GASTINEAU ELEMENTARY SCHOOL RENOVATION

EED No. DR 10-101

VOLUME I OF III

Divisions 0 through 7

Contract No. E11-137

File No. 1680

ENGINEERING DEPARTMENT

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SECTION 00030 - NOTICE INVITING BIDS

OBTAINING CONTRACT DOCUMENTS. The Contract Documents are entitled:

Gastineau Elementary School Renovation
CBJ Contract No. E11-137

The Contract Documents may be obtained at the CBJ Engineering Department, 3rd Floor Marine View Center, upon payment of **$100.00** (non-refundable) for each set of Contract Documents (including Technical Specifications and Drawings.)

PRE-BID CONFERENCE. Prospective Bidders are encouraged to attend a Pre-Bid conference of the proposed WORK, which will be conducted by the OWNER and ARCHITECT, on December 7, 2010, at 3:00 p.m., with a walk through to follow, at Gastineau Elementary School, 1503 3rd St. in Douglas, Alaska. The object of the conference is to acquaint Bidders with the bid documents and site conditions.

DESCRIPTION OF WORK. The Gastineau Elementary School Renovation project will be undertaken in two summer construction seasons. The project will upgrade the school site with asphalt paving, concrete walls and flatwork, landscaping, lighting, utilities, furnishings. The project will perform comprehensive renovations to school building including the following work: hazardous material abatement, concrete, masonry, structural steel, metal fabrications, gratings, wood and metal framing, casework & countertops, insulation, roofing, metal siding & flashing, doors, windows, GWB, carpet, linoleum tile, ceramic tile, athletic flooring, painting, wall coverings, ACT & specialty ceilings, specialties, fixed furnishings, commercial kitchen equipment, plumbing, fire sprinklers, HVAC, controls, electrical power & lighting, and special electrical systems, and other WORK described in the Contract Documents. There are eight Additive Alternates with this project.

COMPLETION OF WORK.

Work Description	**Completion Date**
Season One – Site available for construction May 29 to August 21, 2011	Substantial Completion: August 8, 2011
Season Two – Site available for construction May 31 to August 23, 2012	Substantial Completion: August 13, 2012

DEADLINE FOR BIDS: Sealed bids must be received by the Purchasing Division **prior to 2:00 p.m., Alaska Time on December 21, 2010,** or such later time as may be announced by addendum at any time prior to the deadline. Bids will be time and date stamped by the Purchasing Division, which will establish the official time of receipt of bids. Bids will be opened immediately thereafter in the Assembly Chambers of the Municipal Building, 155 S. Seward Street, unless otherwise specified.

Bid documents delivered in person or by courier service must be delivered to:

PHYSICAL LOCATION:
City and Borough of Juneau, Purchasing Division
105 Municipal Way, Room 300
Juneau, AK 99801

Bid documents delivered by the U.S. Postal Service must be mailed to:

MAILING ADDRESS:
City and Borough of Juneau, Purchasing Division
155 South Seward Street

SECTION 00030 - NOTICE INVITING BIDS

Juneau, AK 99801

Please affix the label below to outer envelope in the lower left hand corner.

IMPORTANT NOTICE TO BIDDER		
To submit your Bid: 1. Print your company name and address on the upper left corner of your envelope. **2. Complete this label and place it on the lower left corner of your envelope.**		
S **E** **A** **L** **E** **D**	**BID NUMBER:** **E11-137** **SUBJECT:** **Gastineau Elementary School Renovation** **DEADLINE DATE:** _____ **PRIOR TO 2:00PM ALASKA TIME**	**B** **I** **D**

Mailing/delivery times to Alaska may take longer than other areas of the U.S. Late bids will not be accepted and will be returned.

SITE OF WORK. The site of the WORK is located in Gastineau Elementary School, 1507 3rd Street in Douglas, Alaska.

BIDDING, CONTRACT, or TECHNICAL QUESTIONS. All communications relative to this WORK, prior to opening Bids, shall be directed to the following:

Jennifer Mannix, Contract Administrator
CBJ Engineering Department, 3rd Floor, Marine View Center
jennifer_mannix@ci.juneau.ak.us
Telephone: (907) 586-0873
Fax: (907) 586-4530

BID SECURITY. Each Bid shall be accompanied by a certified or cashier's check or Bid Bond, in the amount of 5% percent of the Bid, payable to the City and Borough of Juneau, Alaska, as a guarantee that the Bidder, if its Bid is accepted, will promptly execute the Agreement. A Bid shall not be considered unless one of the forms of Bidder's security is enclosed with it.

CONTRACTOR'S LICENSE. All contractors are required to have a current Alaska Contractor's License, prior to submitting a Bid, and a current Alaska Business License prior to award.

BID TO REMAIN OPEN. The Bidder shall guarantee the Bid for a period of 90 Days from the date of Bid opening. Any component of the Bid, including Additive Alternates, and may be awarded anytime during the 90 Days.

OWNER'S RIGHTS RESERVED. The OWNER reserves the right to reject any or all Bids, to waive any informality in a Bid, and to make award to the lowest responsive, responsible Bidder as it may best serve the interests of the OWNER.

SECTION 00030 - NOTICE INVITING BIDS

OWNER: City and Borough of Juneau

By: _____ 11-18-10

Jennifer Mannix, Contract Administrator Date

END OF SECTION

SECTION 00031 – SPECIAL NOTICE TO BIDDERS

PART 1 - GENERAL

1.1 SPECIAL NOTICE

A. Bidders are hereby alerted that this Project, Gastineau Elementary School Renovation, E11-137, is subject to a Project Labor Agreement (PLA). It shall be understood that the PLA is an exclusive agreement between the eventual CONTRACTOR (and Subcontractors) and the organized labor unions. The City and Borough of Juneau (also known as OWNER), the ARCHITECT, and the Design Professionals of Record are not members of this agreement and play no role in its implementation or administration.

NOTE: The terms and conditions of the Project Labor Agreement for this project are currently being negotiated. The final agreement will be added to this contract by addendum.

SECTION 00100 - INSTRUCTIONS TO BIDDERS

1.0 DEFINED TERMS. Terms used in these Instructions to Bidders and the Notice Inviting Bids, which are defined in the General Conditions, have the meanings assigned to them in the General Conditions. The term "Bidder" means one who submits a Bid directly to the OWNER, as distinct from a sub-bidder, who submits a Bid to a Bidder.

2.0 INTERPRETATIONS AND ADDENDA.

A. INTERPRETATIONS. All questions about the meaning or intent of the Contract Documents are to be directed to the Engineering Contracts Administrator. Interpretations or clarifications considered necessary by the Engineering Contracts Administrator in response to such questions will be issued by Addendum, mailed, faxed, or delivered to all parties recorded by the Engineering Contracts Administrator, or OWNER, as having received the Contract Documents. Questions received less than seven Days prior to the Deadline for Bids may not be answered. Only questions answered by formal written Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect.

B. ADDENDA. Addenda may be issued to modify the Contract Documents as deemed advisable by the OWNER. Addenda may be faxed or, if addendum format warrants, addenda may be posted to the CBJ Engineering Department website. In any event, notification of addendum issuance will be faxed to planholders. Hard copies are available upon request. The OWNER will make all reasonable attempts to ensure that all planholders receive notification of Addenda, however, it is strongly recommended by the OWNER that bidders independently confirm the contents, number, and dates of each Addendum prior to submitting a Bid.

3.0 FAIR COMPETITION. More than one Bid from an individual, firm, partnership, corporation, or association under the same or different names will not be considered. If the OWNER believes that any Bidder is interested in more than one Bid for the WORK contemplated, all Bids in which such Bidder is interested will be rejected. If the OWNER believes that collusion exists among the Bidders, all Bids will be rejected.

4.0 RESPONSIBLE BIDDER. Only responsive Bids from responsible Bidders will be considered. A Bid submitted by a Bidder determined to be not responsible may be rejected. A responsible Bidder is one who is considered to be capable of performing the WORK.

1. financial resources
2. ability to meet delivery standards
3. past performance record
    a. References from others on contractor’s performance
    b. Record of performance on prior OWNER contracts
4. record of integrity
5. obligations to OWNER
    a. Bidders must be registered as required by law and in good standing for all amounts owed to the OWNER within ten Days of OWNER’s Notice of Intent to Award.

b. City and Borough of Juneau (CBJ) Finance Department, Treasury Division administers the registration and assessment of sales, business personal property and business real property taxes.

A. Special standards for responsibility, if applicable, will be specified. These special standards establish minimum standards or experience required for a responsible Bidder on a specific contract.

B. Before a Bid is considered for award, a Bidder may be requested to submit information documenting its ability and competency to perform the WORK, according to general standards of responsibility and any special standards which may apply. It is Bidder's responsibility to submit sufficient, relevant, and adequate information. OWNER will make its determination of responsibility and has no obligation to request clarification or supplementary information.

5.0 NON-RESPONSIVE BIDS. Only responsive Bids will be considered. Bids may be considered non-responsive and may be rejected. Some of the reasons a Bid may be rejected for being non-responsive are:

A. If a Bid is received by the CBJ Purchasing Division after the Deadline for Bids.

B. If the Bid is on a form other than that furnished by the OWNER, or legible copies thereof; or if the form is altered or any part thereof is detached; or if the Bid is improperly signed.

C. If there are unauthorized additions, conditional or alternate Bids, or irregularities of any kind which may tend to make the bid incomplete, indefinite, ambiguous as to its meaning, or in conflict with the OWNER's Bid document.

D. If the Bidder adds any unauthorized conditions, limitations, or provisions reserving the right to accept or reject any award, or to enter into a contract pursuant to an award. This does not exclude a Bid limiting the maximum gross amount of awards acceptable to any one Bidder at any one Bid opening, provided that any selection of awards will be made by the OWNER.

E. If the Bid does not contain a Unit Price for each pay item listed, except in the case of authorized alternate pay items.

F. If the Bidder has not acknowledged receipt of each Addendum.

G. If the Bidder fails to furnish an acceptable Bid guaranty with the Bid.

H. If any of the Unit Prices Bid are excessively unbalanced (either above or below the amount of a reasonable Bid) to the potential detriment of the OWNER.

I. If a Bid modification does not conform to Article 15.0 of this Section.

6.0 BIDDER'S EXAMINATION OF CONTRACT DOCUMENTS AND SITE. It is the responsibility of each Bidder before submitting a Bid:

A. To examine thoroughly the Contract Documents, and other related data identified in the Bidding documents (including "technical data" referred to below):

1. To visit the site to become familiar with and to satisfy the Bidder as to the general and local conditions that may affect cost, progress, or performance, of the WORK,
2. To consider federal, state and local laws and regulations that may affect cost, progress, or performance of the WORK,
3. To study and carefully correlate the Bidder's observations with the Contract Documents, and other related data; and
4. To notify the ARCHITECT of all conflicts, errors, or discrepancies in or between the Contract Documents and such other related data.

7.0 REFERENCE IS MADE TO THE SUPPLEMENTARY GENERAL CONDITIONS FOR IDENTIFICATION OF:

A. Those reports of explorations and tests of subsurface conditions at the site which have been utilized by the Architect of Record in the preparation of the Contract Documents. The Bidder may rely upon the accuracy of the technical data contained in such reports, however, the interpretation of such technical data, including any interpolation or extrapolation thereof, together with non-technical data, interpretations, and opinions contained therein or the completeness thereof is the responsibility of the Bidder.

B. Those Drawings of physical conditions in or relating to existing surface and subsurface conditions (except underground utilities) which are at or contiguous to the site have been utilized by the Architect of Record in the preparation of the Contract Documents. The Bidder may rely upon the accuracy of the technical data contained in such Drawings, however, the interpretation of such technical data, including any interpolation or extrapolation thereof, together with nontechnical data, interpretations, and opinions contained in such Drawings or the completeness thereof is the responsibility of the Bidder.

C. Copies of such reports and Drawings will be made available by the OWNER to any Bidder on request if said reports and Drawings are not bound herein. Those reports and Drawings are not part of the Contract Documents, but the technical data contained therein upon which the Bidder is entitled to rely, as provided in Paragraph SGC-4.2 of the Supplementary General Conditions, are incorporated herein by reference.

D. Information and data reflected in the Contract Documents with respect to underground utilities at or contiguous to the site is based upon information and data furnished to the OWNER and the Architect of Record by the owners of such underground utilities or others, and the OWNER does not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary General Conditions, or in Section 01530 - Protection and Restoration of Existing Facilities of the General Requirements.

E. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders on subsurface conditions, underground utilities and other physical conditions, and possible changes in the Contract Documents due to differing conditions appear in Paragraphs 4.2, 4.3, and 4.4 of the General Conditions.

F. Before submitting a Bid, each Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests, and studies and obtain any additional information and data which pertain to the physical conditions (surface, subsurface,

and underground utilities) at or contiguous to the site or otherwise which may affect cost, progress, or performance of the WORK and which the Bidder deems necessary to determine its Bid for performing the WORK in accordance with the time, price, and other terms and conditions of the Contract Documents.

G. On request in advance, the OWNER will provide each Bidder access to the site to conduct such explorations and tests as each Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and shall clean up and restore the site to its former condition upon completion of such explorations.

H. The lands upon which the WORK is to be performed, rights-of-way and easements for access thereto and other lands designated for use by the CONTRACTOR in performing the WORK are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by the CONTRACTOR. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by the OWNER unless otherwise provided in the Contract Documents.

I. The submission of a Bid will constitute an incontrovertible representation by the Bidder that the Bidder has complied with every requirement of Article 6.0, "Bidder's Examination of Contract Documents and Site" herein, that without exception the Bid is premised upon performing the WORK required by the Contract Documents and such means, methods, techniques, sequences, or procedures of construction as may be indicated in or required by the Contract Documents, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the WORK.

8.0 BID FORM.

A. The Bid shall be made on the Bid Schedule(s) bound herein, or on the yellow Bid packet provided, or on legible and complete copies thereof, and shall contain the following: Sections 00300, 00310, the required Bid Security, and any other documents required in Section 00300 – Bid.

B. All blanks on the Bid Form and Bid Schedule must be completed in ink or typed.

C. Bids by corporations must be executed in the corporate name by the president, a vice-president (or other corporate officer). The corporate address and state of incorporation must appear below the signature.

D. Bids by partnerships must be executed in the partnership name and be signed by a managing partner, and the official address of the partnership must appear below the signature.

E. The Bidder’s Bid must be signed. All names must be printed or typed below the signature.

F. The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid form. Failure to acknowledge Addenda may render Bid non-responsive and may cause its rejection.

G. The address to which communications regarding the Bid are to be directed must be shown.

9.0 QUANTITIES OF WORK. The quantities of WORK, or material, stated in Unit Price items of the Bid are supplied only to give an indication of the general scope of the WORK; the OWNER does not expressly or by implication agree that the actual amount of WORK, or material, will correspond therewith, and reserves the right after award to increase or decrease the amount of any Unit Price item of the WORK by an amount up to and including 25 percent of any Bid item, without a change in the Unit Price, and shall include the right to delete any Bid item in its entirety, or to add additional Bid items up to and including an aggregate total amount not to exceed 25 percent of the Contract Price (see Section 00700 - General Conditions, Article 10 Changes In the WORK).

10.0 SUBSTITUTE OR "OR-EQUAL" ITEMS. The procedure for the submittal of substitute or "or-equal" products is specified in Section 01300 - Submittals.

11.0 SUBMISSION OF BIDS. The Bid shall be delivered by the time and to the place stipulated in Section 00030 - Notice Inviting Bids. It is the Bidder's sole responsibility to see that its Bid is received in proper time. Oral, telegraphic, emailed, or faxed Bids will not be considered. The envelope enclosing the sealed Bids shall be plainly marked in the upper left-hand corner with the name and address of the Bidder and shall also include the label included in Section 00030 – Notice Inviting Bids. The Bid Security shall be enclosed in the same envelope with the Bid

12.0 BID SECURITY, BONDS, AND INSURANCE. Each Bid shall be accompanied by a certified, or cashier's check, or approved Bid Bond in an amount of at least 5 percent of the total Bid price. The “total Bid price” is the amount of the Base Bid, plus the amount of alternate Bids, if any, which total to the maximum amount for which the CONTRACT could be awarded. Said check or Bond shall be made payable to the OWNER and shall be given as a guarantee that the Bidder, if offered the WORK, will enter into an Agreement with the OWNER, and will furnish the necessary insurance certificates, Payment Bond, and Performance Bond; each of said Bonds, if required, and insurance amounts shall be as stated in the Supplementary General Conditions. In case of refusal or failure to enter into said Agreement, the check or Bid Bond, as the case may be, may be forfeited to the OWNER. If the Bidder elects to furnish a Bid Bond as its Bid security, the Bidder shall use the Bid Bond form bound herein, or one conforming substantially to it in form. Bid Bonds must be accompanied by a legible Power of Attorney.

13.0 RETURN OF BID SECURITY. The OWNER will return all Bid security checks (certified or cashier’s) accompanying such of the Bids as are not considered in making the award. All other Bid securities will be held until the Agreement has been executed. Following execution of the Agreement, all other Bid security checks will be returned to the respective Bidders whose Bids they accompanied and Bid security bonds will be appropriately discarded.

14.0 DISCREPANCIES IN BIDS. In the event there is more than one Pay Item in a Bid Schedule, the Bidder shall furnish a price for all Pay Items in the schedule, and failure to do so may render the Bid non-responsive and cause its rejection. In the event there are Unit Price Pay Items in a Bid Schedule and the “amount” indicated for a Unit Price Bid Item does not equal the product of the Unit Price and quantity, the Unit Price shall govern and the amount will be corrected accordingly, and the Bidder shall be bound by said correction. In the event there is more than one Pay Item in a Bid Schedule and the total indicated for the schedule does not agree with the sum of the prices Bid on the individual items, the prices Bid on the individual items shall govern and the total for the schedule will be corrected accordingly, and the Bidder shall be bound by said correction.

15.0 BID MODIFICATIONS AND UNAUTHORIZED ALTERNATIVE BIDS.

A. Any bidder may deliver a modification to a bid in person, by mail or fax (907-586-4561), provided that such modification is received by the Purchasing Division no later than the deadline for bids. Modifications will be time and date stamped by the Purchasing Division, which will establish the official time of receipt of the modification. The modification must not reveal the bid price but should be in the form of an addition or subtraction or other modification so that the final prices will not be known until the sealed bid is opened.

The Bid modifications shall be provided on the **Bid Modification Form** located at the end of this Section. Submittal of any other form by the vendor may deem the modification unacceptable by the OWNER **A mail or fax modification should not reveal the Bid price but should provide the addition or subtraction or other modification so that the final prices will not be known by the City and Borough until the sealed Bid is opened.** Submitted Modification forms shall include the modification to the unit price or lump sum amount of each pay item modified.

FAX DISCLAIMER: It is the responsibility of the bidder to submit modifications in a timely manner. Bidders' use of a fax machine to modify their bid shall be at bidders' sole risk. The Purchasing Division will attempt to keep the fax machine in good working order but will not be responsible for bid modifications that are late due to mechanical failure, a busy fax machine, or any other cause arising from bidder's use of a fax machine, even if bidder submits a transmission report or provides other confirmation indicating that the bidder transmitted a bid modification prior to the deadline. The City will not be responsible for its failure to receive the modification whether such failure is caused by equipment or human error, or otherwise. Bidders are therefore strongly encouraged to confirm receipt of their bid modification with the Purchasing Division (907-586-5258) prior to deadline.

B. Conditioned bids, limitations, or provisos attached to the Bid or bid modification will render it unauthorized and cause its rejection as being non-responsive. The completed Bid forms shall be without interlineations, alterations, or erasures in the printed text. All changes shall be initialed by the person signing the Bid. Alternative Bids will not be considered unless called for.

16.0 WITHDRAWAL OF BID. Prior to the Deadline for Bids, the Bid may be withdrawn by the Bidder by means of a written request, signed by the Bidder or its properly authorized representative. Such written request must be delivered to the place stipulated in the Notice Inviting Bids for receipt of Bids.

17.0 AWARD OF CONTRACT.

A. Award of a contract, if it is awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Technical Specifications and will be made to the lowest responsive, responsible Bidder whose Bid complies with all the requirements prescribed. Unless otherwise specified, any such award will be made within the period stated in the Notice Inviting Bids that the Bids are to remain open. Unless otherwise indicated, a single award will be made for all the Bid items in an individual Bid Schedule.

B. If the OWNER has elected to advertise this Project with a Base Bid and Alternates, the OWNER may elect to award the contract for the Base Bid, or the Base Bid in combination with one or more Alternates selected by the OWNER. In either case, award shall be made to the responsive, responsible bidder offering the lowest total Bid for the WORK to be awarded.

C. Low Bidder will be determined on the basis of the lowest total of the Base Bid plus combinations of Alternates if funding allows, as selected by the Selection Committee through the process described below.

1 Prior to the Deadline for Bids, a Selection Committee will be appointed by the Owner.
2 The Selection Committee will be sequestered in a conference room apart from the bid opening room at the time of bid opening.
3 The CBJ Purchasing staff will open bids. A bid summary sheet will be compiled without bidder identification, so that the Selection Committee will have no knowledge of which bids were made by which bidders.
4 The bid summary sheet will be delivered to the Selection Committee by the Engineering Contract Administrator.
5 The Selection Committee will choose the low bid comprised of the Base Bid and those Alternates deemed to be in the best interest of the project and within the approved construction budget. For award purposes, the CBJ will add any Alternate to the Total Base Bid Amount in Section 00310 – Bid Schedule.
6 The Selection Committee will identify in order from low to high the bids received for the project and the results will be posted.

18.0 EXECUTION OF AGREEMENT.

A. All Bids of value greater than $1,000,000 must be approved by the CBJ Assembly. After the CBJ Assembly has approved the award and after the Bid protest period, the OWNER will issue a Notice of Intent to Award to the approved Bidder. The Bidder to whom award is made shall execute a written Agreement with the OWNER on the Agreement form, Section 00500, collect insurance, and shall furnish all certificates and Bonds required by the Contract Documents within 10 Days (calendar) from the date of the Notice of Intent to Award letter.

B. Failure or refusal to enter into the Agreement as herein provided or to conform to any of the stipulated requirements in connection therewith shall be just cause for annulment of the award and forfeiture of the Bid security. If the lowest responsive, responsible Bidder refuses or fails to execute the Agreement, the OWNER may award the contract to the second lowest responsive, responsible Bidder. If the second lowest responsive, responsible Bidder refuses or fails to execute the Agreement, the OWNER may award the contract to the third lowest responsive, responsible Bidder. On the failure or refusal of such second or third lowest Bidder to execute the Agreement, each such Bidder's Bid securities shall be likewise forfeited to the OWNER.

