduit from any other system. Cabling shall be spliced in junction boxes, device boxes, or terminal cabinets. In-line splices are not permitted. Plenum rated as required.
- C. Patch Bay Jumper Cables: Cable shall be provided by vendor.

2.09. ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturers shall be as listed above, and as follows, or approved equal.
 - 1. Speakers: Electro-Voice, Radian,, Atlas, Bogen.
 - 2. Speaker Enclosures: Atlas, Lowell.
 - 3. Control Equipment: Existing Bogen Muticom-2000
 - 4. Cable: West Penn, Belden, Canare.

PART 3 - EXECUTION

3.01. INSTALLATION

- A. Installation of the school clock, intercom and paging system and its components shall be done by, or under the direct supervision of, a factory trained authorized representative of the manufacturer.
- B. The qualified representative of the manufacturer shall coordinate with owner's representative, obtain the school's schedule and calendar year, and completely program the system.

3.02. TESTING

- A. Testing of the school clock, intercom and paging system shall be done by a qualified representative of the manufacturer; who, after completion, shall submit a letter that he has tested the system and found it acceptable in all respects.
- B. Testing shall include ringing out each speaker throughout the facility.

3.03. TRAINING, INSTRUCTION AND ASSISTANCE

- A. After the installation is complete and operating, and prior to acceptance of the work, conduct instruction period(s) at the site, to point out locations of service and maintenance, and instruct the Owner's representatives in the operation of all systems and equipment. Provide one-on-one time with key personnel to show how to program, make changes and point out special features of the system that may not be inherently obvious.
- B. The person(s) who conduct these instructions and demonstrations shall be a qualified representative of the manufacturer with substantial training and operating experience on this equipment and project. Their qualifications shall be submitted to the Owner before conducting the instruction period.
- C. Upon completion of the installation, the contractor shall provide two copies of an operating manual to the owner. A copy of the manual in PDF format on a CD shall also be provided.
- D. Operational guidelines and an intercommunication system extension directory shall be given in written form in sufficient numbers so that all key personnel have operational instructions of programming, station use, and special features.

- E. Each period shall include preliminary discussion and presentation of information using the actual maintenance manuals required for this project. Contractor shall notify Owner at least 48 hours in advance of readiness to conduct the instruction period. The actual time and date of instruction period shall be acceptable to the Owner and the Contractor.

3.04. WARRANTY

- A. A five-year manufacturer's warranty shall be provided covering all components, equipment, and software. A copy of the five-year manufacturer's warranty shall be submitted in writing with system documentation. The warranty period shall begin on the substantial completion date.
- B. A two-year warranty on the installation of the system shall also be provided. A copy of the two-year warranty shall be submitted in writing with system documentation. Should any trouble develop within this period from the date of acceptance of the work, the contractor shall promptly make all required corrections without cost to the owner. The warranty period shall begin on the substantial completion date.

End of Section 27 51 23