19.0 LIQUIDATED DAMAGES. Provisions for liquidated damages if any, are set forth in Section 00500 - Agreement.

20.0 FILING A PROTEST.

A. A Bidder may protest the proposed award of a competitive sealed Bid by the City and Borough of Juneau. The protest shall be executed in accordance with CBJ Ordinance 53.50.062 PROTESTS and CBJ Ordinance 53.50.080 ADMINISTRATION OF PROTEST. The entire text of the CBJ Purchasing Ordinance can be accessed at the CBJ website, *http://www.juneau.org/law/code/code.php*, or call the CBJ Purchasing Division at (907) 586-5258 for a copy of the ordinance.

B. Late protests shall not be considered by the CBJ Purchasing Officer.

C. This project is funded with Alaska Department of Education and Early Development funds; per 4 AAC 31.080 (c), the written Bid protest shall be filed within 10 Calendar Days after the Notice of Intended Award of the contract has been issued. The written protest shall, at a minimum, contain the following:

- the name, address and telephone number of the interested party filing the protest;
- the signature of the interested party;
- identification of the proposed award at issue;
- statement of legal or factual ground for protest;
- copies of all relevant documents;
- protest fee.

21.0 JUNEAU BUSINESS SALES AND PERSONAL PROPERTY TAX: Vendors/merchants conducting business within the City are required by law to register with, and periodically report to, the City for sales and property taxes. CONTRACTORs and Subcontractors must be in good standing with the City prior to award, and prior to any contract renewals, and in any event no later than ***ten Days (calendar)*** following notification by the City of intent to award. **Good standing** means: all amounts owed to the City are paid in full, including Confession of Judgments; and vendor/merchant is current in reporting (sales tax filings, business personal property declarations). Failure to meet these requirements, if so subject, may be cause for rejection of your bid. To determine if your business is in good standing, or for further information, contact the City Finance Department's Sales Tax Division, at (907) 586-5265, concerning sales tax and/or Treasury Division, at (907) 586-5268, concerning business personal property and real property tax.

22.0 PERMITS AND LICENSES. The CONTRACTOR is responsible for all WORK associated with meeting any local, state, and/or federal permit and licensing requirements.

CITY AND BOROUGH OF JUNEAU
PURCHASING DIVISION
FAX NO. 907-586-4561

BID MODIFICATION FORM

Modification Number: _____

Note: All modifications shall be made to the original bid amount(s). If more than one Modification form is submitted by any one bidder, changes from all Modification forms submitted will be combined and applied to the original bid. Changes to the modified Bid amounts will be calculated by the OWNER.

PAY ITEM NO.	PAY ITEM DESCRIPTION	MODIFICATIONS TO UNIT PRICE OR LUMP SUM (*indicate* +/-)

Total Increase or Decrease: $_____

_____
Name of Bidding Firm

_____
Responsible Party Signature

_____
Printed Name (must be an authorized signatory for Bidding Firm)

END OF SECTION

SECTION 00300 - BID

BID TO: THE CITY AND BOROUGH OF JUNEAU

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with the OWNER in the form included in the Contract Documents (as defined in Article 7 of Section 00500 - Agreement) to perform the WORK as specified or indicated in said Contract Documents entitled

Gastineau Elementary School Renovation
CBJ Contract No. E11-137

2. Bidder accepts all of the terms and conditions of the Contract Documents, including without limitation those in the "Notice Inviting Bids" and "Instructions to Bidders," dealing with the disposition of the Bid Security.

3. This Bid will remain open for the period of time stated in the "Notice Inviting Bids" unless otherwise required by law. Bidder will enter into an Agreement within the time and in the manner required in the "Notice Inviting Bids" and the "Instructions to Bidders," and will furnish insurance certificates, Payment Bond, Performance Bond, and any other documents as may be required by the Contract Documents.

4. Bidder has familiarized itself with the nature and extent of the Contract Documents, WORK, site, locality where the WORK is to be performed, the legal requirements (federal, state and local laws, ordinances, rules, and regulations), and the conditions affecting cost, progress or performance of the WORK and has made such independent investigations as Bidder deems necessary.

5. This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any person, firm or corporation to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.

6. To all the foregoing, and including all Bid Schedule and information required of Bidder contained in this Bid Form, said Bidder further agrees to complete the WORK required under the Contract Documents within the Contract Time stipulated in said Contract Documents, and to accept in full payment therefore the Contract Price based on the total bid price(s) named in the aforementioned Bid Schedule.

7. Bidder has examined copies of all the Contract Documents including the following Addenda (receipt of all of which is hereby acknowledged by the Undersigned):

Addenda No.	Date Issued	Addenda No.	Date Issued

Give number and date of each addenda above. Failure to acknowledge receipt of all Addenda may cause the Bid to be non-responsive and may cause its rejection.

8. The Bidder has read this Bid and agrees to the conditions as stated herein by signing his/her signature in the space provided below.

Dated: _____	Bidder: _____ (Company Name)
Alaska CONTRACTOR's Business License No: _____	By: _____ (Signature)
Alaska CONTRACTOR's License No: _____	Printed Name: _____
	Title: _____
Telephone No: _____	Address: _____ (Street or P.O. Box)
Fax No: _____	_____ (City, State, Zip)

9. TO BE CONSIDERED, ALL BIDDERS MUST COMPLETE AND INCLUDE THE FOLLOWING AT THE TIME OF THE BID OPENING:

- Bid, Section 00300 (includes addenda receipt statement)
- Completed Bid Schedule, Section 00310
- Bid Security (Bid Bond, Section 00320, or by a certified or cashier's check as stipulated in the Notice Inviting Bids, Section 00030)

10. The apparent low Bidder is required to complete and submit the following documents by 4:30 p.m. on the ***fifth business day*** following the date of the Posting Notice.

- Subcontractor Report, Section 00360

The apparent low Bidder who fails to submit a completed Subcontractor Report within the time specified in Section 00360 – Subcontractor Report will be found to be not a responsible Bidder and may be required to forfeit the Bid security. The OWNER will then consider the next lowest Bidder for award of the contract.

11. The successful Bidder will be required to submit, within ***ten Days (calendar)*** after the date of the "Notice of Intent to Award" letter, the following executed documents:

- Agreement Forms, Section 00500
- Performance Bond, Section 00610
- Payment Bond, Section 00620
- Certificates of Insurance, (CONTRACTOR) Section 00700 and Section 00800

END OF SECTION

SECTION 00310 - BID SCHEDULE

Bid Schedule for construction of **E11-137, named Gastineau Elementary School Renovation**, in accordance with the Contract Documents.

A. **BASE BID** - Furnish all labor, equipment and materials for the following work as defined in the Contract Documents:

1. Site improvements including paving, concrete walls and flatwork, lighting, and utilities.
2. New structure to facilitate new mechanical penthouses and commons areas. Improvements to existing structure and concrete slab repairs to facilitate new plumbing and structure.
3. Exterior envelope upgrades including new metal siding and roofing at new structure, new metal siding at existing EIFS, painting, and new windows and doors at select locations.
4. Replacement of architectural finishes throughout most of facility interior spaces, as well as new casework, doors, and fixed furnishings. Some reconfiguration of interior spaces and the installation of a new commercial kitchen.
5. Replacement of heating and ventilation systems in most of the facility, plumbing replacement and reconfiguration, upgrade of fire sprinkler system, upgrade of BAS controls, and complete renovation of existing boiler room.
6. Replacement of special electrical systems including data, intercom, fire alarm, and communications. Upgrade of existing access control system. Replacement and upgrade of electrical power and lighting systems in most of facility.
7. Abatement of hazardous materials including removal of ACM substrate under carpet in throughout the facility, abatement of lead containing materials, abatement of light fixtures, and abatement of limited ACM associated with mechanical and architectural demolition.
8. Completion of LEED certification for construction submittals as defined in project specifications.
9. Phased construction over two summer construction seasons with installation of temporary partitions and building systems as required for building occupancy use and operation in the intervening school year.

BASE BID **$**_____

(Price in Figures)

ADDITIVE ALTERNATE NO. 1 - Furnish all labor, equipment and materials and perform all WORK for

Additive Alternate No. 1: Infill Construction at former mid-building entry. The intent of this Additive Alternate is to add additional square footage to the building by infilling a small exterior space between areas C and D. The foundation, wall and glazing, cabinetry, and heating fin-tube assembly included in the Base Bid will be constructed on gridline 1 instead of at the existing building perimeter. The Additive Alternate will include new roof structure, eave, and roof assembly, and new fill and interior slab. Finishes, electrical and lighting identified in Base Bid will be expanded into new area. The ventilation system will be modified for the larger space.

TOTAL ADDITIVE ALTERNATE NO. 1 **$**_____

(Price in Figures)

Bidder Company Name: _____

ADDITIVE ALTERNATE NO. 2 - Furnish all labor, equipment and materials and perform all WORK for

Additive Alternate No. 2: Kitchen Equipment. The intent of this Additive Alternate is to furnish and install equipment identified at the kitchen. In the Base Bid, the space is to be provided with all finishes, blocking, and mechanical and electrical rough-ins prepared for owner installation of all identified kitchen equipment items.

The following Kitchen Equipment as defined on sheet FS-2.0 shall be added to the Base Bid as part of Additive Alternate No. 2:

1. (6) Dry Storage Shelving
2. (1) Reach-in Freezer, One Door
3. (2) Transport Cabinets
4. (1) Pot Rack
5. (1) Filter System (Ice Maker)
6. (1) Ice Maker w/ Bin
7. (1) Utility Cart
8. (1) Convection Microwave
9. (1) Range, Restaurant, Electric
10. (1) Cashier Station
11. (1) Hot Food Station
12. (1) Milk Cooler

TOTAL ADDITIVE ALTERNATE NO. 2 $ _____

(Price in Figures)

ADDITIVE ALTERNATE NO. 3 - Furnish all labor, equipment and materials and perform all WORK for

Additive Alternate No. 3: Civil and Landscape site work, Plan North of building along Douglas Highway, and Plan East of the building along I street. The intent of this Additive Alternate is to provide all components of the civil work between the building and Douglas Highway, and between the building and I Street. Architectural site plan drawings G0.6A and G0.6B describe the Base Bid conditions. Sheets Go.7A and G0.7B describe the Additive Alternate No. 3 scope. The Base Bid includes front entry stairs, ADA ramp, bike racks and canopy, and includes limited curb, walkway, pavement striping and speed bumps and bollards permitting temporary traffic control. With award of Additive Alternate #3, deduct curb and walkways, bollards, striping and speed bumps, and provide the new plaza and associated partial height walls and benches, an additional bike rack, the Drive Lane and Drop Off area with stair and ramp up to entry plaza, sidewalks, site lighting, signage, and flag pole. Along I Street, provide new drop-off and parking designations, with grading adjustments, new paved areas and curbs and signage indicated.

TOTAL ADDITIVE ALTERNATE NO. 3 $ _____

(Price in Figures)

Bidder Company Name: _____

ADDITIVE ALTERNATE NO. 4

Additive Alternate No. 4: Civil and Landscape site work, Plan West of building along Douglas Highway. The intent of this Additive Alternate is to provide all components of the civil work associate with construction the 25-car parking lot on what is presently an undeveloped site. This work includes retaining wall, fencing, concrete ramps with free-standing handrails, stairs, earthwork, site lighting, and landscaping, and the area is describe generally on architectural sheets G0.6B and G0.8. Landscape, civil and site electrical drawings further define the scope of this effort. In the Base Bid, no work is done in this area.

TOTAL ADDITIVE ALTERNATE NO. 4 $ _____

ADDITIVE ALTERNATE NO. 5

Additive Alternate No. 5: Gymnasium upgrades. The intent of this Additive Alternate is to renovate specific components of the gymnasium. First, completely remove the existing gymnasium flooring system and replace it with a new flooring system with court striping. This will include the temporary removal and reinstallation of the bleachers. Second, remove all existing gymnasium lighting and replace it with new lighting and switching specified and noted in the electrical documents. Third, mask all art panels at gymnasium walls. Paint all plywood wall surfaces and unmask all art pieces. The Base Bid includes all other modifications illustrated in the construction documents, including mechanical grill relocation and associate wall patching identified.

TOTAL ADDITIVE ALTERNATE NO. 5 $ _____

ADDITIVE ALTERNATE NO. 6

Additive Alternate No. 6: Mechanical upgrades at fan room 202. The intent of this Additive Alternate is to improve energy performance of the equipment in the indicated space. Base Bid excludes work on this equipment, with the exception of the addition of a sound dampening device at the return air grill at the library wall. The Additive Alternate will include all mechanical and electrical equipment upgrades indicated in this fan room.

TOTAL ADDITIVE ALTERNATE NO. 6 $ _____

ADDITIVE ALTERNATE NO. 7

Additive Alternate No. 7: Video Surveillance System. The intent of this Additive Alternate is to improve facility security. Base Bid excludes Video Surveillance Work, including devices and wiring.. The Additive Alternate will include all electrical equipment and wiring associate with providing the specified system. Coordinate with electrical design.

TOTAL ADDITIVE ALTERNATE NO. 7 $ _____

Bidder Company Name: _____

ADDITIVE ALTERNATE NO. 8

Additive Alternate No. 8: Lighting at covered play area and playground. The intent of this Additive Alternate is to improve building and site lighting at the outdoor covered play area and the playground. Base Bid excludes lighting, conduit and wiring, and suspension systems in the indicated areas. The Additive Alternate will include all equipment components, conduit and wiring associate with providing the specified system. Coordinate with electrical design.

TOTAL ADDITIVE ALTERNATE NO. 8 $ _____

Date: _____ **Bidder:** _____
(Company Name)

END OF SECTION

SECTION 00320 - BID BOND

KNOW ALL PERSONS BY THESE PRESENTS, that_____

_____ as Principal, and _____

as Surety, are held and firmly bound unto **THE CITY AND BOROUGH OF JUNEAU** hereinafter called "OWNER," in the sum of _____

_____ dollars, (not less than five percent of the total amount of the Bid) for the payment of which sum, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, said Principal has submitted a Bid to said OWNER to perform the WORK required under the Bid Schedule of the OWNER's Contract Documents entitled

Gastineau Elementary School Renovation
CBJ Contract No. E11-137

NOW THEREFORE, if said Principal is awarded a contract by said OWNER and, within the time and in the manner required in the "Notice Inviting Bids" and the "Instructions to Bidders" enters into a written Agreement on the form of Agreement bound with said Contract Documents, furnishes the required certificates of insurance, and furnishes the required Performance Bond and Payment Bond, then this obligation shall be null and void, otherwise it shall remain in full force and effect. In the event suit is brought upon this bond by said OWNER and OWNER prevails, said Surety shall pay all costs incurred by said OWNER in such suit, including a reasonable attorney's fee to be fixed by the court.

SIGNED AND SEALED, this _____ day of _____, 20_____.

(SEAL)_____ (SEAL)_____
(Principal) (Surety)

By:_____ By:_____
(Signature) (Signature)

END OF SECTION

SECTION 00360 - SUBCONTRACTOR REPORT

LIST OF SUBCONTRACTORS (AS 36.30.115)

The apparent low Bidder must submit a list of Subcontractors that the Bidder proposes to use in the performance of this contract ***on the fifth business day*** following the Posting Notice of Bids. If the fifth day falls on a weekend or holiday, the report is due by close of business on the next business Day following the weekend or holiday. The Subcontractor Report list must include each Subcontractor's name, address, location, evidence of valid Alaska Business License, and valid Alaska Contractor's Registration under AS 08.18. ***If no Subcontractors are to be utilized in the performance of the WORK, write in ink or type "NONE" on line (1) below***

	SUBCONTRACTOR ADDRESS	[1] AK Contractor License No. [2] AK Business License No.	[1] Contact Name [2] Phone No.	Type of Work	Contract Amount	✓ if DBE
1.		[1] [2]			$	☐
2.		[1] [2]			$	☐
3.		[1] [2]			$	☐
4.		[1] [2]			$	☐
5.		[1] [2]			$	
6.		[1] [2]			$	☐

SECTION 00360 - SUBCONTRACTOR REPORT

	SUBCONTRACTOR ADDRESS	License No. [2]AK Business License No. [1] AK Contractor	[1] Contact Name [2] Phone No.	Type of Work	Contract Amount	✓ if DBE
7.	_____	[1] _____ [2] _____	_____ _____	_____	$ _____	☐
8.	_____	[1] _____ [2] _____	_____ _____	_____	$ _____	☐
9.	_____	[1] _____ [2] _____	_____ _____	_____	$ _____	☐
10.	_____	[1] _____ [2] _____	_____ _____	_____	$ _____	☐
11.	_____	[1] _____ [2] _____	_____ _____	_____	$ _____	☐
12.	_____	[1] _____ [2] _____	_____ _____	_____	$ _____	☐

I certify that the above listed Alaska Business License(s) and CONTRACTOR Registration(s), if applicable, were valid at the time Bids were opened for this Project.

_____
CONTRACTOR, Authorized Signature

_____
CONTRACTOR, Printed Name

_____
COMPANY

SECTION 00360 - SUBCONTRACTOR REPORT

A. A Bidder may replace a listed Subcontractor if the Subcontractor:

1. fails to comply with AS 08.18;
2. files for bankruptcy or becomes insolvent;
3. fails to execute a contract with the Bidder involving performance of the WORK for which the Subcontractor was listed and the Bidder acted in good faith;
4. fails to obtain bonding;
5. fails to obtain insurance acceptable to the OWNER;
6. fails to perform the contract with the Bidder involving work for which the Subcontractor was listed;
7. must be substituted in order for the CONTRACTOR to satisfy required state and federal affirmative action requirements;
8. refuses to agree or abide with the Bidder's labor agreement; or
9. is determined by the OWNER not to be responsible.

B. If a Bidder fails to list a Subcontractor or lists more than one Subcontractor for the same portion of WORK, the Bidder shall be considered to have agreed to perform that portion of WORK without the use of a Subcontractor and to have represented the Bidder to be qualified to perform that WORK.

C. A Bidder who attempts to circumvent the requirements of this section by listing as a Subcontractor another contractor who, in turn, sublets the majority of the WORK required under the contract violates this section.

D. If a contract is awarded to a Bidder who violates this section, the OWNER may:

1. cancel the contract; or
2. after notice and a hearing, assess a penalty on the Bidder in an amount that does not exceed 10 percent of the value of the subcontract at issue.

E. On the Subcontractor Report, the apparent low Bidder must list any Subcontractors anticipated to perform WORK with a value of greater than one-half of one percent of the intended award amount, or $2,000, whichever is less.

F. An apparent low Bidder who fails to submit a completed Subcontractor Report within the time specified in this section will be found to be not a responsible Bidder and may be required to forfeit the Bid security. The OWNER will then consider the next lowest Bidder for award of the contract.

END OF SECTION

SECTION 00500 - AGREEMENT

THIS AGREEMENT is between **THE CITY AND BOROUGH OF JUNEAU** (hereinafter called OWNER) and _____ (hereinafter called CONTRACTOR) OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1. WORK.

CONTRACTOR shall complete the WORK as specified or as indicated under the Bid Schedule of the OWNERS Contract Documents **Contract E11-137, named Gastineau Elementary School Renovation.**

The WORK is generally described as follows: The Gastineau Elementary School Renovation project will be undertaken in two summer construction seasons. The project will upgrade the school site with asphalt paving, concrete walls and flatwork, landscaping, lighting, utilities, furnishings. The project will perform comprehensive renovations to school building including the following work: hazardous material abatement, concrete, masonry, structural steel, metal fabrications, gratings, wood and metal framing, casework & countertops, insulation, roofing, metal siding & flashing, doors, windows, GWB, carpet, linoleum tile, ceramic tile, athletic flooring, painting, wall coverings, ACT & specialty ceilings, specialties, fixed furnishings, commercial kitchen equipment, plumbing, fire sprinklers, HVAC, controls, electrical power & lighting, and special electrical systems and all other WORK described in the Contract Documents. There are 8 Additive Alternates with this project.

The WORK to be paid under this contract shall include the following: Base Bid and Additive Alternate Nos. 1 through 8, as shown in Section 00310 - Bid Schedule.

ARTICLE 2. CONTRACT COMPLETION TIME.

Work Description	**Completion Date**
Season One – Site available for construction May 29 to August 21, 2011	Substantial Completion: August 8, 2011
Season Two – Site available for construction May 31 to August 23, 2012	Substantial Completion: August 13, 2012

ARTICLE 3. DATE OF AGREEMENT

The date of this agreement will be the date of the last signature on page three of this section.

ARTICLE 4. LIQUIDATED DAMAGES.

OWNER and the CONTRACTOR recognize that time is of the essence of this Agreement and that the OWNER will suffer financial loss if the WORK is not completed within the time specified in Article 2 herein, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense, and difficulties involved in proving in a legal proceeding the actual damages suffered by the OWNER if the WORK is not completed on time. Accordingly, instead of requiring any such proof, the OWNER and the CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) the CONTRACTOR shall pay the OWNER **$1,000.00** for each Day that expires after the completion time(s) specified in Article 2 herein. The amount of liquidated damages specified above is agreed to be a reasonable estimate based on all facts known as of the date of this Agreement.

ARTICLE 5. CONTRACT PRICE.

OWNER shall pay CONTRACTOR for completion of the WORK in accordance with the Contract Documents in current funds the amount set forth in the Bid Schedule. The CONTRACTOR agrees to accept as full and complete payment for all WORK to be done in this contract for: **CBJ Contract E11-137, named Gastineau Elementary School Renovation ,** those Lump Sum amounts as set forth in the Bid Schedule in the Contract Documents for this Project.

The total amount of this contract shall be _____ ($ _____), except as adjusted in accordance with the provisions of the Contract Documents.

ARTICLE 6. PAYMENT PROCEDURES.

CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by the ARCHITECT as provided in the General Conditions.

Progress payments will be paid in full in accordance with Article 14 of the General Conditions until ninety (90) percent of the Contract Price has been paid. The remaining ten (10) percent of the Contract Price may be retained, in accordance with applicable Alaska State Statutes, until final inspection, completion, and acceptance of the Project by the OWNER.

ARTICLE 7. CONTRACT DOCUMENTS.

The Contract Documents which comprise the entire Agreement between OWNER and CONTRACTOR concerning the WORK consist of this Agreement (pages 00500-1 to 00500-6, inclusive) and the following sections of the Contract Documents:

- Table of Contents (pages 00030-1 to 00030-13, inclusive).
- Notice Inviting Bids (pages 00030-1 to 00030-3, inclusive).
- Special Notice to Bidders (pages 00031, inclusive)
- Instructions to Bidders (pages 00100-1 to 00100-9, inclusive).
- Bid (pages 00300-1 to 00300-2, inclusive).
- Bid Schedule (pages 00310-1 to 00310-4, inclusive).
- Bid Bond (page 00320-1, inclusive) or Bid Security.
- Subcontractor Report (pages 00360-1 to 00360-3, inclusive).
- Performance Bond (pages 00610-1 to 00610-2, inclusive).
- Payment Bond (pages 00620-1 to 00620-2, inclusive).
- Insurance Certificate(s).
- General Conditions (pages 00700-1 to 00700-44, inclusive).
- Supplementary General Conditions (pages 00800-1 to 00800-6, inclusive).
- Alaska Labor Standards, Reporting, and Prevailing Wage Determination (page 00830-1).
- Standard Details (page 00853-1).
- Technical Specifications as listed in the Table of Contents.
- Drawings consisting of 292 sheets, as listed in the Table of Contents.
- Addenda numbers _____ to _____, inclusive.
- Change Orders which may be delivered or issued after the Date of the Agreement and which are not attached hereto.

There are no Contract Documents other than those listed in this Article 7. The Contract Documents may only

be amended by Change Order as provided in Paragraph 3.3 of the General Conditions.

ARTICLE 8. MISCELLANEOUS.

Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.

No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

OWNER and CONTRACTOR each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents. This Agreement shall be governed by the laws of the State of Alaska. Jurisdiction shall be in the State of Alaska, First Judicial District.

IN WITNESS WHEREOF, OWNER and CONTRACTOR have caused this Agreement to be executed on the date listed below signed by OWNER.

OWNER:	**CONTRACTOR:**
City and Borough of Juneau	_____ (Company Name)
_____ (Signature)	_____ (Signature)
By: Rod Swope, City Manager (Printed Name)	By: _____ (Printed Name, Authority or Title)
Date: _____	Date: _____ (CONTRACTOR Signature Date)
OWNER's address for giving notices:	CONTRACTOR's address for giving notices:
155 South Seward Street	_____
Juneau, Alaska 99801	_____
907-586-0873 907-586-4530 (Telephone) (Fax)	_____ (Telephone) (Fax)
	_____ (E-mail address)
	CONTRACTOR License No. _____

CERTIFICATE
(if Corporation)

STATE OF)
) SS:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Board of Directors of the

_____a corporation existing under the laws of

the State of_____, held on _____, 20____, the following resolution was duly passed and adopted:

> "RESOLVED, that _____, as _____ President of the Corporation, be and is hereby authorized to **execute the Agreement** with the CITY AND BOROUGH OF JUNEAU and this corporation and that the execution thereof, attested by the Secretary of the Corporation, and with the Corporate Seal affixed, shall be the official act and deed of this Corporation."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the official seal of the corporation this _____ day of _____, 20____.

Secretary

(SEAL)

CERTIFICATE
(if Partnership)

STATE OF)
) SS:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Partners of the

_____ a partnership existing under the laws of the State

of _____, held on _____, 20___, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as _____ of the Partnership, be and is hereby authorized to **execute the Agreement** with the CITY AND BOROUGH OF JUNEAU and this partnership and that the execution thereof, attested by the _____shall be the official act and deed of this Partnership."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this _____, day of _____, 20_____.

Secretary

(SEAL)

CERTIFICATE
(if Joint Venture)

STATE OF)
) SS:
COUNTY OF)

I HEREBY CERTIFY that a meeting of the Principals of the

_____ a joint venture existing under the laws of the

State of _____, held on _____, 20___, the following resolution was duly passed and adopted:

"RESOLVED, that _____, as _____ of the Joint Venture, be and is hereby authorized to **execute the Agreement** with the CITY AND BOROUGH OF JUNEAU and this joint venture and that the execution thereof, attested by the _____ shall be the official act and deed of this Joint Venture."

I further certify that said resolution is now in full force and effect.

IN WITNESS WHEREOF, I have hereunto set my hand this _____, day of _____, 20___.

Secretary

(SEAL)

END OF SECTION

SECTION 00610 - PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS: That we _____
(Name of CONTRACTOR)
a _____
(Corporation, Partnership, Individual)
hereinafter called "Principal" and _____
(Surety)
of _____, State of _____ hereinafter called the "Surety", are held and firmly bound to the CITY AND BOROUGH of JUNEAU, ALASKA hereinafter called "OWNER", for the penal sum
(Owner)` (City and State)
of _____dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the CONTRACTOR has entered into a certain contract with the OWNER, the effective date of which is (CBJ Contracts Office to fill in effective date) _____, a copy of which is hereto attached and made a part hereof for the construction of:

Gastineau Elementary School Renovation
CBJ Contract No. E11-137

NOW, THEREFORE, if the Principal shall truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof, which may be granted by the OWNER, with or without notice to the Surety, and if it shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

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

PROVIDED, FURTHER, that no final settlement between the OWNER and the Principal shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

Gastineau Elementary School Renovation
CBJ Contract No. E11-137

IN WITNESS WHEREOF, this instrument is issued in two (2) identical counterparts, each one of which shall be deemed an original.

CONTRACTOR:

By: _____
(Signature)

_____
(Printed Name)

_____
(Company Name)

_____
(Street or P.0. Box)

_____
(City, State, Zip Code)

SURETY:

By: _____ Date Issued: _____
(Signature of Attorney-in-Fact)

_____
(Printed Name)

_____
(Company Name)

_____
(Street or P.0. Box)

_____
(City, State, Zip Code)

(Affix SURETY'S SEAL)

NOTE: If CONTRACTOR is Partnership, <u>all</u> Partners must execute bond.

SECTION 00620 - PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS: That we _____
(Name of CONTRACTOR)

_____ a _____
(Corporation, Partnership, Individual)

hereinafter called "Principal" and _____
(Surety)

of _____, State of _____ hereinafter called the "Surety," are held and

firmly bound to the CITY AND BOROUGH of JUNEAU, ALASKA hereinafter called "OWNER," for the
(Owner) (City and State)

penal sum of _____ Dollars ($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the CONTRACTOR has entered into a certain contract with the OWNER, the effective date of which is (CBJ Contracts Office to fill in effective date) _____, a copy of which is hereto attached and made a part hereof for the construction of:

Gastineau Elementary School Renovation
CBJ Contract No. E11-137

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, Subcontractors, and corporations furnishing materials for, or performing labor in the prosecution of the WORK provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and all insurance premiums on said work, and for all labor performed in such WORK, whether by Subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

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

PROVIDED, FURTHER, that no final settlement between the OWNER and the Principal shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

Gastineau Elementary School Renovation
CBJ Contract No. E11-137

IN WITNESS WHEREOF, this instrument is issued in two (2) identical counterparts, each one of which shall be deemed an original.

CONTRACTOR:

By: _____
(Signature)

_____
(Printed Name)

_____
(Company Name)

_____
(Street or P.0. Box)

_____
(City, State, Zip Code)

SURETY:

By: _____ Date Issued: _____
(Signature of Attorney-in-Fact)

_____
(Printed Name)

_____
(Company Name)

_____
(Street or P.0. Box)

_____
(City, State, Zip Code)

(Affix SURETY'S SEAL)

NOTE: If CONTRACTOR is Partnership, <u>all</u> Partners must execute bond.

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ARTICLE 1 DEFINITIONS

Wherever used in these General Conditions or in the Contract Documents the following terms have the meanings indicated which are applicable to both the singular and plural thereof. Where a word is capitalized in the definitions and is found not capitalized in the Contract Documents it has the ordinary dictionary definition.

Addenda - Written or graphic instruments issued prior to the opening of Bids which make additions, deletions, or revisions to the Contract Documents.

Agreement - The written contract between the OWNER and the CONTRACTOR covering the WORK to be performed; other documents are attached to the Agreement and made a part thereof as provided therein.

Application for Payment - The form furnished by the ARCHITECT which is to be used by the CONTRACTOR to request progress or final payment and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

ARCHITECT - The ARCHITECT is the firm or person(s) selected by the City and Borough of Juneau (CBJ) to perform the duties of project inspection and management. CBJ will inform the CONTRACTOR of the identity of the ARCHITECT at or before the Notice to Proceed.

Architect of Record – The individual, partnership, corporation, joint-venture or other legal entity legally responsible for preparation of Design and Construction Documents for the project.

Asbestos - Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

Bid - The offer or proposal of the Bidder submitted on the prescribed form setting forth the price or prices for the WORK.

Bonds - Bid, Performance, and Payment Bonds and other instruments which protect against loss due to inability or refusal of the CONTRACTOR to perform its contract.

CBJ - City and Borough of Juneau

CBJ Project Manager - The authorized representative of the City and Borough of Juneau Engineering Department, as OWNER, who is responsible for administration of the contract.

Change Order - A document recommended by the ARCHITECT, which is signed by the CONTRACTOR and the OWNER and authorizes an addition, deletion, or revision in the WORK, or an adjustment in the Contract Price or the Contract Time, issued on or after the Effective Date of the Agreement.

Contract Documents - The Table of Contents, Notice Inviting Bids, Instructions to Bidders, Bid Forms (including the Bid, Bid Schedule(s), Information Required of Bidder, Bid Bond, and all required certificates and affidavits), Agreement, Performance Bond, Payment Bond, General Conditions, Supplementary General Conditions, Technical Specifications, Drawings, Permits, and all Addenda, Field Orders and Change Orders executed pursuant to the provisions of the Contract Documents.

Contract Price - The total monies payable by the OWNER to the CONTRACTOR under the terms and conditions of the Contract Documents.

Contract Time - The number of successive calendar Days or the specific date stated in the Contract Documents for the completion of the WORK.

CONTRACTOR - The individual, partnership, corporation, joint-venture or other legal entity with whom the OWNER has executed the Agreement.

Day - A calendar day of 24 hours measured from midnight to the next midnight.

Defective WORK - WORK that is unsatisfactory, faulty, or deficient; or that does not conform to the Contract Documents; or that does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents; or WORK that has been damaged prior to the ARCHITECT's recommendation of final payment.

Drawings - The drawings, plans, maps, profiles, diagrams, and other graphic representations which indicate the character, location, nature, extent, and scope of the WORK and which have been prepared by the Architect of Record and are referred to in the Contract Documents. Shop Drawings are not within the meaning of this paragraph.

Effective Date of the Agreement - The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

Field Order - A written order issued by the ARCHITECT which may or may not involve a change in the WORK.

General Requirements - Division 1 of the Technical Specifications.

Hazardous Waste - The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 9603) as amended from time to time.

Holidays - The CBJ legal holidays occur on:

A. New Year's Day - January 1
B. Martin Luther King's Birthday - Third Monday in January
C. President's Day - Third Monday in February
D. Seward's Day - Last Monday in March
E. Memorial Day - Last Monday in May
F. Independence Day - July 4
G. Labor Day - First Monday in September
H. Alaska Day - October 18
I. Veteran's Day - November 11
J. Thanksgiving Day - Fourth Thursday and the following Friday in November
K. Christmas Day - December 25.

If any holiday listed above falls on a Saturday, Saturday and the preceding Friday are both legal holidays. If the holiday should fall on a Sunday, Sunday and the following Monday are both legal holidays.

Inspector - The authorized representative of the ARCHITECT assigned to make detailed inspections for conformance to the Contract Documents. Any reference to the Resident Project Representative in this document shall mean the Inspector.

Laws and Regulations; Laws or Regulations - Any and all applicable laws, rules, regulations, ordinances, codes, and/or orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

Mechanic's Lien - A form of security, an interest in real property, which is held to secure the payment of an obligation. When referred to in these Contract Documents, "Mechanic's Lien" or "lien" means "Stop Notice".

Milestone - A principal event specified in the Contract Documents relating to an intermediate completion date of a portion of the work, or a period of time within which the portion of the work should be performed prior to Substantial Completion of all the WORK.

Notice of Intent to Award - The written notice by the OWNER to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the requirements listed therein, within the time specified, the OWNER will enter into an Agreement.

Notice of Award - The written notice by the OWNER to the apparent successful bidder stating that the apparent successful bidder has complied with all conditions for award of the contract.

Notice of Completion - A form signed by the ARCHITECT and the CONTRACTOR recommending to the OWNER that the WORK is Substantially Complete and fixing the date of Substantial Completion. After acceptance of the WORK by the OWNER's governing body, the form is signed by the OWNER. This filing starts the 30 day lien filing period on the WORK.

Notice to Proceed - The written notice issued by the OWNER to the CONTRACTOR authorizing the CONTRACTOR to proceed with the WORK and establishing the date of commencement of the Contract Time.

OWNER - The City and Borough of Juneau (CBJ), acting through its legally designated officials, officers, or employees.

Partial Utilization - Use by the OWNER of a substantially completed part of the WORK for the purpose for which it is intended prior to Substantial Completion of all the WORK.

PCB's - Polychlorinated biphenyls.

Petroleum - Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Wastes and crude oils.

Project - The total construction of which the WORK to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

Radioactive Material - Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

Shop Drawings - All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the CONTRACTOR and submitted by the CONTRACTOR, to the ARCHITECT, to illustrate some portion of the WORK.

Specifications - Same definition as for "Technical Specifications" hereinafter.

Stop Notice - A legal remedy for subcontractors and suppliers who contribute to public works, but who are not paid for their work, which secures payment from construction funds possessed by the OWNER. For public property, the Stop Notice remedy is designed to substitute for mechanic's lien rights.

Sub-Consultant - The individual, partnership, corporation, joint-venture or other legal entity having a direct contract with Architect of Record, or with any of its Consultants to furnish services with respect to the Project.

Subcontractor - An individual, partnership, corporation, joint-venture or other legal entity having a direct contract with the CONTRACTOR, or with any of its Subcontractors, for the performance of a part of the WORK at the site.

Substantial Completion - Refers to when the WORK has progressed to the point where, in the opinion of the ARCHITECT as evidenced by Notice of Completion as applicable, it is sufficiently complete, in accordance with the Contract Documents, so that the WORK can be utilized for the purposes for which it is intended; or if no such notice is issued, when final payment is due in accordance with Paragraph 14.8. The terms "substantially complete" and "substantially completed" as applied to any WORK refer to Substantial Completion thereof.

Supplementary General Conditions - The part of the Contract Documents which make additions, deletions, or revisions to these General Conditions.

Supplier - A manufacturer, fabricator, supplier, distributor, material man, or vendor.

Technical Specifications - Divisions 1 through 16 of the Contract Documents consisting of the General Requirements and written technical descriptions of products and execution of the WORK.

Underground Utilities - All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: water, sewage and drainage removal, electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, traffic, or other control systems.

WORK, Work - The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. WORK is the result of performing, or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.

ARTICLE 2 PRELIMINARY MATTERS

2.1 DELIVERY OF BONDS/INSURANCE CERTIFICATES. When the CONTRACTOR delivers the signed Agreements to the OWNER, the CONTRACTOR shall also deliver to the OWNER such Bonds and Insurance Policies and Certificates as the CONTRACTOR may be required to furnish in accordance with the Contract Documents.

2.2 COPIES OF DOCUMENTS. The OWNER shall furnish to the CONTRACTOR the required number of copies of the Contract Documents specified in the Supplementary General Conditions.

2.3 COMMENCEMENT OF CONTRACT TIME; NOTICE TO PROCEED. The Contract Time will start to run on the commencement date stated in the Notice to Proceed. If no date is stated, Contract Time shall commence upon the date of the Notice to Proceed is issued.

2.4 STARTING THE WORK

A. The CONTRACTOR shall begin to perform the WORK within 10 days after the commencement date stated in the Notice to Proceed, but no WORK shall be done at the site prior to said commencement date.

B. Before undertaking each part of the WORK, the CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. The CONTRACTOR shall promptly report in writing to the ARCHITECT any conflict, error, or discrepancy which the CONTRACTOR may discover and shall obtain a written interpretation or clarification from the ARCHITECT before proceeding with any WORK affected thereby.

C. The CONTRACTOR shall submit to the ARCHITECT for review those documents called for under Section 01300 - CONTRACTOR Submittals in the General Requirements.

2.5 PRE-CONSTRUCTION CONFERENCE. The CONTRACTOR is required to attend a Pre-Construction Conference. This conference will be attended by the ARCHITECT and others as appropriate in order to discuss the WORK in accordance with the applicable procedures specified in the General Requirements, Section 01010 - Summary of Work.

2.6 FINALIZING CONTRACTOR SUBMITTALS. At least 7 days before submittal of the first Application for Payment a conference attended by the CONTRACTOR, the ARCHITECT and others as appropriate will be held to finalize the initial CONTRACTOR submittals in accordance with the General Requirements. As a minimum the CONTRACTOR's representatives should include it's project manager and schedule expert. The CONTRACTOR should plan on this meeting taking no less than 8 hours. If the submittals are not finalized at the end of the meeting, additional meetings will be held so that the submittals can be finalized prior to the submittal of the first Application for Payment. No Application for Payment will be processed until CONTRACTOR submittals are finalized.

ARTICLE 3 CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.1 INTENT

A. The Contract Documents comprise the entire agreement between the OWNER and the CONTRACTOR concerning the WORK. The Contract Documents shall be construed as a whole in accordance with Alaska Law.

B. It is the intent of the Contract Documents to describe the WORK, functionally complete, to be constructed in accordance with the Contract Documents. Any WORK, materials, or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be supplied whether or not specifically called for. When words or phrases which have a well-known technical or construction industry or trade meaning are used to describe WORK, materials, or equipment such words or phrases shall be interpreted in accordance with that meaning, unless a definition has been provided in Article 1 of the General Conditions. Reference to standard specifications, manuals, or codes of any technical society, organization, or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual, or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of the ARCHITECT, OWNER, the CONTRACTOR, or the Architect of Record or any of their consultants, agents, or employees from those set forth in the Contract Documents.

C. If, during the performance of the WORK, CONTRACTOR discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such Law or Regulation applicable to the performance of the WORK or of any such standard, specification, manual or code or of any instruction of any Supplier referred to in paragraph 6.5, the CONTRACTOR shall report it to the ARCHITECT in writing at once, and the CONTRACTOR shall not proceed with the WORK affected thereby (except in an emergency as authorized by the ARCHITECT) until a clarification Field Order, or Change Order to the Contract Documents has been issued.

3.2 ORDER OF PRECEDENCE OF CONTRACT DOCUMENTS

A. In resolving conflicts resulting from, errors, or discrepancies in any of the Contract Documents, the order of precedence shall be as follows:

1. Permits from other agencies as may be required by law, excepting the definition of "Permittee" in these permits.
2. Field Orders
3. Change Orders
4. ARCHITECT’s written interpretations and clarifications.
5. Agreement
6. Addenda
7. CONTRACTOR's Bid (Bid Form)
8. Supplementary General Conditions
9. Notice Inviting Bids
10. Instructions to Bidders

11. General Conditions
12. Technical Specifications
13 Drawings

B. With reference to the Drawings the order of precedence is as follows:

1. Figures govern over scaled dimensions
2. Detail drawings govern over general drawings
3. Addenda/Change Order drawings govern over contract Drawings
4. Contract Drawings govern over standard details

3.3 AMENDING AND SUPPLEMENTING CONTRACT DOCUMENTS. The Contract Documents may be amended to provide for additions, deletions, and revisions in the WORK or to modify the terms and conditions thereof by a Change Order (pursuant to Article 10 CHANGES IN THE WORK).

3.4 REUSE OF DOCUMENTS. Neither the CONTRACTOR, nor any Subcontractor or Supplier, nor any other person or organization performing any of the WORK under a contract with the OWNER shall have or acquire any title to or ownership rights in any of the Drawings, Technical Specifications, or other documents used on the WORK, and they shall not reuse any of them on the extensions of the Project or any other project without written consent of the OWNER.

ARTICLE 4 AVAILABILITY OF LANDS; PHYSICAL CONDITIONS; REFERENCE POINTS

4.1 AVAILABILITY OF LANDS. The OWNER shall furnish, as indicated in the Contract Documents, the lands upon which the WORK is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for the use of the CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by the OWNER, unless otherwise provided in the Contract Documents. Nothing contained in the Contract Documents shall be interpreted as giving the CONTRACTOR exclusive occupancy of the lands or rights-of-way provided. The CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment; provided, that the CONTRACTOR shall not enter upon nor use any property not under the control of the OWNER until a written temporary construction easement, lease or other appropriate agreement has been executed by the CONTRACTOR and the property owner, and a copy of said agreement furnished to the ARCHITECT prior to said use; and, neither the OWNER nor the ARCHITECT shall be liable for any claims or damages resulting from the CONTRACTOR's unauthorized trespass or use of any such properties.

4.2 PHYSICAL CONDITIONS - SUBSURFACE AND EXISTING STRUCTURES

A. Explorations and Reports. Reference is made to SGC 4.2 Physical Conditions of the Supplementary General Conditions for identification of those reports of explorations and tests of sub-surface conditions at the site that have been utilized by the Architect of Record in the preparation of the Contract Documents. The CONTRACTOR may rely upon the accuracy of the technical data contained in such reports, however, reports are not to be considered complete or comprehensive and nontechnical data, interpretations, and opinions contained in such reports are not to be relied on by the CONTRACTOR. The CONTRACTOR is responsible for any further explorations or tests that

may be necessary and any interpretation, interpolation, or extrapolation that it makes of any information shown in such reports.

B. Existing Structures. Reference is made to SGC 4.2 Physical Conditions of the Supplementary General Conditions for identification of those drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Utilities referred to in Paragraph 4.4 herein) which are at or contiguous to the site that have been utilized by the Architect of Record in the preparation of the Contract Documents. The CONTRACTOR may rely upon the accuracy of the technical data contained in such drawings, however, nontechnical data, interpretations, and opinions contained in such drawings are not to be relied on by the CONTRACTOR. The CONTRACTOR is also responsible for any interpretation, interpolation, or extrapolation that it makes of any information shown in such drawings.

4.3 DIFFERING SITE CONDITIONS

A. The CONTRACTOR shall promptly upon discovery (but in no event later than 14 days thereafter) and before the following conditions are disturbed, notify the ARCHITECT, in writing of any:

1. Material that the CONTRACTOR believes may be material that is hazardous waste, as defined in Article 1 of these General Conditions, or asbestos, PCB's, petroleum or any other substance or material posing a threat to human or to the environment.
2. Subsurface or latent physical conditions at the site differing from those indicated.
3. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in WORK of the character provided for in the contract.

B. The ARCHITECT shall promptly investigate the conditions, and if it finds that the conditions do materially so differ, or do involve hazardous waste, and cause a decrease or increase in the CONTRACTOR's cost of, or the time required for, performance of any part of the WORK shall issue a Change Order under the procedures described in the contract.

C. In the event that a dispute arises between the ARCHITECT and the CONTRACTOR whether the conditions materially differ, or involved hazardous waste or other materials listed above, or cause a decrease or increase in the CONTRACTOR's cost of, or time required for, performance of any part of the WORK, the CONTRACTOR shall not be excused from any scheduled completion date provided for by the contract, but shall proceed with all WORK to be performed under the contract. The CONTRACTOR shall retain any and all rights provided either by contract or by Law which pertain to the resolution of disputes and protests between the contracting parties.

4.4 PHYSICAL CONDITIONS - UNDERGROUND UTILITIES

A. Indicated. The information and data indicated in the Contract Documents with respect to existing Underground Utilities at or contiguous to the site are based on information and data furnished to the OWNER or the Architect of Record by the owners of such Underground Utilities or by others. Unless it is expressly provided in the Supplementary General Conditions and/or Section 01530 - Protection and Restoration of Existing Facilities, the OWNER and the Architect of Record shall not be responsible for the accuracy or completeness of any such information or data, and the CONTRACTOR shall have full responsibility for reviewing and checking all such information and data, for locating all Underground Utilities indicated in the Contract Documents, for coordination of

the WORK with the owners of such Underground Utilities during construction, for the safety and protection thereof and repairing any damage thereto resulting from the WORK, the cost of which will be considered as having been included in the Contract Price.

B. Not Indicated. If an Underground Utility is uncovered or revealed at or contiguous to the site which was not indicated in the Contract Documents and which the CONTRACTOR could not reasonably have been expected to be aware of, the CONTRACTOR shall identify the owner of such Underground Utility and give written notice thereof to that owner and shall notify the ARCHITECT in accordance with the requirements of the Supplementary General Conditions and Section 01530 - Protection and Restoration of Existing Facilities of the General Requirements.

4.5 REFERENCE POINTS

A. The ARCHITECT will provide one bench mark, near or on the site of the WORK, and will provide two points near or on the site to establish a base line for use by the CONTRACTOR for alignment control. Unless otherwise specified in the General Requirements, the CONTRACTOR shall furnish all other lines, grades, and bench marks required for proper execution of the WORK.

B. The CONTRACTOR shall preserve all bench marks, stakes, and other survey marks, and in case of their removal or destruction by its own employees or by its subcontractor's employees, the CONTRACTOR shall be responsible for the accurate replacement of such reference points by personnel qualified under the Alaska Statute governing the licensing of architects, engineers, and land surveyors.

4.6 USE OF THE CBJ/STATE LEMON CREEK GRAVEL PIT

A. On City and Borough of Juneau (CBJ) construction projects, the CBJ may make unclassified material available to CONTRACTORs, from the CBJ/State Lemon Creek gravel pit, at a rate less than charged other customers. CONTRACTORs are not required to use material from the CBJ/State pit and the CBJ makes no guarantee as to the quantity or quality of the available material. For this Project, the price shall be $1.90 per ton.

B. CONTRACTORs proposing to use gravel from the CBJ/State pit are required to be in good standing for all amounts owed to the CBJ, for previous gravel operations, prior to submitting a mining plan for approval. CONTRACTORs using the pit must comply with Allowable Use Permit USE 98-00047. Failure to meet these requirements, if so subject, shall be sufficient reason to deny use of the CBJ/State pit as a gravel source. To determine if your company is subject to these requirements, contact the CBJ Engineering Department, Gravel Pit Management, at (907) 586-0883.

C. CONTRACTORs deciding to use material from the CBJ/State pit shall provide an Individual Mining Plan prepared by a professional engineer registered in the State of Alaska. The Individual Mining Plan must be reviewed and approved by the CBJ, prior to commencing operations within the pit. CONTRACTORs shall also secure a Performance Bond to ensure compliance with contract provisions, including any Individual Mining Plan stipulations. The bond shall remain in full force and effect until a release is obtained from the CBJ.

D. If CONTRACTOR operations for a Project do not exceed 500 tons of material, the CONTRACTOR will not be required to provide an Individual Mining Plan prepared by an engineer, however, the CONTRACTOR must submit an Individual Mining Plan that is in compliance with Allowable Use

Permit USE 98-00047 for gravel extraction within the CBJ/State pit. The CONTRACTOR must contact the CBJ Engineering Department for conditions for the extraction.

E. CONTRACTORs using the CBJ material may do primary dry separation (screening) of materials within the pit. Crushing and washing of material will not be allowed. CONTRACTORs shall account for placement of materials removed from the pit. The CBJ may require CONTRACTORs to cross-check weight tickets, submit to an audit, or participate in other measures required by the CBJ to ensure accountability. Unprocessed overburden removed from the pit will not be weighed. All other material mined will be weighed at the CBJ scale. CONTRACTORs will be responsible for loading and/or screening their own material. If asphalt pavement is removed as part of the WORK, CONTRACTORs shall dispose of the material at a to-be-specified location within the pit area, as directed by the CBJ Gravel Pit Manager, (907) 586-0883.

F. The gravel pit overhead charge shall be paid to the CBJ by the CONTRACTOR within 60 days after removal of all materials from the pit and prior to requesting and/or receiving final payment. Upon completion of each excavation CONTRACTORs shall notify the CBJ, in writing, in sufficient time to perform a field-compliance examination prior to vacating the pit. Any significant deviation from the stipulations of the Individual Mining Plan identified during the field inspection shall be corrected by the CONTRACTOR prior to release of the bond. A signed release from CBJ will be required prior to releasing the CONTRACTOR's bond.

G. If asphalt pavement is removed as part of this WORK, the CONTRACTOR shall dispose of the material at the location designated as the Asphalt Storage Facility, or as directed by the ARCHITECT.

H. The CBJ/State Pit is a seasonal operation. The hours of operation are from 7:00 a.m. to 6:00 p.m., Monday through Friday, from April 1 through October 15 of the year. CONTRACTORs may obtain gravel on weekends, or during the off-season, by applying for a separate agreement with the City and Borough of Juneau Engineering Department. The CONTRACTOR will be responsible for any additional costs incurred during weekend or off-season operations at the gravel pit.

I. All CONTRACTORs/equipment operators using the CBJ/State Pit shall be in compliance with Federal Mine Safety and Health Administration regulations for quarry and gravel operations.

ARTICLE 5 BONDS AND INSURANCE

5.1 PERFORMANCE, PAYMENT, AND OTHER BONDS

A. The CONTRACTOR shall furnish Performance and Payment Bonds, each in the amount set forth in the Supplementary General Conditions as security for the faithful performance and payment of all the CONTRACTOR's obligations under the Contract Documents. These bonds shall remain in effect at least until one year after the date of Substantial Completion except as otherwise provided by Law or Regulation or by the Contract Documents. The CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary General Conditions. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operations,

U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

B. If the surety on any Bond furnished by the CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the WORK is located, the CONTRACTOR shall within 7 days thereafter substitute another Bond and Surety, which must be acceptable to the OWNER.

C. All Bonds required by the Contract Documents to be purchased and maintained by CONTRACTOR shall be obtained from surety companies that are duly licensed or authorized in the State of Alaska to issue Bonds for the limits so required. Such surety companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary General Conditions.

5.2 INSURANCE

A. The CONTRACTOR shall purchase and maintain the insurance required under this paragraph. Such insurance shall include the specific coverages set out herein and be written for not less than the limits of liability and coverages provided in the Supplementary General Conditions, or required by law, whichever are greater. All insurance shall be maintained continuously during the life of the Agreement up to the date of Final Completion and at all times thereafter when the CONTRACTOR may be correcting, removing, or replacing Defective WORK in accordance with Paragraph 13.6, but the CONTRACTOR's liabilities under this Agreement shall not be deemed limited in any way to the insurance coverage required.

B. All insurance required by the Contract Documents to be purchased and maintained by the CONTRACTOR shall be obtained from insurance companies that are duly licensed or authorized in the State of Alaska to issue insurance policies for the limits and coverages so required. Such insurance companies shall have a current Best's Rating of at least an "A" (Excellent) general policy holder's rating and a Class VII financial size category and shall also meet such additional requirements and qualifications as may be provided in the Supplementary General Conditions.

C. The CONTRACTOR shall furnish the OWNER with certificates showing the type, amount, class of operations covered, effective dates and dates of expiration of policies. All of the policies of insurance so required to be purchased and maintained (or the certificates or other evidence thereof) shall contain a provision or endorsement that the coverage afforded will not be cancelled, reduced in coverage, or renewal refused until at least 30 days' prior written notice has been given to the OWNER by certified mail. All such insurance required herein (except for Workers' Compensation and Employer's Liability) shall name the OWNER, its Consultants and subconsultants and their officers, directors, agents, and employees as "additional insureds" under the policies. The CONTRACTOR shall purchase and maintain the following insurance:

1. Workers' Compensation and Employer's Liability. This insurance shall protect the CONTRACTOR against all claims under applicable state workers' compensation laws. The CONTRACTOR shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a Workers' Compensation law. This policy shall include an "all states" endorsement. The CONTRACTOR shall require each Subcontractor similarly to provide Workers' Compensation Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the CONTRACTOR's Workers' Compensation Insurance. In case any

class of employees is not protected, under the Workers' Compensation Statute, the CONTRACTOR shall provide and shall cause each subcontractor to provide adequate employer's liability insurance for the protection of such of its employees as are not otherwise protected.

2. Commercial General Liability. This insurance shall be written in comprehensive form and shall protect the CONTRACTOR against all claims arising from injuries to persons other than its employees or damage to property of the OWNER or others arising out of any act or omission of the CONTRACTOR or its agents, employees, or Subcontractors. The policy shall contain no exclusions for any operations within the scope of this contract.
3. Comprehensive Automobile Liability. This insurance shall be written in comprehensive form and shall protect the CONTRACTOR against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, and shall cover operation on or off the site of all motor vehicles licensed for highway use, whether they are owned, non-owned, or hired. Coverage for hired motor vehicles should include endorsement covering liability assumed under this contract.
4. Subcontractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance. The CONTRACTOR shall either require each of its Subcontractors to procure and to maintain Subcontractor's Commercial General Liability and Property Damage Insurance and Vehicle Liability Insurance of the type and in the amounts specified in the Supplementary General Conditions or insure the activities of its subcontractors in the CONTRACTOR's own policy, in like amount.
5. Builder's Risk. This insurance shall be of the "all risks" type, shall be written in completed value form, and shall protect the CONTRACTOR, the OWNER, and the ARCHITECT, against risks of damage to buildings, structures, and materials and equipment. The amount of such insurance shall be not less than the insurable value of the WORK at completion. Builder's risk insurance shall provide for losses to be payable to the CONTRACTOR and the OWNER, as their interests may appear. The policy shall contain a provision that in the event of payment for any loss under the coverage provided, the insurance company shall have no rights of recovery against the CONTRACTOR, the OWNER, and the ARCHITECT. The Builder's Risk policy shall insure against all risks of direct physical loss or damage to property from any external cause including flood and earthquake. Allowable exclusions, if any, shall be as specified in the Supplementary General Conditions.

ARTICLE 6 CONTRACTOR'S RESPONSIBILITIES

6.1 SUPERVISION AND SUPERINTENDENCE

A. The CONTRACTOR shall supervise, inspect, and direct the WORK competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the WORK in accordance with the Contract Documents. The CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incidental thereto. The CONTRACTOR shall be responsible to see that the completed WORK complies accurately with the Contract Documents.

B. The CONTRACTOR shall designate in writing and keep on the work site at all times during its progress a technically qualified, English-speaking superintendent, who is an employee of the CONTRACTOR and who shall not be replaced without written notice to the OWNER and the

ARCHITECT. The superintendent will be the CONTRACTOR's representative at the site and shall have authority to act on behalf of the CONTRACTOR. All communications given to the superintendent shall be as binding as if given to the CONTRACTOR. The CONTRACTOR shall issue all its communications to the OWNER through the ARCHITECT and the ARCHITECT only.

C. The CONTRACTOR's superintendent shall be present at the site of the WORK at all times while WORK is in progress. Failure to observe this requirement shall be considered suspension of the WORK by the CONTRACTOR until such time as such superintendent is again present at the site.

6.2 LABOR, MATERIALS, AND EQUIPMENT

A. The CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out the WORK and perform construction as required by the Contract Documents. The CONTRACTOR shall furnish, erect, maintain, and remove the construction plant and any temporary works as may be required. The CONTRACTOR shall at all times maintain good discipline and order at the site. Except in connection with the safety or protection of persons or the WORK or property at the site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all WORK at the site shall be performed during regular working hours, and the CONTRACTOR will not permit overtime WORK or the performance of WORK on Saturday, Sunday, or any legal holiday without the OWNER's written consent. The CONTRACTOR shall apply for this consent through the ARCHITECT.

B. Except as otherwise provided in this Paragraph, the CONTRACTOR shall receive no additional compensation for overtime WORK, i.e., work in excess of 8 hours in any one calendar day or 40 hours in any one calendar week, even though such overtime WORK may be required under emergency conditions and may be ordered by the ARCHITECT in writing. Additional compensation will be paid the CONTRACTOR for overtime WORK only in the event extra WORK is ordered by the ARCHITECT and the Change Order specifically authorizes the use of overtime WORK and then only to such extent as overtime wages are regularly being paid by the CONTRACTOR for overtime WORK of a similar nature in the same locality.

C. All costs of inspection and testing performed during overtime WORK by the CONTRACTOR which is allowed solely for the convenience of the CONTRACTOR shall be borne by the CONTRACTOR. The ARCHITECT shall have the authority to deduct the cost of all such inspection and testing from any partial payments otherwise due to the CONTRACTOR.

D. Unless otherwise specified in the Contract Documents, the CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up, and completion of the WORK.

E. All materials and equipment to be incorporated into the WORK shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of the OWNER. If required by the ARCHITECT, the CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Contract Documents; but no provisions of any such instructions will be effective to assign to the ARCHITECT, or any of the

Architect's of Record consultants, agents, or employees, any duty or authority to supervise or direct the furnishing or performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of Paragraphs 9.9C and 9.9D.

F. The CONTRACTOR shall at all times employ sufficient labor and equipment for prosecuting the several classes of WORK to full completion in the manner and time set forth in and required by these specifications. All workers shall have sufficient skill and experience to properly perform the WORK assigned to them. Workers engaged in special WORK, or skilled WORK, shall have sufficient experience in such WORK and in the operation of the equipment required to perform all WORK, properly and satisfactorily.

G. Any person employed by the CONTRACTOR or by any SUBCONTRACTOR who, in the opinion of the ARCHITECT, does not perform the WORK in a proper and skillful manner, or is intemperate or disorderly shall, at the written request of the ARCHITECT, be removed forthwith by the CONTRACTOR or Subcontractor employing such person, and shall not be employed again in any portion of the WORK without the approval of the ARCHITECT. Should the CONTRACTOR fail to remove such person or persons as required above, or fail to furnish suitable and sufficient personnel for the proper prosecution of the WORK, the ARCHITECT may suspend the WORK by written notice until such orders are complied with.

6.3 ADJUSTING PROGRESS SCHEDULE. The CONTRACTOR shall submit monthly updates of the progress schedule to the ARCHITECT for acceptance in accordance with the provisions in Section 01300 - CONTRACTOR Submittals in the General Requirements.

6.4 SUBSTITUTES OR "OR-EQUAL" ITEMS. The CONTRACTOR shall submit proposed substitutes or "or-equal" items in accordance with the provisions in Section 01300 - CONTRACTOR Submittals in the General Requirements.

6.5 CONCERNING SUBCONTRACTORS, SUPPLIERS, AND OTHERS. The CONTRACTOR shall be responsible to the OWNER and the ARCHITECT of Record for the acts and omissions of its subcontractors and their employees to the same extent as CONTRACTOR is responsible for the acts and omissions of its own employees. Nothing contained in this Paragraph shall create any contractual relationship between any subcontractor and the OWNER or the ARCHTIECT nor relieve the CONTRACTOR of any liability or obligation under the contract.

6.6 PERMITS

A. Unless otherwise provided in the Supplementary General Conditions, the CONTRACTOR shall obtain and pay for all construction permits and licenses from the agencies having jurisdiction, including the furnishing of insurance and Bonds if required by such agencies. The enforcement of such requirements under this contract shall not be made the basis for claims for additional compensation. The OWNER shall assist the CONTRACTOR, when necessary, in obtaining such permits and licenses. The CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the WORK, which are applicable at the time of opening of Bids. The CONTRACTOR shall pay all charges of utility owners for connections to the WORK.

B. These Contract Documents may require that the WORK be performed within the conditions and/or requirements of local, state and/or federal permits. These permits may be bound within the Contract Documents, included within the Contract Documents by reference, or included as part of the WORK, as designated in this Section. The CONTRACTOR is responsible for completing the WORK required

for compliance with all permit requirements; this WORK is incidental to other items in the Contract Documents. Any reference to the PERMITTEE in the permits shall mean the CONTRACTOR. If any permits were acquired by the OWNER, this action was done to expedite the start of construction. If the CONTRACTOR does not complete the WORK within the specified permit window, the CONTRACTOR shall be responsible for the permit extension, and for completing any additional requirements placed upon the permit.

6.7 PATENT FEES AND ROYALTIES. The CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the WORK or the incorporation in the WORK of any invention, design, process, product, software or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the WORK and if to the actual knowledge of the OWNER or the Architect of Record its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by the OWNER in the Contract Documents. The CONTRACTOR shall indemnify, defend and hold harmless the OWNER and the Architect of Record and anyone directly or indirectly employed by either of them from and against all claims, damages, losses, and expenses (including attorneys' fees and court costs) arising out of any infringement of patent rights or copyrights incident to the use in the performance of the WORK or resulting from the incorporation in the WORK of any invention, design, process, product, or device not specified in the Contract Documents, and shall defend all such claims in connection with any alleged infringement of such rights.

6.8 LAWS AND REGULATIONS. The CONTRACTOR shall observe and comply with all federal, state, and local laws, ordinances, codes, orders, and regulations which in any manner affect those engaged or employed on the WORK, the materials used in the WORK, or the conduct of the WORK. If any discrepancy or inconsistency should be discovered in this contract in relation to any such law, ordinance, code, order, or regulation, the CONTRACTOR shall report the same in writing to the ARCHITECT. The CONTRACTOR shall indemnify, defend, and hold harmless the OWNER, the Architect of Record, and their officers, agents, and employees against all claims or liability arising from violation of any such law, ordinance, code, order, or regulation, whether by CONTRACTOR or by its employees, Subcontractors, or third parties. Any particular law or regulation specified or referred to elsewhere in the Contract Documents shall not in any way limit the obligation of the CONTRACTOR to comply with all other provisions of federal, state, and local laws and regulations.

6.9 TAXES. The CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by the CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the WORK.

6.10 USE OF PREMISES. The CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to (1) the Project site, (2) the land and areas identified in and permitted by the Contract Documents, and (3) the other land and areas permitted by Laws and Regulations, rights-of-way, permits, leases and easements. The CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any land or areas contiguous thereto, resulting from the performance of the WORK. Should any claim be made against the OWNER or the Architect of Record by any such owner or occupant because of the performance of the WORK, the CONTRACTOR shall promptly attempt to settle with such other party by agreement or otherwise resolve the claim through litigation. The CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify, defend, and hold the OWNER and the Architect of Record harmless from and against all claims, damages, losses, and expenses (including, but not limited to, fees of Architect's of Records attorneys, and other

professionals and court costs) arising directly, indirectly, or consequentially out of any action, legal or equitable, brought by any such owner or occupant against the OWNER, the Architect of Record, their consultants, sub-consultants, and the officers, directors, employees and agents of each and any of them to the extent caused by or based upon the CONTRACTOR's performance of the WORK.

6.11 SAFETY AND PROTECTION

A. The CONTRACTOR shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the WORK. The CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all employees on the WORK and other persons and organizations who may be affected thereby;
2. all the WORK and materials and equipment to be incorporated therein, whether in storage on or off the site; and
3. other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

B. The CONTRACTOR shall comply with all applicable Laws and Regulations whether referred to herein or not) of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss and shall erect and maintain all necessary safeguards for such safety and protection. The CONTRACTOR shall notify owners of adjacent property and utilities when prosecution of the WORK may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. The CONTRACTOR shall designate a qualified and experienced safety representative at the site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and program.

D. Materials that contain hazardous substances or mixtures may be required on the WORK. A Material Safety Data Sheet (MSDS) shall be requested by the CONTRACTOR from the manufacturer of any hazardous product used.

E. Material usage shall be accomplished with strict adherence to all safety requirements and all manufacturer's warnings and application instructions listed on the Material Safety Data Sheet and on the product container label.

F. The CONTRACTOR shall be responsible for coordinating communications on any exchange of Material Safety Data Sheets or other hazardous material information that is required to be made available to, or exchanged between, or among, employers at the site in accordance with Laws or Regulations.

G. The CONTRACTOR shall notify the ARCHITECT if it considers a specified product or its intended usage to be unsafe. This notification must be given to the ARCHITECT prior to the product being ordered, or if provided by some other party, prior to the product being incorporated in the WORK.

6.12 SHOP DRAWINGS AND SAMPLES

A. After checking and verifying all field measurements and after complying with applicable procedures specified in the General Requirements, the CONTRACTOR shall submit to the ARCHITECT for review, all Shop Drawings in accordance with Section 01300 - CONTRACTOR Submittals in the General Requirements.

B. The CONTRACTOR shall also submit to the ARCHITECT for review all samples in accordance with Section 01300 - CONTRACTOR Submittals in the General Requirements.

C. Before submittal of each Shop Drawing or sample, the CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar data with respect thereto and reviewed or coordinated each Shop Drawing or sample with other Shop Drawings and samples and with the requirements of the WORK and the Contract Documents.

6.13 CONTINUING THE WORK. The CONTRACTOR shall carry on the WORK and adhere to the progress schedule during all disputes or disagreements with the OWNER. No WORK shall be delayed or postponed pending resolution of any disputes or disagreements, except as the CONTRACTOR and the OWNER may otherwise agree in writing.

6.14 INDEMNIFICATION

A. To the fullest extent permitted by Laws and Regulations, the CONTRACTOR shall indemnify, defend, and hold harmless the OWNER, the Architect of Record, their consultants, sub-consultants and the officers, directors, employees, and agents of each and any of them, against and from all claims and liability arising under, by reason of or incidentally to the contract or any performance of the WORK, but not from the sole negligence or willful misconduct of the OWNER, and the Architect of Record. Such indemnification by the CONTRACTOR shall include but not be limited to the following:

1. Liability or claims resulting directly or indirectly from the negligence or carelessness of the CONTRACTOR, its employees, or agents in the performance of the WORK, or in guarding or maintaining the same, or from any improper materials, implements, or appliances used in its construction, or by or on account of any act or omission of the CONTRACTOR, its employees, agents, or third parties;
2. Liability or claims arising directly or indirectly from bodily injury, occupational sickness or disease, or death of the CONTRACTOR’s or Subcontractor’s own employees engaged in the WORK resulting in actions brought by or on behalf of such employees against the OWNER, or the Architect of Record;
3. Liability or claims arising directly or indirectly from or based on the violation of any law, ordinance, regulation, order, or decree, whether by the CONTRACTOR, its employees, or agents;
4. Liability or claims arising directly or indirectly from the use or manufacture by the CONTRACTOR, its employees, or agents in the performance of this contract of any copyrighted or non-copyrighted composition, secret process, patented or non-patented invention, computer software, article, or appliance, unless otherwise specifically stipulated in this contract.

5. Liability or claims arising directly or indirectly from the breach of any warranties, whether express or implied, made to the ARCHITECT, OWNER or any other parties by the CONTRACTOR, its employees, or agents;
6. Liabilities or claims arising directly or indirectly from the willful or criminal misconduct of the CONTRACTOR, its employees, or agents; and,
7. Liabilities or claims arising directly or indirectly from any breach of the obligations assumed herein by the CONTRACTOR.

B. The CONTRACTOR shall reimburse the OWNER and the Architect of Record for all costs and expenses, (including but not limited to fees and charges of Architects of Record, attorneys, and other professionals and court costs including all costs of appeals) incurred by the OWNER, and the Architect of Record in enforcing the provisions of this Paragraph 6.14.

C. The indemnification obligation under this Paragraph 6.14 shall not be limited in any way by any limitation of the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR or any such Subcontractor or other person or organization under workers' compensation acts, disability benefit acts, or other employee benefit acts.

6.15 CONTRACTOR'S DAILY REPORTS. The CONTRACTOR shall complete a daily report indicating total manpower for each construction trade, major equipment on site, each Subcontractor's manpower, weather conditions, etc., involved in the performance of the WORK. The daily report shall be completed on forms provided by the ARCHITECT and shall be submitted to the ARCHITECT at the conclusion of each WORK day. The report should comment on the daily progress and status of the WORK within each major component of the WORK. These components will be decided by the ARCHITECT. The CONTRACTOR shall record the name, affiliation, time of arrival and departure, and reason for visit for all visitors to the location of the WORK.

6.16 ASSIGNMENT OF CONTRACT. The CONTRACTOR shall not assign, sublet, sell, transfer, or otherwise dispose of the contract or any portion thereof, or its right, title, or interest therein, or obligations thereunder, without the written consent of the OWNER except as imposed by law. If the CONTRACTOR violates this provision, the contract may be terminated at the option of the OWNER. In such event, the OWNER shall be relieved of all liability and obligations to the CONTRACTOR and to its assignee or transferee, growing out of such termination.

6.17 CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTY AND SERVICES. It is understood that any turn-on, or turn-off line locates and any other WORK or assistance necessary by the CBJ Water Utilities Division, will be at the CONTRACTOR's expense unless otherwise stated in the bid documents. All cost must be agreed to prior to any related actions, and will be considered incidental to the Project cost. Billing to the CONTRACTOR will be direct from the CBJ Water Utilities Division.

6.18 OPERATING WATER SYSTEM VALVES

A. The CONTRACTOR shall submit a written request, to the ARCHITECT, for approval to operate any valve on any in-service section of the CBJ water system. The request must be submitted at least 24-hours prior to operating any valves. The CBJ Water Utilities Division reserves the right to approve or deny the request. The request shall specifically identify each valve to be operated, the time of operation, and the operation to be performed. The CONTRACTOR shall obtain the written approval of the ARCHITECT for any scheduled operation before operating any valve.

B. The CONTRACTOR shall be responsible for all damages, both direct and consequential, to the OWNER or any other party, caused by unauthorized operation of any valve of the CBJ water system.

6.19 CONTRACTOR'S WORK SCHEDULE LIMITATIONS. Construction of Buildings and Projects. It is unlawful to operate any pile driver, power shovel, pneumatic hammer, derrick, power hoist, or similar heavy construction equipment before 7:00 a.m. or after 10:00 p.m., Monday through Friday, or before 9:00 a.m. or after 10:00 p.m., Saturday and Sunday, unless a permit shall first be obtained from the City and Borough Building Official. Such permit shall be issued by the Building Official only upon a determination that such operation during hours not otherwise permitted hereunder is necessary and will not result in unreasonable disturbance to surrounding residents.

ARTICLE 7 OTHER WORK

7.1 RELATED WORK AT SITE

A. The OWNER may perform other work related to the Project at the site by the OWNER's own forces, have other work performed by utility owners, or let other direct contracts therefor which may contain General Conditions similar to these. If the fact that such other work is to be performed was not noted in the Contract Documents, written notice thereof will be given to the CONTRACTOR prior to starting any such other work.

B. The CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (or the OWNER, if the OWNER is performing the additional work with the OWNER's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such work, and shall properly connect and coordinate with their WORK. The CONTRACTOR shall do all cutting, fitting, and patching of the WORK that may be required to make its several parts come together properly and integrate with such other work. The CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of the ARCHITECT and the others whose work will be affected.

C. If the proper execution or results of any part of the CONTRACTOR's WORK depends upon the work of any such other contractor or utility owner (or OWNER), the CONTRACTOR shall inspect and report to the ARCHITECT in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for such proper execution and results. The CONTRACTOR's failure to report such delays, defects, or deficiencies will constitute an acceptance of the other work as fit and proper for integration with the CONTRACTOR's WORK except for latent or nonapparent defects and deficiencies in the other work.

7.2 COORDINATION. If the OWNER contracts with others for the performance of other work on the Project at the site, the person or organization who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified in the Supplementary General Conditions, and the specific matters to be covered by such authority and responsibility will be itemized and the extent of such authority and responsibilities will be provided in the Supplementary General Conditions.

ARTICLE 8 OWNER'S RESPONSIBILITIES

8.1 COMMUNICATIONS

A. The OWNER shall issue all its communications to the CONTRACTOR through the ARCHITECT.

B. The CONTRACTOR shall issue all its communications to the OWNER through the ARCHITECT.

8.2 PAYMENTS. The OWNER shall make payments to the CONTRACTOR as provided in Paragraphs 14.5, 14.8, 14.9 and 14.10.

8.3 LANDS, EASEMENTS, AND SURVEYS. The OWNER's duties in respect of providing lands and easements and providing surveys to establish reference points are set forth in Paragraphs 4.1 and 4.5.

8.4 CHANGE ORDERS. The OWNER shall execute Change Orders as indicated in Paragraph 10.1F.

8.5 INSPECTIONS AND TESTS. The OWNER's responsibility in respect of inspections, tests, and approvals is set forth in Paragraph 13.3.

8.6 SUSPENSION OF WORK. In connection with the OWNER's right to stop WORK or suspend WORK, see Paragraphs 13.4 and 15.1.

8.7 TERMINATION OF AGREEMENT. Paragraphs 15.2 and 15.3 deal with the OWNER's right to terminate services of the CONTRACTOR.

ARTICLE 9 ARCHITECT'S STATUS DURING CONSTRUCTION

9.1 OWNER'S REPRESENTATIVE. The ARCHITECT will be the OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of the ARCHITECT as the OWNER's representative during construction are set forth in the Contract Documents.

9.2 VISITS TO SITE. The ARCHITECT will make visits to the site during construction to observe the progress and quality of the WORK and to determine, in general, if the WORK is proceeding in accordance with the Contract Documents. Exhaustive or continuous on-site inspections to check the quality or quantity of the WORK will not be required of the ARCHITECT. The ARCHITECT will not, during such visits, or as a result of such observations of the CONTRACTOR's WORK in progress, supervise, direct, or have control over the CONTRACTOR's WORK.

9.3 PROJECT REPRESENTATION. The ARCHITECT may furnish an Inspector to assist in observing the performance of the WORK. The duties, responsibilities, and limitations of authority of any such Inspector and assistants will be as provided in the Supplementary General Conditions.

9.4 CLARIFICATIONS AND INTERPRETATIONS. The ARCHITECT will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as the ARCHITECT may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents.

9.5 AUTHORIZED VARIATIONS IN WORK. The ARCHITECT may authorize variations in the WORK from the requirements of the Contract Documents. These may be accomplished by a Field Order and will require the CONTRACTOR to perform the WORK involved in a manner that minimizes the impact to the WORK and the contract completion date. If the CONTRACTOR believes that a Field Order justifies an increase in the Contract Price or an extension of the Contract Time, the CONTRACTOR may make a claim therefor as provided in Article 11 or 12.

9.6 REJECTING OR ACCEPTING DEFECTIVE WORK. The ARCHITECT will have authority to reject or accept WORK which the ARCHITECT believes to be defective and will also have authority to require special inspection or testing of the WORK as provided in Paragraph 13.3G, whether or not the WORK is fabricated, installed, or completed.

9.7 CONTRACTOR SUBMITTALS, CHANGE ORDERS, AND PAYMENTS

A. In accordance with the procedures set forth in the General Requirements, the ARCHITECT will review all CONTRACTOR submittals, including Shop Drawings, samples, substitutes, or "or equal" items, etc., in order to determine if the items covered by the submittals will, after installation or incorporation in the WORK, conform to the requirements of the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. The ARCHITECT's review will not extend to means, methods, techniques, sequences or procedures of construction or to safety precautions or programs incident thereto.

B. In connection with the ARCHITECT's responsibilities as to Change Orders, see Articles 10, 11, and 12.

C. In connection with the ARCHITECT's responsibilities in respect of Applications for Payment, see Article 14.

9.8 DECISIONS ON DISPUTES

A. The ARCHITECT will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the WORK thereunder. Claims, disputes, and other matters relating to the acceptability of the WORK; the interpretation of the requirements of the Contract Documents pertaining to the performance of the WORK; and those claims under Articles 11 and 12 in respect to changes in the Contract Price or Contract Time will be referred initially to the ARCHITECT in writing with a request for formal decision in accordance with this paragraph, which the ARCHITECT will render in writing within 30 days of receipt of the request. Written notice of each such claim, dispute, and other matter will be delivered by the CONTRACTOR to the ARCHITECT promptly (but in no event later than 30 days) after the occurrence of the event giving rise thereto. Written supporting data will be submitted to the ARCHITECT within 60 days after such occurrence unless the ARCHITECT allows an additional period of time to ascertain more accurate data in support of the claim.

B. The rendering of a decision by the ARCHITECT with respect to any such claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment as provided in Paragraph 14.12) will be a condition precedent to any exercise by the OWNER or the CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Law or Regulations in respect of any such claim, dispute, or other matter.

9.9 LIMITATION ON ARCHITECT'S RESPONSIBILITIES

A. Neither the ARCHITECT's authority to act under this Article or other provisions of the Contract Documents nor any decision made by the ARCHITECT in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of the ARCHITECT to the CONTRACTOR, any Subcontractor, any Supplier, any surety for any of them, or any other person or organization performing any of the WORK.

B. Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as reviewed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review, or judgment of the ARCHITECT as to the WORK, it is intended that such requirement, direction, review, or judgment will be solely to evaluate the WORK for compliance with the requirements of the Contract Documents, and conformance with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents, unless there is a specific statement indicating otherwise. The use of any such term or adjective shall not be effective to assign to the ARCHITECT any duty or authority to supervise or direct the performance of the WORK or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.9C or 9.9D.

C. The ARCHITECT will not supervise, direct, control, or have authority over or be responsible for the CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of the CONTRACTOR to comply with Laws and Regulations, applicable to the performance of the WORK. The ARCHITECT will not be responsible for the CONTRACTOR's failure to perform the WORK in accordance with the Contract Documents.

D. The ARCHITECT will not be responsible for the acts or omissions of the CONTRACTOR nor of any Subcontractor, Supplier, or any other person or organization performing any of the WORK.

ARTICLE 10 CHANGES IN THE WORK

10.1 GENERAL

A. Without invalidating the Agreement and without notice to any surety, the OWNER may at any time or from time to time, order additions, deletions, or revisions in the WORK; these will be authorized by a written Field Order and/or a Change Order issued by the ARCHITECT.

B. If the CONTRACTOR believes that it is entitled to an increase or decrease in the Contract Price, or an extension or shortening in the Contract Time as the result of a Field Order, a claim may be made as provided in Articles 11 and 12.

C. If the OWNER and CONTRACTOR agree on the value of any WORK, or the amount of Contract Time that should be allowed as a result of a Field Order, upon receiving written notice from the ARCHITECT, the CONTRACTOR shall proceed so as to minimize the impact on and delays to the WORK pending the issuance of a Change Order.

D. If the OWNER and the CONTRACTOR are unable to agree as to the extent, if any, of an increase or decrease in the Contract Price or an extension or shortening of the Contract Time that should be

allowed as a result of a Field Order, the ARCHITECT can direct the CONTRACTOR to proceed on the basis of Time and Materials so as to minimize the impact on and delays to the WORK, and a claim may be made therefor as provided in Articles 11 and 12.

E. The CONTRACTOR shall not be entitled to an increase in the Contract Price nor an extension of the Contract Time with respect to any WORK performed that is not required by the Contract Documents as amended, modified, supplemented by Change Order, except in the case of an emergency and except in the case of uncovering WORK as provided in Paragraph 13.3G.

F. The OWNER and the CONTRACTOR shall execute appropriate Change Orders covering:

1. changes in the WORK which are ordered by the OWNER pursuant to Paragraph 10.1A;
2. changes required because of acceptance of Defective WORK under Paragraph 13.7;
3. changes in the Contract Price or Contract Time which are agreed to by the parties; or
4. changes in the Contract Price or Contract Time which embody the substance of any written decision rendered by the ARCHITECT pursuant to Paragraph 9.8.

G. If notice of any change is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be the CONTRACTOR's responsibility, and the amount of each applicable Bond shall be adjusted accordingly.

10.2 ALLOWABLE QUANTITY VARIATIONS

A. In the event of an increase or decrease in bid item quantity of a unit price contract, the total amount of WORK actually done or materials or equipment furnished shall be paid for according to the unit price established for such WORK under the Contract Documents, wherever such unit price has been established; provided, that an adjustment in the Contract Price may be made for changes which result in an increase or decrease in excess of 25% of the estimated quantity of any major item of the WORK. Major Item is defined as any bid item amount that is ten percent (10%) or more of the total contract amount.

B. In the event a part of the WORK is to be entirely eliminated and no lump sum or unit price is named in the Contract Documents to cover such eliminated WORK, the price of the eliminated WORK shall be agreed upon in writing by the OWNER and the CONTRACTOR. If the OWNER and the CONTRACTOR fail to agree upon the price of the eliminated WORK, said price shall be determined in accordance with the provisions of Article 11.

ARTICLE 11 CHANGE OF CONTRACT PRICE

11.1 GENERAL

A. The Contract Price constitutes the total compensation payable to the CONTRACTOR for performing the WORK. All duties, responsibilities, and obligations assigned to or undertaken by the CONTRACTOR to complete the WORK shall be at its expense without change in the Contract Price.

B. The Contract Price may only be changed by a Change Order. Any claim for an increase in the Contract Price shall be based on written notice delivered by the CONTRACTOR to the ARCHITECT promptly (but in no event later than 30 days) after the start of the occurrence or the event giving rise

to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within 60 days after such occurrence (unless the ARCHITECT allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR's written statement that the amount claimed covers all known amounts (direct, indirect, and consequential) to which the CONTRACTOR is entitled as a result of said occurrence or event. All claims for adjustment in the Contract Price shall be determined by the ARCHITECT in accordance with Paragraph 9.8A if the OWNER and the CONTRACTOR cannot otherwise agree on the amount involved. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this Paragraph 11.1B.

C. The value of any WORK covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:

1. Where the WORK involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved.
2. By mutual acceptance of a lump sum, which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.4.
3. On the basis of the "Cost of WORK" (determined as provided in Paragraphs 11.3) plus a CONTRACTOR's fee for overhead and profit (determined as provided in Paragraph 11.4).

11.2 COSTS RELATING TO WEATHER. The CONTRACTOR shall have no claims against the OWNER for damages for any injury to WORK, materials, or equipment, resulting from the action of the elements. If, however, in the opinion of the ARCHITECT, the CONTRACTOR has made all reasonable efforts to protect the materials, equipment and WORK, the CONTRACTOR may be granted a reasonable extension of Contract Time to make proper repairs, renewals, and replacements of the WORK, materials, or equipment.

11.3 COST OF WORK (BASED ON TIME AND MATERIALS)

A. General. The term "Cost of WORK" means the sum of all costs necessarily incurred and paid by the CONTRACTOR for labor, materials, and equipment in the proper performance of extra WORK. Except as otherwise may be agreed to in writing by the OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project; shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.5 EXCLUDED COSTS.

B. Labor. The costs of labor will be the actual cost for wages prevailing for each craft or type of workers performing the extra WORK at the time the extra WORK is done, plus employer payments of payroll taxes, worker’s compensation insurance, liability insurance, health and welfare, pension, vacation, apprenticeship funds, and other direct costs resulting from Federal, State or local laws, as well as assessments or benefits required by lawful collective bargaining agreements. Labor costs for equipment operators and helpers shall be paid only when such costs are not included in the invoice for equipment rental. The labor costs for forepersons shall be proportioned to all of their assigned WORK and only that applicable to extra WORK shall be paid. Non-direct labor costs including superintendence shall be considered part of the mark-up set out in paragraph 11.4.

C. Materials. The cost of materials reported shall be at invoice or lowest current price at which materials are locally available and delivered to the job in the quantities involved, plus the cost of freight, delivery and storage, subject to the following:

1. Trade discounts available to the purchaser shall be credited to the OWNER notwithstanding the fact that such discounts may not have been taken by the CONTRACTOR.
2. For materials secured by other than a direct purchase and direct billing to the purchaser, the cost shall be deemed to be the price paid to the actual supplier as determined by the ARCHITECT. Mark-up except for actual costs incurred in the handling of such materials will not be allowed.
3. Payment for materials from sources owned wholly or in part by the purchaser shall not exceed the price paid by the purchaser for similar materials from said sources on extra WORK items or the current wholesale price for such materials delivered to the WORK site, whichever price is lower.
4. If in the opinion of the ARCHITECT the cost of material is excessive, or the CONTRACTOR does not furnish satisfactory evidence of the cost of such material, then the cost shall be deemed to be the lowest current wholesale price for the quantity concerned delivered to the WORK site less trade discount. The OWNER reserves the right to furnish materials for the extra WORK and no claim shall be allowed by the CONTRACTOR for costs and profit on such materials.

D. Equipment. The CONTRACTOR will be paid for the use of equipment at the rental rate listed for such equipment specified in the Supplementary General Conditions. Such rental rate will be used to compute payments for equipment whether the equipment is under the CONTRACTOR's control through direct ownership, leasing, renting, or another method of acquisition. The rental rate to be applied for use of each item of equipment shall be the rate resulting in the least total cost to the OWNER for the total period of use. If it is deemed necessary by the CONTRACTOR to use equipment not listed in the publication specified in the Supplementary General Conditions, an equitable rental rate for the equipment will be established by the ARCHITECT. The CONTRACTOR may furnish cost data which might assist the ARCHITECT in the establishment of the rental rate.

1. All equipment shall, in the opinion of the ARCHITECT, be in good working condition and suitable for the purpose for which the equipment is to be used.
2. Before construction equipment is used on the extra WORK, the CONTRACTOR shall plainly stencil or stamp an identifying number thereon at a conspicuous location, and shall furnish to the ARCHITECT, in duplicate, a description of the equipment and its identifying number.
3. Unless otherwise specified, manufacturer's ratings and manufacturer approved modifications shall be used to classify equipment for the determination of applicable rental rates. Equipment which has no direct power unit shall be powered by a unit of at least the minimum rating recommended by the manufacturer.
4. Individual pieces of equipment or tools having a replacement value of $200 or less, whether or not consumed by use, shall be considered to be small tools and no payment will be made therefor.
5. Rental time will not be allowed while equipment is inoperative due to breakdowns.
6. Equipment. Unless otherwise agreed to in writing, the CONTRACTOR will be paid for the use of equipment at the rental rate listed for such equipment specified in the current edition of the following reference publication: “Rental Rate Blue Book” available on-line at http://www.equipmentwatch.com/rrbb.htm or contact Equipment Watch at (800) 669-3282.

E. Equipment on the WORK Site. The rental time to be paid for equipment on the WORK site shall be the time the equipment is in productive operation on the extra WORK being performed and, in addition, shall include the time required to move the equipment to the location of the extra WORK and return it to the original location or to another location requiring no more time than that required

to return it to its original location; except, that moving time will not be paid if the equipment is used on other than the extra WORK, even though located at the site of the extra WORK. Loading and transporting costs will be allowed, in lieu of moving time, when the equipment is moved by means other than its own power, except that no payment will be made for loading and transporting costs when the equipment is used at the site of the extra WORK on other than the extra WORK. The following shall be used in computing the rental time of equipment on the WORK site.

1. When hourly rates are listed, any part of an hour less than 30 minutes of operation shall be considered to be 1/2-hour of operation, and any part of an hour in excess of 30 minutes will be considered one hour of operation.
2. When daily rates are listed, any part of a day less than 4 hours operation shall be considered to be 1/2-day of operation. When owner-operated equipment is used to perform extra WORK to be paid for on a time and materials basis, the CONTRACTOR will be paid for the equipment and operator, as set forth in Paragraphs (3), (4), and (5), following.
3. Payment for the equipment will be made in accordance with the provisions in Paragraph 11.3D, herein.
4. Payment for the cost of labor and subsistence or travel allowance will be made at the rates paid by the CONTRACTOR to other workers operating similar equipment already on the WORK site, or in the absence of such labor, established by collective bargaining agreements for the type of worker and location of the extra WORK, whether or not the operator is actually covered by such an agreement. A labor surcharge will be added to the cost of labor described herein in accordance with the provisions of Paragraph 11.3B, herein, which surcharge shall constitute full compensation for payments imposed by state and federal laws and all other payments made to or on behalf of workers other than actual wages.
5. To the direct cost of equipment rental and labor, computed as provided herein, will be added the allowances for equipment rental and labor as provided in Paragraph 11.4, herein.

F. Specialty WORK. Specialty WORK is defined as that WORK characterized by extraordinary complexity, sophistication, or innovation or a combination of the foregoing attributes which are unique to the construction industry. The following shall apply in making estimates for payment for specialty WORK:

1. Any bid item of WORK to be classified as Specialty WORK shall be listed as such in the Supplementary General Conditions. Specialty WORK shall be performed by an entity especially skilled in the work to be performed. After validation of invoices and determination of market values by the ARCHITECT, invoices for Specialty WORK based upon the current fair market value thereof may be accepted without complete itemization of labor, material, and equipment rental costs.
2. When the CONTRACTOR is required to perform WORK necessitating special fabrication or machining process in a fabrication or a machine shop facility away from the job site, the charges for that portion of the WORK performed at the off-site facility may, by agreement, be accepted as Specialty WORK and accordingly, the invoices for the WORK may be accepted without detailed itemization.
3. All invoices for specialty WORK will be adjusted by deducting all trade discounts offered or available, whether the discounts were taken or not. In lieu of the allowances for overhead and profit specified in Paragraph 11.4, herein, an allowance of 5 percent will be added to invoices for specialty WORK.

G. Sureties. All WORK performed hereunder shall be subject to all of the provisions of the Contract Documents and the CONTRACTOR's sureties shall be bound with reference thereto as under the original Agreement. Copies of all amendments to surety Bonds or supplemental surety Bonds shall be submitted to the OWNER for review prior to the performance of any WORK hereunder.

11.4 CONTRACTOR'S FEE

A. Extra WORK ordered on the basis of time and materials will be paid for at the actual necessary cost as determined by the ARCHITECT, plus allowances for overhead and profit. The allowance for overhead and profit shall include full compensation for superintendence, Bond and insurance premiums, taxes, field office expense, extended overhead, home office overhead, and all other items of expense or cost not included in the cost of labor, materials, or equipment provided for under Paragraph 11.3. The allowance for overhead and profit will be made in accordance with the following schedule:

Actual Overhead and Profit Allowance

Labor ..... 15 percent
Materials ..... 10 percent
Equipment ..... 10 percent

To the sum of the costs and mark-ups provided for in this Article, one (1) percent shall be added as compensation for Bonds.

B. It is understood that labor, materials, and equipment may be furnished by the CONTRACTOR or by the Subcontractor on behalf of the CONTRACTOR. When all or any part of the extra WORK is performed by a Subcontractor, the allowance specified herein shall be applied to the labor, materials, and equipment costs of the Subcontractor, to which the CONTRACTOR may add five (5) percent of the Subcontractor's total cost for the extra WORK. Regardless of the number of hierarchical tiers of Subcontractors, the five (5) percent increase above the Subcontractor's total cost which includes the allowances for overhead and profit specified herein may be applied one time only.

11.5 EXCLUDED COSTS.

A. The term "Cost of the WORK" shall not include any of the following:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, architects, estimators, attorneys' auditors, accountants, purchasing and contracting agents, expenditures, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the site or in CONTRACTOR's principal or a branch office for general administration of the WORK, or not specifically covered by paragraph 11.3, all of which are to be considered administrative costs covered by the CONTRACTOR's fee.
2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the site.
3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the WORK and charges against CONTRACTOR for delinquent payments.

4. Cost of premiums for all Bonds and for all insurance whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except for the cost of premiums covered by paragraph 11.4 above).
5. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of Defective WORK, disposal of materials or equipment wrongly supplied and making good any damage to property.
6. Other overhead or general expense costs of any kind and the cost of any item not specifically and expressly included in paragraph 11.4.

ARTICLE 12 CHANGE OF CONTRACT TIME

12.1 GENERAL

A. The Contract Time may only be changed by a Change Order. Any claim for an extension of the Contract Time (or Milestones) shall be based on written notice delivered by the CONTRACTOR to the ARCHITECT promptly (but in no event later than 30 days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within 60 days after such occurrence (unless the ARCHITECT allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the CONTRACTOR's written statement that the adjustment claimed is the entire adjustment to which the CONTRACTOR has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Time shall be determined by the ARCHITECT in accordance with Paragraph 9.8 if the OWNER and the CONTRACTOR cannot otherwise agree. No claim for an adjustment in the Contract Time will be valid if not submitted in accordance with the requirements of this paragraph. An increase in Contract Time does not mean that the CONTRACTOR is due an increase in Contract Price. Only Compensable time extensions will result in an increase in Contract Price.

B. All time limits stated in the Contract Documents are of the essence of the Agreement.

C. Where CONTRACTOR is prevented from completing any part of the WORK within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost on the critical path of the Project due to such delay if a claim is made therefor as provided in paragraph 12.1. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, unprecedented weather conditions or acts of God. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

D. Where CONTRACTOR is prevented from completing any part of the WORK within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost on the critical path of the Project due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay. In no event shall the OWNER be liable to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from (i) delays caused by or within the control of

CONTRACTOR, or (ii) delays beyond the control of both parties including but not limited to fires, floods, epidemics abnormal weather conditions, acts of God or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

12.2 EXTENSIONS OF TIME FOR DELAY DUE TO WEATHER. Contract time may be extended by the ARCHITECT because of delays in completion of the WORK due to unusually severe weather, provided that the CONTRACTOR shall, within 10 days of the beginning of any such delay, notify the ARCHITECT in writing of the cause of delay and request an extension of contract time. The ARCHITECT will ascertain the facts and the extent of the delay and extend the time for completing the WORK when, in the ARCHITECT's judgment, the findings of fact justify such an extension. Unprecedented, abnormal, or unusually severe weather will be defined as an event, or events, with a greater than 50-year recurrence interval, as determined by the National Weather Service, or equivalent state or federal agency.

ARTICLE 13 WARRANTY AND GUARANTEE; TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

13.1 WARRANTY AND GUARANTEE. The CONTRACTOR warrants and guarantees to the OWNER and the ARCHITECT that all WORK will be in accordance with the Contract Documents and will not be defective. Prompt notice of defects known to the OWNER or ARCHITECT shall be given to the CONTRACTOR. All Defective WORK, whether or not in place, may be rejected, corrected, or accepted as provided in this Article 13.

13.2 ACCESS TO WORK. The OWNER, ARCHITECT, Architect of Record, their consultants, sub-consultants, other representatives and personnel of OWNER, independent testing laboratories and governmental agencies with jurisdictional interests will have access to the WORK at reasonable times for their observation, inspecting and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's site safety procedures and programs so that they may comply therewith as applicable.

13.3 INSPECTIONS AND TESTS

A. The CONTRACTOR shall give the ARCHITECT timely notice of readiness of the WORK for all required inspections, tests, or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. If Laws or Regulations of any public body having jurisdiction other than the OWNER require any WORK to specifically be inspected, tested, or approved, the CONTRACTOR shall pay all costs in connection therewith. The CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with the OWNER's or the ARCHITECT's acceptance of a Supplier of materials or equipment proposed as a substitution or (or-equal) to be incorporated in the WORK, or of materials or equipment submitted for review prior to the CONTRACTOR's purchase thereof for incorporation in the WORK. The cost of all inspections, tests, and approvals in addition to the above which are required by the Contract Documents shall be paid by the OWNER (unless otherwise specified).

C. The ARCHITECT will make, or have made, such inspections and tests as the ARCHITECT deems necessary to see that the WORK is being accomplished in accordance with the requirements of the Contract Documents. Unless otherwise specified in the Supplementary General Conditions, the cost

of such inspection and testing will be borne by the OWNER. In the event such inspections or tests reveal non-compliance with the requirements of the Contract Documents, the CONTRACTOR shall bear the cost of corrective measures deemed necessary by the ARCHITECT, as well as the cost of subsequent re-inspection and retesting. Neither observations by the ARCHITECT nor inspections, tests, or approvals by others shall relieve the CONTRACTOR from the CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents.

D. All inspections, tests, or approvals other than those required by Laws or Regulations of any public body having jurisdiction shall be performed by organizations acceptable to the ARCHITECT and the CONTRACTOR.

E. If any WORK (including the work of others anticipated under paragraph 7.1) that is to be inspected, tested, or approved is covered without written concurrence of the ARCHITECT, it must, if requested by the ARCHITECT, be uncovered for observation. Such uncovering shall be at the CONTRACTOR's expense unless the CONTRACTOR has given the ARCHITECT timely notice of the CONTRACTOR's intention to perform such test or to cover the same and the ARCHITECT has not acted with reasonable promptness in response to such notice.

F. If any WORK is covered contrary to the written request of the ARCHITECT, it must, if requested by the ARCHITECT, be uncovered for the ARCHITECT's observation and recovered at the CONTRACTOR's expense.

G. If the ARCHITECT considers it necessary or advisable that covered WORK be observed by the ARCHITECT or inspected or tested by others, the CONTRACTOR, at the ARCHITECT's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as the ARCHITECT may require, that portion of the WORK in question, furnishing all necessary labor, material, and equipment. If it is found that such WORK is defective, the CONTRACTOR shall bear all direct, indirect, and consequential costs and damages of such uncovering, exposure, observation, inspection, and testing and of satisfactory reconstruction, including but not limited to fees and charges of Architects of Record, attorneys, and other professionals. However, if such WORK is not found to be defective, the CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, and reconstruction; and, if the parties are unable to agree as to the amount or extent thereof, the CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.

13.4 OWNER MAY STOP THE WORK. If the WORK is defective, or the CONTRACTOR fails to perform WORK in such a way that the completed WORK will conform to the Contract Documents, the OWNER may order the CONTRACTOR to stop the WORK, or any portion thereof, until the cause for such order has been eliminated; however, this right of the OWNER to stop the WORK shall not give rise to any duty on the part of the OWNER to exercise this right for the benefit of the CONTRACTOR or any other party.

13.5 CORRECTION OR REMOVAL OF DEFECTIVE WORK. If required by the ARCHITECT, the CONTRACTOR shall promptly, either correct all Defective WORK, whether or not fabricated, installed, or completed, or, if the WORK has been rejected by the ARCHITECT, remove it from the site and replace it with non-defective WORK. The CONTRACTOR shall bear all direct, indirect and consequential costs and damages of such correction or removal, including but not limited to fees and charges of Architects of Record, attorneys, and other professionals made necessary thereby.

13.6 ONE YEAR CORRECTION PERIOD

A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any WORK is found to be defective, the CONTRACTOR shall promptly, without cost to the OWNER and in accordance with OWNER's written notification, (i) correct such Defective WORK, or, if it has been rejected by the OWNER, remove it from the site and replace it with non-defective WORK, and (ii) satisfactorily correct or remove and replace any damage to other work of others resulting therefrom. If the CONTRACTOR does not promptly comply with such notification, or in an emergency where delay would cause serious risk of loss or damage, the OWNER may have the Defective WORK corrected or the rejected WORK removed and replaced, and all direct, indirect, and consequential costs and damages of such removal and replacement including but not limited to fees and charges of Architects of Record, attorneys and other professionals will be paid by the CONTRACTOR.

B. Where Defective WORK (and damage to other WORK resulting therefrom) has been corrected, removed or replaced under this paragraph 13.6, the correction period hereunder with respect to such WORK will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

13.7 ACCEPTANCE OF DEFECTIVE WORK. If, instead of requiring correction or removal and replacement of Defective WORK, the OWNER prefers to accept the WORK, the OWNER may do so. The CONTRACTOR shall bear all direct, indirect, and consequential costs attributable to the OWNER's evaluation of and determination to accept such Defective WORK. If any such acceptance occurs prior to final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the WORK, and the OWNER shall be entitled to an appropriate decrease in the Contract Price.

ARTICLE 14 PAYMENTS TO CONTRACTOR AND COMPLETION

14.1 SCHEDULE OF VALUES (LUMP SUM PRICE BREAKDOWN). The Schedule of Values or lump sum price breakdown established as provided in the General Requirements shall serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to the ARCHITECT.

14.2 UNIT PRICE BID SCHEDULE. Progress payments on account of Unit Price WORK will be based on the number of units completed.

14.3 APPLICATION FOR PROGRESS PAYMENT

A. Unless otherwise prescribed by law, on the 25th of each month, the CONTRACTOR shall submit to the ARCHITECT for review, an Application for Payment filled out and signed by the CONTRACTOR covering the WORK completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.

B. The Application for Payment shall identify, as a sub-total, the amount of the CONTRACTOR's Total Earnings to Date, plus the Value of Materials Stored at the Site which have not yet been incorporated in the WORK, and less a deductive adjustment for materials installed which were not previously

incorporated in the WORK, but for which payment was allowed under the provisions for payment for Materials Stored at the Site, but not yet incorporated in the WORK.

C. The Net Payment Due the CONTRACTOR shall be the above-mentioned subtotal from which shall be deducted the total amount of all previous payments made to the CONTRACTOR. Progress payments will be paid in full in accordance with Article 14 of the General Conditions until 90% of the contract amount has been paid. The remaining 10% of the contract amount shall be retained until:

1. final inspection has been made;
2. completion of the project;
3. acceptance of the project by the OWNER and;
4. the OWNER has received notification from the Alaska Department of Labor that the CONTRACTOR has no outstanding wage/hour violations.

D. The Value of Materials Stored at the Site shall be an amount equal to the specified percent of the value of such materials as set forth in the Supplementary General Conditions. Said amount shall be based upon the value of all acceptable materials and equipment not incorporated in the WORK but delivered and suitably stored at the Project site or at another location agreed to in writing; provided, each such individual item has a value of more than $5000 and will become a permanent part of the WORK. The Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that the CONTRACTOR has received the materials and equipment free and clear of all liens, charges, security interests, and encumbrances (which are hereinafter in these General Conditions referred to as "Liens") and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect the OWNER's interest therein, all of which will be satisfactory to the OWNER.

14.4 CONTRACTOR'S WARRANTY OF TITLE. The CONTRACTOR warrants and guarantees that title to all WORK, materials, and equipment covered by an Application for Payment, whether incorporated in the WORK or not, will pass to the OWNER no later than the time of payment free and clear of all liens.

14.5 REVIEW OF APPLICATIONS FOR PROGRESS PAYMENT

A. The ARCHITECT will, within seven (7) days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to the OWNER, or return the Application to the CONTRACTOR indicating in writing the ARCHITECT's reasons for refusing to recommend payment. In the later case, the CONTRACTOR may make the necessary corrections and resubmit the Application. If the ARCHITECT still disagrees with a portion of the Application, it will submit the Application recommending the undisputed portion of the Application to the OWNER for review and provide reasons for recommending non-payment of the disputed amount. Thirty days after presentation of the Application for Payment with the ARCHITECT's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.5B) become due and when due will be paid by the OWNER to the CONTRACTOR.

B. The OWNER may refuse to make payment of the full amount recommended by the ARCHITECT because claims have been made against the OWNER on account of the CONTRACTOR's performance of the WORK or Liens have been filed in connection with the WORK or there are other items entitling the OWNER to a credit against the amount recommended, but the OWNER must give

the CONTRACTOR written notice within seven (7) days (with a copy to the ARCHITECT) stating the reasons for such action.

14.6 PARTIAL UTILIZATION

A. The OWNER shall have the right to utilize or place into service any item of equipment or other usable portion of the WORK prior to completion of the WORK. Whenever the OWNER plans to exercise said right, the CONTRACTOR will be notified in writing by the OWNER, identifying the specific portion or portions of the WORK to be so utilized or otherwise placed into service.

B. It shall be understood by the CONTRACTOR that until such written notification is issued, all responsibility for care and maintenance of all of the WORK shall be borne by the CONTRACTOR. Upon issuance of said written notice of partial utilization, the OWNER will accept responsibility for the protection and maintenance of all such items or portions of the WORK described in the written notice.

C. The CONTRACTOR shall retain full responsibility for satisfactory completion of the WORK, regardless of whether a portion thereof has been partially utilized by the OWNER and the CONTRACTOR's one year correction period shall commence only after the date of Substantial Completion for the WORK.

14.7 SUBSTANTIAL COMPLETION. When the CONTRACTOR considers the WORK ready for its intended use the CONTRACTOR shall notify the OWNER and the ARCHITECT in writing that the WORK is substantially complete. The CONTRACTOR will attach to this request a list of all WORK items that remain to be completed and a request that the ARCHITECT prepare a Notice of Completion. Within a reasonable time thereafter, the OWNER, the CONTRACTOR, and the ARCHITECT shall make an inspection of the WORK to determine the status of completion. If the ARCHITECT does not consider the WORK substantially complete, or the list of remaining WORK items to be comprehensive, the ARCHITECT will notify the CONTRACTOR in writing giving the reasons thereof. If the ARCHITECT considers the WORK substantially complete, the ARCHITECT will prepare and deliver to the OWNER, for its execution and recording, the Notice of Completion signed by the ARCHITECT and CONTRACTOR, which shall fix the date of Substantial Completion.

14.8 FINAL APPLICATION FOR PAYMENT. After the CONTRACTOR has completed all of the remaining WORK items referred to in Paragraph 14.7 and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, record as-built documents (as provided in the General Requirements) and other documents, all as required by the Contract Documents, and after the ARCHITECT has indicated that the WORK is acceptable, the CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers (satisfactory to the OWNER) of all liens arising out of or filed in connection with the WORK.

14.9 FINAL PAYMENT AND ACCEPTANCE

A. If, on the basis of the ARCHITECT's observation of the WORK during construction and final inspection, and the ARCHITECT's review of the final Application for Payment and accompanying documentation, all as required by the Contract Documents, the ARCHITECT is satisfied that the WORK has been completed and the CONTRACTOR's other obligations under the Contract Documents have been fulfilled, the ARCHITECT will, within 14 days after receipt of the final Application for Payment, indicate in writing the ARCHITECT's recommendation of payment and present the Application to the OWNER for payment.

B. After acceptance of the WORK by the OWNER's governing body, the OWNER will make final payment to the CONTRACTOR of the amount remaining after deducting all prior payments and all amounts to be kept or retained under the provisions of the Contract Documents, including the following items:

1. Liquidated damages, as applicable.
2. Two times the value of outstanding items of correction WORK or punch list items yet uncompleted or uncorrected, as applicable. All such WORK shall be completed or corrected to the satisfaction of the OWNER within the time stated on the Notice of Completion, otherwise the CONTRACTOR does hereby waive any and all claims to all monies withheld by the OWNER to cover the value of all such uncompleted or uncorrected items.

14.10 RELEASE OF RETAINAGE AND OTHER DEDUCTIONS

A. After executing the necessary documents to initiate the lien period, and not more than 45 days thereafter (based on a 30-day lien filing period and 15-day processing time), the OWNER will release to the CONTRACTOR the retainage funds withheld pursuant to the Agreement, less any deductions to cover pending claims against the OWNER pursuant to Paragraph 14.5B.

B. After filing of the necessary documents to initiate the lien period, the CONTRACTOR shall have 30 days to complete any outstanding items of correction WORK remaining to be completed or corrected as listed on a final punch list made a part of the Notice of Completion. Upon expiration of the 45 days, referred to in Paragraph 14.10A, the amounts withheld pursuant to the provisions of Paragraph 14.9B herein, for all remaining WORK items will be returned to the CONTRACTOR; provided, that said WORK has been completed or corrected to the satisfaction of the OWNER within said 30 days. Otherwise, the CONTRACTOR does hereby waive any and all claims for all monies withheld by the OWNER under the contract to cover 2 times the value of such remaining uncompleted or uncorrected items.

14.11 CONTRACTOR'S CONTINUING OBLIGATION. The CONTRACTOR's obligation to perform and complete the WORK in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or final payment by the ARCHITECT, nor the issuance of a Notice of Completion, nor any payment by the OWNER to the CONTRACTOR under the Contract Documents, nor any use or occupancy of the WORK or any part thereof by the OWNER, nor any act of acceptance by the OWNER nor any failure to do so, nor any review of a Shop Drawing or sample submittal, will constitute an acceptance of WORK not in accordance with the Contract Documents or a release of the CONTRACTOR's obligation to perform the WORK in accordance with the Contract Documents.

14.12 FINAL PAYMENT TERMINATES LIABILITY OF OWNER. Final payment is defined as the last progress payment made to the CONTRACTOR for earned funds, less monies withheld as applicable, pursuant to Paragraph 14.10A. The acceptance by the CONTRACTOR of the final payment referred to in Paragraph 14.9 herein, shall be a release of the OWNER and its agents from all claims of liability to the CONTRACTOR for anything done or furnished for, or relating to, the WORK or for any act of neglect of the OWNER or of any person relating to or affecting the WORK, except demands against the OWNER for the remainder, if any, of the amounts kept or retained under the provisions of Paragraph 14.9 herein; and excepting pending, unresolved claims filed prior to the date of the Notice of Completion.

ARTICLE 15 SUSPENSION OF WORK AND TERMINATION

15.1 SUSPENSION OF WORK BY OWNER. The OWNER, acting through the ARCHITECT, may, at any time and without cause, suspend the WORK or any portion thereof for a period of not more than 90 days by notice in writing to the CONTRACTOR. The CONTRACTOR shall resume the WORK on receipt from the ARCHITECT of a notice of resumption of WORK. The CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if the CONTRACTOR makes an approved claim therefor as provided in Articles 11 and 12.

15.2 TERMINATION OF AGREEMENT BY OWNER (CONTRACTOR DEFAULT)

A. In the event of default by the CONTRACTOR, the OWNER may give 10 days written notice to the CONTRACTOR of OWNER's intent to terminate the Agreement and provide the CONTRACTOR an opportunity to remedy the conditions constituting the default. It shall be considered a default by the CONTRACTOR whenever CONTRACTOR shall: (1) declare bankruptcy, become insolvent, or assign its assets for the benefit of its creditors; (2) fail to provide materials or quality of WORK meeting the requirements of the Contract Documents; (3) disregard or violate provisions of the Contract Documents or ARCHITECT's instructions; (4) fail to prosecute the WORK according to the approved progress schedule; or, (5) fail to provide a qualified superintendent, competent workers, or materials or equipment meeting the requirements of the Contract Documents. If the CONTRACTOR fails to remedy the conditions constituting default within the time allowed, the OWNER may then issue the Notice of Termination.

B. In the event the Agreement is terminated in accordance with Paragraph 15.2A, herein, the OWNER may take possession of the WORK and may complete the WORK by whatever method or means the OWNER may select. The cost of completing the WORK shall be deducted from the balance which would have been due the CONTRACTOR had the Agreement not been terminated and the WORK completed in accordance with the Contract Documents. If such cost exceeds the balance which would have been due, the CONTRACTOR shall pay the excess amount to the OWNER. If such cost is less than the balance which would have been due, the CONTRACTOR shall not have claim to the difference.

15.3 TERMINATION OF AGREEMENT BY OWNER (FOR CONVENIENCE). The OWNER may terminate the Agreement at any time if it is found that reasons beyond the control of either the OWNER or CONTRACTOR make it impossible or against the OWNER's interests to complete the WORK. In such a case, the CONTRACTOR shall have no claims against the OWNER except: (1) for the value of WORK performed up to the date the Agreement is terminated; and, (2) for the cost of materials and equipment on hand, in transit, or on definite commitment, as of the date the Agreement is terminated, which would be needed in the WORK and which meet the requirements of the Contract Documents. The value of WORK performed and the cost of materials and equipment delivered to the site, as mentioned above, shall be determined by the ARCHITECT in accordance with the procedure prescribed for the making of the final Application for Payment and payment under Paragraphs 14.8 and 14.9.

15.4 TERMINATION OF AGREEMENT BY CONTRACTOR. The CONTRACTOR may terminate the Agreement upon 10 days written notice to the OWNER, whenever: 1) the WORK has been suspended under the provisions of Paragraph 15.1, herein, for more than 90 consecutive days through

no fault or negligence of the CONTRACTOR, and notice to resume WORK or to terminate the Agreement has not been received from the OWNER within this time period; or, 2) the OWNER should fail to pay the CONTRACTOR any monies due to the CONTRACTOR in accordance with the terms of the Contract Documents and within 60 days after presentation to the OWNER by the CONTRACTOR of a request therefor, unless within said 10-day period the OWNER shall have remedied the condition upon which the payment delay was based. In the event of such termination, the CONTRACTOR shall have no claims against the OWNER except for those claims specifically enumerated in Paragraph 15.3, herein, and as determined in accordance with the requirements of said paragraph.

ARTICLE 16 MISCELLANEOUS

16.1 GIVING NOTICE. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

16.2 RIGHTS IN AND USE OF MATERIALS FOUND ON THE WORK

A. The CONTRACTOR may use on the Project, with ARCHITECT's approval, such stone, gravel, sand, or other material determined suitable by the ARCHITECT, as may be found in the excavation. The CONTRACTOR will be paid for the excavation of such material at the corresponding contract unit price. No additional payment will be made for utilizing the material from excavation as borrow, or select borrow.

B. The CONTRACTOR shall replace, at its own expense, with other acceptable material, all of that portion of the excavated material so removed and used which was needed for use on the Project. No charge for the materials so used will be made against the CONTRACTOR except that the CONTRACTOR shall be responsible for payment of any royalties required.

C. The CONTRACTOR shall not excavate or remove any material from within the Project location which is not within the grading limits, as indicated by the slope and grade lines, without written authorization from the ARCHITECT.

D. In the event the CONTRACTOR has processed materials from OWNER-furnished sources in excess of the quantities required for performance of this contract, including any waste material produced as a by-product, the CBJ may retain possession of such materials without obligation to reimburse the CONTRACTOR for the cost of their production. When such materials are in a stockpile, the ARCHITECT may require: that it remain in stockpile; the CONTRACTOR level such stockpile(s); or that the CONTRACTOR remove such materials and restore the premises to a satisfactory condition at the CONTRACTOR's expense. This provision shall not preclude the CBJ from arranging with the CONTRACTOR to produce material over and above the contract needs, payment for which shall be by written agreement between the CBJ and the CONTRACTOR.

E. Unless otherwise provided, the material from any existing old structure may be used temporarily by the CONTRACTOR in the erection of the new structure. Such material shall not be cut or otherwise damaged except with the approval of the ARCHITECT.

16.3 RIGHT TO AUDIT. If the CONTRACTOR submits a claim to the OWNER for additional compensation, the OWNER shall have the right, as a condition to considering the claim, and as a basis for evaluation of the claim, and until the claim has been settled, to audit the CONTRACTOR's books to the extent they are relevant. This right shall include the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to discover and verify all direct and indirect costs of whatever nature claimed to have been incurred or anticipated to be incurred and for which the claim has been submitted. The right to audit shall include the right to inspect the CONTRACTOR's plants, or such parts thereof, as may be or have been engaged in the performance of the WORK. The CONTRACTOR further agrees that the right to audit encompasses all subcontracts and is binding upon Subcontractors. The rights to examine and inspect herein provided for shall be exercisable through such representatives as the OWNER deems desirable during the CONTRACTOR's normal business hours at the office of the CONTRACTOR. The CONTRACTOR shall make available to the OWNER for auditing, all relevant accounting records and documents, and other financial data, and upon request, shall submit true copies of requested records to the OWNER.

16.4 ARCHAEOLOGICAL OR HISTORICAL DISCOVERIES. When the CONTRACTOR's operation encounters prehistoric artifacts, burials, remains of dwelling sites, paleontological remains, such as shell heaps, land or sea mammal bones or tusks, or other items of historical significance, the CONTRACTOR shall cease operations immediately and notify the ARCHITECT. No artifacts or specimens shall be further disturbed or removed from the ground and no further operations shall be performed at the site until so directed. Should the ARCHITECT order suspension of the CONTRACTOR's operations in order to protect an archaeological or historical finding, or order the CONTRACTOR to perform extra WORK, such order(s) shall be covered by an appropriate contract change document.

16.5 CONSTRUCTION OVER OR ADJACENT TO NAVIGABLE WATERS. All WORK over, on, or adjacent to navigable waters shall be so conducted that free navigation of the waterways will not be interfered with and the existing navigable depths will not be impaired, except as allowed by permit issued by the U.S. Coast Guard and/or the U.S. Army Corps of Engineers, as applicable.

16.6 GRATUITY AND CONFLICT OF INTEREST. The CONTRACTOR agrees to not extend any loan, gratuity or gift of money of any form whatsoever to any employee or elected official of the OWNER, nor will the CONTRACTOR rent or purchase any equipment or materials from any employee or elected official of the OWNER, or to the best of the CONTRACTOR’s knowledge, from any agent of any employee or elected official of the OWNER. Before final payment, the CONTRACTOR shall execute and furnish the OWNER an affidavit certifying that the CONTRACTOR has complied with the above provisions of the contract.

16.7 SUITS OF LAW CONCERNING THE WORK

A. Should a suit of law be entered into, either by the CONTRACTOR (or the CONTRACTOR's surety) against the OWNER, or by the OWNER against the CONTRACTOR (or the CONTRACTOR's surety), the suit of law shall be tried in the First Judicial District of Alaska.

B. If one of the questions at issue is the satisfactory performance of the WORK by the CONTRACTOR and should the appropriate court of law judge the WORK of the CONTRACTOR to be unsatisfactory, then the CONTRACTOR (or the CONTRACTOR's surety) shall reimburse the

OWNER for all legal and all other expenses (as may be allowed and set by the court) incurred by the OWNER because of the suit of the law and, further, it is agreed that the OWNER may deduct such expense from any sum or sums then, or any that become due the CONTRACTOR under the contract.

16.8 CERTIFIED PAYROLLS

A. All CONTRACTORs or Subcontractor who perform work on a public construction contract for the OWNER shall file a Certified Payroll with the Alaska Department of Labor every two weeks. Before the second Friday, each CONTRACTOR and Subcontractor must file Certified Payrolls with Statements of Compliance for the previous two weeks. (Section 14-2-4 ACLA 1949; am Section 4 ch 142 SLA 1972).

B. In lieu of submitting the State payroll form, the CONTRACTOR's standard payroll form may be submitted, provided it contains the information required by AS 36.05.040 and a statement that the CONTRACTOR is complying with AS 36.10.010.

C. Any CONTRACTOR or Subcontractor, who performs work on public construction in the State, as defined by AS 36.95.010(3), shall pay not less than the current prevailing rate of wages as issued by the Alaska Department of Labor before the end of the pay period. (AS 36.05.010).

16.9 PREVAILING WAGE RATES

A. Wage rates for Laborers and Mechanics on Public Contracts, AS 36.05.070. The CONTRACTOR, or Subcontractors, shall pay all employees unconditionally and not less than once a week. Wages may not be less than those stated in Paragraph 16.8C, regardless of the contractual relationship between the CONTRACTOR or Subcontractors and laborers, mechanics, or field surveyors. The scale of wages to be paid shall be posted by the CONTRACTOR in a prominent, easily accessible place at the site of the WORK.

B. Failure to Pay Agreed Wages, AS 36.05.080. If it is found that a laborer, mechanic, or field surveyor employed by the CONTRACTOR or Subcontractor has been, or is being, paid a rate or wages less than the established rate, the OWNER may, by written notice, terminate the CONTRACTOR or Subcontractors right to proceed with the WORK. The OWNER may prosecute the WORK to completion by contract or otherwise, and the CONTRACTOR and sureties will be held liable to the OWNER for excess costs for completing the WORK. (Section 2 ch 52 SLA 1959).

C. Listing CONTRACTORS Who Violate contracts, AS 36.05.090. In addition, a list giving the names of persons who have disregarded the rights of their employees shall be distributed to all departments of State government and all political subdivisions. No person appearing on this list, and no firm, corporation, partnership or association in which the person has an interest, may WORK as a CONTRACTOR or Subcontractor on a public construction contract for the State, or a political subdivision of the state, until three years after the date of publication of the list. (Section 3 ch 52 SLA 1959; am Section 9 ch 142 SLA).

16.10 EMPLOYMENT REFERENCE. Workers employed in the execution of the contract by the CONTRACTOR or by any Subcontractor under this contract shall not be required or permitted to labor more than 8 hours a day or 40 hours per week in violation of the provisions of the Alaska Wage and Hour Act, Section 23.10.060.

16.11 COST REDUCTION INCENTIVE

A. At any time within 45 days after the date of the Notice of Award, the CONTRACTOR may submit to the ARCHITECT in writing, proposals for modifying the plans, specifications, or other requirements of this contract for the sole purpose of reducing the total cost of construction. The cost reduction proposal shall not impair in any manner the essential functions or characteristics of the project, including but not limited to, service life, economy of operation, ease of maintenance, desired appearance or design and safety standards.

B. The cost reduction proposal shall contain the following information:

1. Description of both the existing contract requirements for performing the WORK and the proposed changes.
2. An itemization of the contract requirements that must be changed if the proposal is adopted.
3. A detailed estimate of the time required and the cost of performing the WORK under both the existing contract and the proposed change.
4. A statement of the date by which the CONTRACTOR must receive the decision from the OWNER on the cost reduction proposal.
5. The contract items of WORK effected by the proposed changes including any quantity variations.
6. A description and estimate of costs the OWNER may incur in implementing the proposed changes, such as test and evaluation and operating and support costs.
7. A prediction of any effects the proposed change would have on future operations and maintenance costs to the OWNER.

C. The provisions of this section shall not be construed to require the OWNER to consider any cost reduction proposal which may be submitted; nor will the OWNER be liable to the CONTRACTOR for failure to accept or act upon any cost reduction proposal submitted, or for delays to the WORK attributable to the consideration or implementation of any such proposal.

D. If a cost reduction proposal is similar to a change in the plans or Specifications for the Project under consideration by the OWNER at the time the proposal is submitted, the OWNER will not accept such proposal and reserves the right to make such changes without compensation to the CONTRACTOR under the provisions of this section.

E. The CONTRACTOR shall continue to perform the WORK in accordance with the requirements of the contract until an executed Change Order incorporating the cost reduction proposal has been issued. If any executed Change Order has not been issued by the date upon which the CONTRACTOR's cost reduction proposal specifies that a decision should be made by the OWNER, in writing, the cost reduction proposal shall be considered rejected.

F. The OWNER, shall be the sole judge of the acceptability of a cost reduction proposal and of the estimated net savings in Contract Time and construction costs resulting from the adoption of all or any part of such proposal. Should the CONTRACTOR disagree with OWNER's decision on the cost reduction proposal, there is no further consideration. The OWNER reserves the right to make final determination.

G. If the CONTRACTOR's cost reduction proposal is accepted in whole or in part, such acceptance will be made by a Contract Change Order, which specifically states that the change is executed pursuant

to this cost reduction proposal section. Such Change Order shall incorporate the changes in the plans and Specifications which are necessary to permit the cost reduction proposal or such part of it as has been accepted to be put into effect and shall include any conditions upon which the OWNER's approval is based, if such approval is conditional. The Change Order shall also describe the estimated net savings in the cost of performing the WORK attributable to the cost reduction proposal, and shall further provide that the contract cost be adjusted by crediting the OWNER with the estimated net savings amount.

H. Acceptance of the cost reduction proposal and performance of the WORK does not extend the time of completion of the contract, unless specifically provided in the Change Order authorizing the use of the submitted proposal. Should the adoption of the cost reduction proposal result in a Contract Time savings, the total Contract Time shall be reduced by an amount equal to the time savings realized.

I. The amount specified to the CONTRACTOR in the Change Order accepted in the cost reduction proposal shall constitute full compensation for the performance of WORK. No claims for additional costs as a result of the changes specified in the cost reduction proposal shall be allowed.

J. The OWNER reserves the right to adopt and utilize any approved cost reduction proposal for general use on any contract administered when it is determined suitable for such application. Cost reduction proposals identical, similar, or previously submitted will not be accepted for consideration if acceptance and compensation has previously been approved. The OWNER reserves the right to use all or part of any cost reduction proposal without obligation or compensation of any kind to the CONTRACTOR.

K. The CONTRACTOR shall bear the costs, if any, to revise all Bonds and insurance requirements for the Project, to include the cost reduction WORK.

END OF SECTION

SECTION 00800 - SUPPLEMENTARY GENERAL CONDITIONS

GENERAL. These Supplementary General Conditions make additions, deletions, or revisions to the General Conditions as indicated herein. All provisions which are not so added, deleted, or revised remain in full force and effect. Terms used in these Supplementary General Conditions which are defined in the General Conditions have the meanings assigned to them in the General Conditions.

SGC 2.2 COPIES OF DOCUMENTS. ***Add*** the following:

The OWNER shall furnish to the CONTRACTOR up to ten (10) copies of the Contract Documents which may include bound reduced Drawings, if any, together with up to five (5) sets of full-scale Drawings. The CBJ Contracts Office shall contact the CONTRACTOR after issuance of Notice of Intent to Award to determine how many copies are needed. Additional quantities of the Contract Documents and full-scale Drawings will be furnished at reproduction cost.

SGC 4.2 PHYSICAL CONDITIONS - SUBSURFACE AND EXISTING STRUCTURES. ***Add*** the following:

C. In the preparation of the Contract Documents, the Engineer of Record has relied upon field measurements and visual inspection of the existing structures and surface conditions.

Add the following SGC 4.6**:**

SGC - 4.6 USE OF THE CBJ/STATE LEMON CREEK GRAVEL PIT. ***Add*** the following.

The CBJ/State Lemon Creek Gravel Pit is available for this Project.

SGC - 4.6 USE OF THE CBJ/STATE LEMON CREEK GRAVEL PIT. ***Delete*** paragraph C., and ***replace*** with the following paragraph C.

C. CONTRACTORs deciding to use material from the CBJ/State pit shall provide an Individual Mining Plan prepared by a professional engineer registered in the State of Alaska. The Individual Mining Plan must be reviewed and approved by the CBJ, prior to commencing operations within the pit. CONTRACTORs shall also secure a Performance Bond to ensure compliance with contract provisions, including any Individual Mining Plan stipulations. The bond shall remain in full force and effect until a release is obtained from the CBJ. A $10,000 cash processing restoration bond is required prior to screening or primary crushing operations.

Add the following SGC 4.7**:**

SGC 4.7 USE OF CITY/STATE STABLER'S POINT ROCK QUARRY. ***Add*** the following:

The CBJ/State Stabler's Point Rock Quarry is not available for this Project.

SGC 5.1 PERFORMANCE, PAYMENT, AND OTHER BONDS. The Contractor shall furnish Performance and Payment Bonds in the amount of 100% of the Bid.

SGC 5.2 INSURANCE AMOUNTS. The limits of liability for the insurance required by Paragraph 5.2 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations**.** All certificates of insurance supplied to the OWNER shall state that the OWNER is named as **"Additional Insured for any and all work performed for the City & Borough of**

Juneau." The Additional Insured requirement does not apply to Workers Compensation insurance. NOTE: This requirement has changed. The OWNER no longer requires certificates of insurance referencing project names and contract numbers.

A. Workers' Compensation: Under Paragraph 5.2C.1 of the General Conditions as in accordance with AS 23.30.045: (Additional Insured requirements not necessary for Workers' Compensation coverage.)

1. State: Statutory
2. Applicable Federal (e.g., Longshore): Statutory

Note: If the WORK called for in the Contract Documents involves work in or on any navigable waters, the CONTRACTOR shall provide Workers' Compensation coverage which shall include coverage under the Longshore and Harbor Workers' Compensation Act, the Jones Act, and any other coverage required under Federal or State laws pertaining to workers in or on navigable waters.

3. Employer's Liability

Bodily Injury by Accident:	$100,000.00	Each Accident
Bodily Injury by Disease:	$100,000.00	Each Employee
Bodily Injury by Disease:	$500,000.00	Policy Limit

a. CONTRACTOR agrees to waive all rights of subrogation against the OWNER of Record for work performed under contract.
b. If CONTRACTOR directly utilizes labor outside of the State of Alaska in the prosecution of the WORK, "Other States" endorsement shall be required as a condition of the contract.

B. Commercial General Liability: (under Paragraph 5.2C.2 of the General Conditions):

1.	General Policy	$1,000,000.00	Each Occurrence
		$2,000,000.00	Annual Aggregate
2.	Products/Completed Operations	$1,000,000.00	Each Occurrence
		$2,000,000.00	Annual Aggregate
3.	Personal Injury	$1,000,000.00	Each Occurrence

C. Comprehensive Automobile Liability: (under Paragraph 5.2C.3 of the General Conditions) including Owned, Hired, and Non-Owned Vehicles:

1. Combined Single Limit, Bodily Injury and Property Damage $1,000,000.00

The CONTRACTOR shall require each Subcontractor similarly to provide Commercial Automobile Liability Insurance for all of the latter's employees to be engaged in such WORK unless such employees are covered by the protection afforded by the CONTRACTOR's Commercial Automobile Liability Insurance.

D. Builder's Risk: (under Paragraph 5.2C.5 of the General Conditions) in an amount equal to the completed value of the BID. Flood and earthquake shall be excluded as a requirement of the Builder's Risk policy.

E. Policies shall also specify insurance provided by CONTRACTOR will be considered primary and not contributory to any other insurance available to the OWNER.

F. All policies will provide for 30 Days written notice prior to any cancellation or non-renewal of insurance policies required under contract. "Will endeavor" and "but failure to mail such notice shall impose no obligation or liability of any kind upon the Company, its agents or representatives" wording will be deleted from certificates.

SGC 6.1 SUPERVISION AND SUPERINTENDENCE. ***Add*** the following:

D. The CONTRACTOR's superintendent shall attend a weekly progress meeting at the site with the OWNER and/or the ARCHITECT at a time to be mutually agreed upon. The CONTRACTOR's superintendent shall have an operating cellular phone on hand at all times that WORK is performed.

SGC 6.5 CONCERNING SUBCONTRACTORS, SUPPLIERS, AND OTHERS. ***Add*** the following:

The CONTRACTOR shall perform not less than 20% of the WORK with its own forces (i.e., without subcontracting). The 20% requirement shall be understood to mean that the CONTRACTOR shall perform, with its own organization, WORK amounting to at least 20% of the original contract amount. The 20% requirement will be calculated based upon the total of the subcontract amounts submitted for Contract Award, and any other information requested by the OWNER from the apparent low Bidder.

SGC 6.6 PERMITS. ***Add*** the following:

C. The OWNER shall apply for, and obtain, the necessary building permit for this Project; however, the CONTRACTOR is responsible for scheduling and coordinating all necessary inspections. The CBJ Inspection number is 586-1703. All other provisions of this section remain in effect.

D. Contractor is responsible for obtaining a Hot Works permit from the CBJ Permit Center, if performing work which requires such a permit. Work requiring a Hot Works Permit includes but is not limited to the following: cutting, welding, Thermit welding, brazing, soldering, grinding, thermal spraying, thawing pipe, installation of torch-applied roof systems or any other similar activity.

SGC 6.8 LAWS AND REGULATIONS. ***Add*** the following:

The OWNER may, per AS 36.30, audit the CONTRACTOR's or Subcontractor(s) records that are related to the cost or pricing data for this contract, all related Change Orders, and/or contract modifications.

SGC 6.15 CONTRACTOR'S DAILY REPORTS. ***Add*** the following:

"Weekly summary reports may be completed in lieu of daily reports."

Add the following SCG 6.19:

SGC 6.19 CONTRACTOR'S WORK SCHEDULE LIMITATIONS. Construction of Buildings and Projects. It is unlawful to operate any pile driver, power shovel, pneumatic hammer, derrick, power hoist, or similar heavy construction equipment before 7:00 a.m. or after 10:00 p.m., Monday through Friday, or before 9:00 a.m. or after 10:00 p.m., Saturday and Sunday, unless a permit shall first be obtained from the City and Borough Building Official. Such permit shall be issued by the Building Official only upon a determination that such operation during hours not otherwise permitted hereunder is necessary and will not result in unreasonable disturbance to surrounding residents.

SGC 9.3 PROJECT REPRESENTATION. ***Add*** the following:

DUTIES, RESPONSIBILITIES AND LIMITATIONS OF AUTHORITY OF INSPECTOR

General. The Inspector will act as directed by and under the supervision of the ARCHITECT and will confer with the ARCHITECT regarding its actions. The Inspector's dealings in matters pertaining to the on-site WORK shall, in general, be only with the ARCHITECT and the CONTRACTOR, and dealings with Subcontractors shall only be through or with the full knowledge of the CONTRACTOR. Written communication with the OWNER will be only through or as directed by the ARCHITECT. The ARCHITECT may further delegate the responsibilities and authorities associated with this Project, when such delegation is in writing and notice thereof is provided to the CONTRACTOR.

SGC 11.1 GENERAL. Paragraph B. In the second sentence change the number of days from 30 Days to 7 Days. In the third sentence change the number of days from 60 Days to 14 Days.

SCG 14.3 APPLICATION FOR PROGRESS PAYMENT. ***Delete*** Paragraph C and replace with the following:

C. The Net Payment Due the CONTRACTOR shall be the above-mentioned subtotal from which shall be deducted the total amount of all previous payments made to the CONTRACTOR. Progress payments will be paid in full in accordance with Article 14 of the General Conditions until 90% of the Contract Price has been paid. The remaining 10% of the contract amount may be withheld until:

1. final inspection has been made;
2. completion of the Project; and
3. acceptance of the Project by the OWNER.

SCG 14.3 APPLICATION FOR PROGRESS PAYMENT. Paragraph D.

D. The Value of Materials Stored at the site shall be the amount of 75%.

SGC 14.9 FINAL PAYMENT AND ACCEPTANCE. ***Add*** the following paragraph:

C. Prior to the final payment the CONTRACTOR shall contact the Alaska Department of Labor and Workforce Development (ADOL) and provide the OWNER with clearance from the ADOL for the CONTRACTOR and all Subcontractors that have worked on the Project. This clearance shall indicate that all Employment Security Taxes have been paid. The following page is a sample form for this purpose. The CONTRACTOR also shall submit a “NOTICE OF COMPLETION OF PUBLIC WORKS” signed by ADOL.

SGC 16.8 CERTIFIED PAYROLLS. ***Change*** paragraph A. to read:

A. All CONTRACTORs or Subcontractors who perform work on a public construction contract for the OWNER shall file a certified payroll with Alaska Department of Labor. See Section 00830 - Alaska Labor Standards, Reporting, and Prevailing Wage Rate Determination.

Add the following SGC 16.12.

SGC 16.12 EQUAL EMPLOYMENT OPPORTUNITY (EEO)

The CONTRACTOR may not discriminate against any employee or applicant for employment because of race, religion, color, national origin, age, disability, sex, marital status, changes in marital status, pregnancy or parenthood. The CONTRACTOR shall post a notice setting out the provisions of this paragraph in a conspicuous place available to employees and applicants for employment.

The CONTRACTOR and each Subcontractor shall state in all solicitations and advertisements for employees to work on this Project, that it is an Equal Opportunity Employer and that all qualified applicants will receive consideration for employment without regard to race, religion, color, national origin, age, disability, sex, marital status, changes in marital status, pregnancy or parenthood.

The CONTRACTOR shall include the provisions of this EEO article in every contract relating to this Project and shall require the inclusion of these provisions in every agreement entered into for this Project, so that those provisions will be binding upon the CONTRACTOR and each Subcontractor.

Add the following SGC 17**:**

SGC 17 GENERAL INFORMATION. This Project is currently funded by the City and Borough of Juneau, Alaska bond proceeds and interest bonds.

Employment Security Tax Clearance

Date: _____

To: Alaska Department of Labor
Juneau Field Tax Office
907-465-2787
FAX 907-465-2374

From: _____

Subject: Gastineau Elementary School Renovation
Contract No. E11-137

Timeframe of Contract _____

Please advise whether or not clearance is granted for the following CONTRACTOR or Subcontractor:
(List only one CONTRACTOR or Subcontractor list per page.)

_____ _____
Name Address

Per AS 23.20.265 of the Alaska Employment Security Act, this request is for tax liability clearance and release to make final payment for WORK performed under the subject contract. Please send your response to:

Jennifer Mannix, Contract Administrator
Engineering Department
155 S. Seward Street
Juneau, Alaska 99801
FAX 907-586-4530

( ) Tax Clearance is granted.
( ) Tax Clearance is NOT granted.

Remarks: _____

_____ _____
Signature Date

_____
Title

END OF SECTION

SECTION 00830 - ALASKA LABOR STANDARDS, REPORTING, AND PREVAILING WAGE RATE DETERMINATION

State of Alaska, Department of Labor, Laborers' and Mechanics' Minimum Rates of Pay, AS 36.05.010 and AS 36.05.050, Wage and Hour Administration Pamphlet No. 600, the latest edition published by the State of Alaska, Department of Labor inclusive, are made a part of this contract by reference.

The CONTRACTOR is responsible for contacting the Alaska Department of Labor to determine compliance with current regulations.

Correspondence regarding Title 36 requirements may be submitted electronically or paper copies can be submitted by mail. To submit Title 36 documents electronically, go to https://myalaska.state.ak.us/home/app. If filing electronically, submit certified payrolls to ADOL at the website above and email a copy of all certified payrolls to Jennifer Mannix at the email address below. If Contractor elects to submit paper copies, they should be submitted to the physical addresses below.

Within 10 Days of "Notice of Award/Notice to Proceed" make a list of **all** Subcontractors. Include their name, address, phone, estimated subcontract amount, and estimated start and finish dates. Send this list to the Wage and Hour Section (contact information below).

Certified Payrolls must be submitted every two weeks. Before the second Friday, each CONTRACTOR and Subcontractor must file Certified Payrolls with Statements of Compliance for the previous two weeks. Indicate ***"Start"*** on your first payroll, and ***"Final"*** on your last payroll for this Project.

As part of the **final payment request package,** CONTRACTOR must submit a "NOTICE OF COMPLETION OF PUBLIC WORKS" form signed by ADOL personnel.

Contact Information:

Wage and Hour Section
State of Alaska
Department of Labor and Workforce Development
Labor Standards and Safety Division
Wage and Hour Administration
P.O. Box 11149
Juneau, AK 99811-1149
907-465-4842
http://labor.state.ak.us/lss/home.htm

and

Jennifer Mannix, Contract Administrator
City and Borough of Juneau
155 S. Seward Street
Juneau, AK 99801
(907) 586-0873
jennifer_mannix@ci.juneau.ak.us

END OF SECTION

SECTION 00853 – STANDARD DETAILS

PART 1 – GENERAL

1.1 CBJ STANDARD DETAILS

A. The following City and Borough of Juneau Standard details are made a part of these Contract Documents:

STANDARD DETAIL NO.	NAME OF DETAIL
111A	CONCRETE SIDEWALK, TYPE I CURB & GUTTER
111B	CURB & GUTTER TYPES II & III
125	PAVEMENT RESURFACING & TRENCH DETAIL
126	CONCRETE COLLAR
127	SIGN ASSEMBLY
303	STORM DRAIN MANHOLE TYPES I & II
304A	TYPE III CATCH BASIN
304B	TYPE IV CATCH BASIN
306	STORM DRAIN MANHOLE COVER & FRAME
308	CURB INLET, FRAME, GRATE & CURB BOX
309	LOCAL DEPRESSION AT CATCH BASIN
310	AREA DRAIN DETAIL
311	FILTER FABRIC FENCE
312	STRAW BALE BARRIER

B. The CONTRACTOR shall obtain the CBJ Standard Details from the CBJ Engineering Department.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 00853

Section 01001 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Work covered by the Contract Documents.
   2. Type of the Contract.
   3. Work Seasons
   4. Use of premises.
   5. OWNER's occupancy requirements.
   6. Work restrictions.
   7. Specification formats and conventions.
   8. Miscellaneous Provisions

B. Related Sections include the following:
   1. Division 1, Section 01500 "Construction Facilities/Temporary Controls" for limitations and procedures governing temporary use of OWNER's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Gastineau Elementary School Renovations – Phase 1.
   1. Project Location: 1507 3rd St., Douglas (Juneau), Alaska

B. OWNER: City and Borough of Juneau, Juneau School District
   1. Point of Contact for the OWNER: CBJ Project Manager

      Nathan Coffee, Project Manager
      City & Borough of Juneau, Engineering Department
      155 S. Seward St.
      Juneau, AK 99801
      (907) 586-0895

C. ARCHITECT:

      NorthWind Architects, LLC
      Sean Boily, Principal Architect
      119A 2nd Street
      Juneau, AK 99801
      (907) 586-6150

D. The Work includes, but is not limited to, the following:
   1. Site improvements including paving, concrete walls and flatwork, landscaping, lighting, and utilities.
   2. New structure to facilitate new mechanical penthouses and commons areas. Improvements to existing structure and concrete slab repairs to facilitate new plumbing and structure.
   3. Exterior envelope upgrades including new metal siding and roofing at new structure, new metal siding at existing EIFS, painting, and new windows and doors at select locations.
   4. Replacement of architectural finishes throughout most of facility interior spaces, as well as new casework, doors, and fixed furnishings. Some reconfiguration of interior spaces and the installation of a new commercial kitchen.
   5. Replacement of heating and ventilation systems in most of the facility, plumbing replacement and reconfiguration, upgrade of fire sprinkler system, upgrade of BAS controls, and complete renovation of existing boiler room.
   6. Replacement of special electrical systems including data, intercom, fire alarm, and communications. Upgrade of existing access control system. Replacement and upgrade of electrical power and lighting systems in most of facility.
   7. Abatement of hazardous materials including removal of ACM substrate under carpet in throughout the facility, abatement of lead containing materials, abatement of light fixtures, and abatement of limited ACM associated with mechanical and architectural demolition.
   8. Completion of LEED certification for construction submittals as defined in project specifications.
   9. Phased construction over two summer construction seasons with installation of temporary partitions and building systems as required for building occupancy use and operation in the intervening school year.

1.4 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract.

1.5 WORK SEASONS

A. The Work shall be conducted in two consecutive summer construction seasons.

B. The site shall be available to for construction from May 29 to August 21 2011 (Season 1), and May 31 to August 23, 2012 (Season 2).

C. CONTRACTOR shall substantially complete all work undertaken in Season 1 by August 8, 2011.

D. CONTRACTOR shall substantially complete all work undertaken in Season 2 by August 13, 2012.

E. The CONTRACTOR shall not occupy the premises between construction seasons.

F. The CONTRACTOR shall coordinate with the OWNER regarding scope of Work to be included in each construction season prior to commencement of the work.

G. All construction related debris, materials, equipment, etc., must be completely removed from the premises at the end of each construction season.

H. All building systems shall be in working order at the end of each construction season and CONTRACTOR shall have received Certificate of Occupancy from building code authority.

1.6 USE OF PREMISES

A. General: CONTRACTOR shall have use of premises for construction operations, including use of Project site, during construction period. CONTRACTOR's use of premises is limited only by OWNER's right to perform work or to retain other CONTRACTORs on portions of Project.

B. Use of Site: Limit use of premises to areas within the Contract limits generally described on the drawings. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Work staging area and access: Coordinate extent of use of parking areas around building for associated construction activity. Provide temporary security fencing around area to be used for construction staging and equipment storage. Coordinate with notes on drawings for extent of temporary fencing separating school ball fields from the work area, anticipating continuous fencing for the full width (north-south orientation) of the site.
   2. OWNER Occupancy: Allow for limited OWNER occupancy of site during construction.
   3. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to OWNER, OWNER's employees, and emergency vehicles at all times.

C. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Protect all openings required to complete the work from inclement weather during construction. Repair damage caused by construction operations. Protect building and its occupants during construction period.
   1. OWNER Occupancy: Allow for limited OWNER occupancy of building during construction. Allow for storage of owner materials and CBJ Project Manager office in areas of the building not being addressed in each summer season of construction.

D. Site Security: CONTRACTOR shall be responsible for building security and protecting the site from theft vandalism, and unauthorized entry during the course of construction. CONTRACTOR to coordinate use and operation of the building security system through the construction period.

1.7 OWNER'S OCCUPANCY REQUIREMENTS

A. Partial OWNER Occupancy: OWNER shall not occupy the premises during the construction period except to perform minor maintenance activities in portions of facility not under construction and OWNER’s employees shall return to the premises one week prior to the end of construction period at which time the CONTRACTOR shall coordinate remaining work with OWNER occupancy of the premises.

1.8 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed inside the existing building during the Summer Break when school is not in session, during normal business working hours of 7:00 a.m. - 10:00 p.m., Monday through Friday, except as otherwise indicated.
   1. Weekend Hours: 7:00 a.m. - 7:00 p.m.

2. Hours for Core Drilling, concrete demolition, and other heavy equipment use: 7:00 am - 7:00 pm weekdays, 9:00 AM -7:00 PM Weekends.
3. Any work overlapping time with school in session shall be coordinated with the CBJ Project Manager, and shall generally be completed after school and on weekends.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by OWNER or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify CBJ Project Manager not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without CBJ Project Manager's written permission.
3. It is anticipated Utility interruptions associated with the Work shall occur between the dates the Work is to occur in each summer season.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.
1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by CONTRACTOR. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by CONTRACTOR or by others when so noted.
    a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.10 MISCELLANEOUS PROVISIONS

A. All references in specification to ARCHITECT and ENGINEER shall be facilitated and coordinated with the CBJ Project Manager.

B. All references in specification to OWNER shall mean CBJ Project Manager.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01001

Section 01005 - ADMINISTRATIVE PROVISIONS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Work Covered by Contract Documents

B. Contract Method

C. CONTRACTOR Use of Premises

D. Owner Occupancy

E. Allowances

F. Additive Alternates

G. Applications for Payment

H. Inspection of Conditions

I. Coordination

J. Field Engineering

K. Reference Standards

L. Project Schedule

1.2 WORK COVERED BY CONTRACT DOCUMENTS

The Work consists of furnishing all labor, equipment, and materials, and performing all work required to construct the Gastineau Elementary School Renovation, including all site work, as described in the construction documents.

1.3 CONTRACT METHOD

Construct the Work in conformance with the Bid Schedule and Section 01001 – Summary.

1.4 CONTRACTOR USE OF PREMISES

A. Coordinate with section 01001 – Summary.

B. The CONTRACTOR shall take all necessary precautions for the protection of the Work and the safety of the public. All barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise. All signs, signals, and barricades shall conform to the requirements of Subpart G, Part 1926, of the OSHA Safety and Health Standards for Construction.

C. The CONTRACTOR will coordinate with the OWNER to determine a means of locking and securing the building during non-working hours.

1.5 OWNER OCCUPANCY

The OWNER will occupy premises on or shortly after date of substantial completion of construction. CONTRACTOR shall cooperate and coordinate with the OWNER to minimize conflict, and to facilitate OWNER operations. The point of contact for the OWNER is:

Nathan Coffee, CBJ Project Manager
City & Borough of Juneau
Engineering Department
155 S. Seward St.
Juneau, AK 99801

Work Phone Number (907) 586-0895

1.6 APPLICATIONS FOR PAYMENT

A. Submit one copy of each application under procedures of Section 01027 Application for Payment on form provided by the CBJ Project Manager.

B. Content and Format: That specified for Schedule of Values in Section 01370.

1.7 INSPECTION OF CONDITIONS

A. Prior to bidding, verify and become familiar with all observable existing conditions by visiting the site. Include in bid all factors which may affect the execution of this work. Include all related costs in the bid.

B. Coordinate exact requirements governed by actual job conditions. Check all information and report any discrepancies before fabrication work. Report changes in time to avoid unnecessary work. Make changes only as directed by the CBJ Project Manager.

C. Examine related work and surfaces before submitting bid. Report to the CBJ Project Manager, in writing, conditions which prevent proper execution of the Work. Bidding work without reporting unsuitable conditions constitutes acceptance of conditions by CONTRACTOR.

1.8 COORDINATION

A. Coordinate Work of the various sections of Specifications to ensure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later. Work of any trade or Subcontractor may be required by any specification section. The specifications are not subdivided for the convenience of Subcontractor bidding or labor agreements. It is the CONTRACTOR's responsibility to coordinate the work of all Subcontractors and tradesmen to ensure all specification requirements are met and that change orders are not caused by coordination issues.

B. Verify if characteristics of elements of interrelated operating equipment are compatible; coordinate Work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on drawings. Follow routing shown for pipes, ducts, and conduits, as closely as practicable; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. Execute cutting and patching to integrate elements of Work, uncover ill-timed, defective, and non-conforming work, provide openings for penetrations of existing surfaces, and provide samples for testing. Seal penetrations through floors, walls and ceilings.

1.9 REFERENCE STANDARDS

A. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. The date of the standard is that in effect as of the Project advertisement date, except when a specific date is specified.

C. Obtain copies of standards when required by Contract Documents. Maintain copy at jobsite during progress of the specific Work.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 01005

Section 01027 - APPLICATION FOR PAYMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for payment.

1.2 RELATED SECTIONS

A. Section 00310 Bid Schedule

B. Section 00700 - General Conditions

C. Section 01300 – Submittals

D. Section 01370 - Schedule of Values

E. Section 01780 - Contract Closeout

1.3 FORMAT

A. Application for payment form in format acceptable by the OWNER.

1.4 PREPARATION OF APPLICATIONS

A. Type required information on Application for Payment form approved by CBJ Project Manager.

B. Execute certification by original signature of authorized officer upon each copy of the Application for Payment.

C. Submit names of individuals authorized to be responsible for information submitted on application for payment.

D. Indicate breakdown of costs for each item of the Work on accepted schedule of values (SOV). Provide dollar value in each column for each line item for portion of Work performed and for stored products.

E. List each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount as for an original item of Work.

F. Prepare Application for Final Payment as specified in Section 01780 – Contract Closeout.

1.5 SUBMITTAL PROCEDURES

A. Submit one copy of each Application for Payment at any time determined by the CONTRACTOR.

B. Submit under dated transmittal letter.

C. Payment Request limited to not more than one Application for Payment in every thirty (30) calendar days.

1.6 SUBSTANTIATING DATA

A. When OWNER requires substantiating information, submit data justifying line item amounts in question.

C. Provide one copy of data with cover letter for each copy of Application. Show application number and date, and line item by number and description.

1.7 SUBMITTALS WITH APPLICATION FOR PAYMENT

A. Submit the following with each Application for Payment.

1. Updated Construction Progress Schedules as required by Section 01300-Submittals.

2. Updated Project Record Documents as required by Section 01780-Contract Closeout.

3. Certified Payrolls for Period.

4. Permit Inspection results.

5. Certifications as required by Section 1400 – Quality Control.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 01027

Section 01028 – CHANGE ORDER PROCEDURES

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Procedures for processing Change Orders.

1.2 RELATED REQUIREMENTS

A. Section 00310 – Bid Schedule

B. Section 00500 - Agreement

C. Section 00700 - General Conditions

D. Section 00800 - Supplementary General Conditions

E. Section 01027 - Applications for Payment

F. Section 01300 - Submittals

G. Section 01600 - Materials and Equipment

H. Section 01780 - Contract Closeout

1.3 SUBMITTALS

A. Submit name of the individual authorized to accept changes, and to be responsible for informing others in CONTRACTOR's employ of changes in the Work.

B. Change Order Forms: Use forms provided by the CBJ Project Manager or approved by the CBJ Project Manager.

1.4 DOCUMENTATION OF CHANGE IN CONTRACT PRICE AND CONTRACT TIME

A. Maintain detailed records of work done on a Cost of Work Plus a Fee Basis. Provide full information required for evaluation of proposed changes and to substantiate costs of changes in the Work.

B. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.

C. On request, provide additional data to support computations:

1. Quantities of products, labor, and equipment.

2. Taxes, insurance and bonds.

3. Overhead and profit.

4. Justification for any change in Contract Time.

5. Credit for deletions from Contract, similarly documented.

D. Support each claim for additional costs, and for work done on a cost of the Work plus a Fee basis, with additional information:

1. Origin and date of claim.

2. Dates and times work was performed, and by whom.

3. Time records, wage rates paid and workman compensation rates.

4. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

1.5 PRELIMINARY PROCEDURES

A. The OWNER may submit a Proposal Request which includes: Detailed description of change with supplementary or revised Drawings and Specifications, the projected time for executing the change, with a stipulation of any overtime work required, and the period of time during which the requested price will be considered valid.

B. CONTRACTOR may initiate a change by submittal of a request to the OWNER describing the proposed change with a statement of the reason for the change, and the effect on Contract Price and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01600 – Materials and Equipment.

1.6 CONSTRUCTION CHANGE AUTHORIZATION

A. Shall be in accordance with Article 10 – Changes in the Work, Section 00700 - General Conditions.

1.7 LUMP SUM CHANGE ORDER

A. Prior to completion of the change the CONTRACTOR shall submit in final form an account of all costs, with support data.

B. Contractor fees shall not exceed fees defined in Section 00700 General Conditions, Article 11.4 Contractor Fees.

1.8 COST OF THE WORK CHANGE ORDER

A. After completion of the change and within a reasonable period of time, the CONTRACTOR shall submit in final form an itemized account, with support data, of all costs.

B. The CBJ Project Manager or Architect will determine the change allowable in Contract Price and Contract Time as provided in provisions of the Contract Documents.

1.9 EXECUTION OF CHANGE ORDERS

A. The OWNER will issue Change Orders for CONTRACTOR's signature. All change orders are executed when signed by the OWNER-authorized person. CONTRACTOR's signature indicates acceptance or acknowledgment depending on which box is checked on the OWNER change order form.

1.10 CORRELATION OF CONTRACTOR SUBMITTALS

A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Price as shown on Change Order.

B. Promptly revise progress schedules to reflect any change in Contract Time, Revise subschedules to adjust times for other items of Work affected by the change, and resubmit.

C. Promptly enter changes in project record documents.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 01028

Section 01060 - REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Applicability of referenced Regulatory Requirements.

B. Provision of referenced Regulatory Requirements on Project.

C. Listing of referenced Regulatory Requirements, together with the enforcement agency and its location.

1.2 RELATED REQUIREMENTS

A. Document 00700 - General Conditions

B. Individual Specification Sections: Regulatory Requirements.

1.3 QUALITY ASSURANCE

A. Shall be governed by the Regulatory Requirements referenced within the Contract Documents and listed herein.

B. The date of the Regulatory Requirement is that in effect as of the Project Advertisement date or Effective Date of the Contract when there was no Advertisement, except when a specific date is specified. Labor rates shall be kept current to the most recent published or effective rates, by the Department of Labor, throughout the contract.

C. Compliance with the provisions of the Regulatory Requirements is mandatory. If conflicts or discrepancies between Requirements exist the most rigid Regulatory Requirement shall prevail. Interpretation or questions shall be resolved as per paragraph 2.2 of the General Conditions.

D. When required or referenced within the Contract Documents the CONTRACTOR shall obtain and maintain a copy of the Regulatory Requirements on the Project, including both the office site and construction site if they are different, during both submittal and construction stages of the specific Work and until Final Completion.

1.4 SCHEDULE OF REGULATORY REQUIREMENTS

A. PRIMARY APPLICABLE CODES.

1. Codes adopted by the City and Borough of Juneau (CBJ), inclusive of all current CBJ Amendments and Supplements.

2006 IBC (International Building Code)

International Building Code (IBC) published by the International Conference of Building Officials and as amended by the State Supplement.

INTERNATIONAL MECHANICAL CODE

2006 edition of the *International Mechanical Code* (IMC) and *Uniform Mechanical Code Standards* published by the International Conference of Building Officials.

UNIFORM PLUMBING CODE

2006 edition of the *Uniform Plumbing Code* published by the International Association of Plumbing and Mechanical Officials.

NATIONAL ELECTRIC CODE

2008 edition of the *National Electric Code* (NEC) published by the National Fire Protection Association (NFPA). Note that every six months amendments to the NEC are published. Revised codes are available every three years. All electrical components must be tested and labeled.

INTERNATIONAL FIRE CODE

2006 edition of the *International Fire Code* (IFC) and *International Fire Code Standards* published by the "International Conference of Building Officials and Western Fire Chiefs Association" and as amended by the State Supplement.

2. Codes Adopted by the Department of Labor

NATIONAL ELECTRIC CODE

(See NEC above)

NATIONAL ELECTRICAL SAFETY CODE

The National Electrical Safety Code, ANSI C-2-1987
This Code covers overhead and buried electrical and communications services both for building services and for transmission facilities.

UNIFORM PLUMBING CODE

2006 edition of the *Uniform Plumbing Code* published by the International Association of Plumbing and Mechanical Officials.

3. Codes adopted by Department of Environmental Conservation; 18 AAC 72 and 18 AAC 80 for waste water and sewer under authority of AS 46.03.720.

B. OTHER REQUIREMENTS

1. In addition to those Chapters of the IBC and revisions to the IBC adopted by the State Fire Marshal, the City and Borough of Juneau adopts by policy portions which have been deleted by the Alaska State Fire Marshal. Application of local codes shall not dilute the

requirements of the codes required in this Section. The CONTRACTOR must determine additional requirements applying to the Project by local jurisdictions.

2. The City and Borough of Juneau requires all City-owned buildings comply with the provisions outlined in the Americans with Disabilities Act (ADA), 1991 Federal Register of the U.S. Department of Justice.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION 01060

SECTION 01073 – EXPLANATIONS: DRAWINGS AND SPECIFICATIONS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Explanation of terminology used within the Drawings and Specifications.

1.2 RELATED REQUIREMENTS

A. Document 00700 - General Conditions

1.3 SPECIFICATION FORMAT AND COMPOSITION

A. Specifications are divided into Divisions and Sections for the convenience of writing and using. Titles are not intended to imply a particular meaning or to fully describe the Work of each Division or Section, and are not an integral part of the text that specifies the requirements. The OWNER is not bound to define the limits of any subcontract, and will not enter into disputes between the CONTRACTOR and his employees, including subcontractors. The OWNER has no obligation to define the Divisions and Sections for the convenience of subcontractor bidding or separation of labor agreements.

B. Pages are numbered independently for each Section, and recorded in the Table of Contents. Section number is shown with the page number at the bottom of each page. It is CONTRACTOR's responsibility to verify that Contract Documents received for bidding and/or construction are complete in accordance with Table of Contents.

C. These Specifications are of the abbreviated or "streamlined" type, and may include incomplete sentences.

D. Omissions of the words or phrases such as "the CONTRACTOR shall," "in conformity therewith," "shall be," "as noted on the Drawings," "according to the Drawings," "a," "an," "the" and "all" are intentional.

E. Omitted words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the Drawings.

1.4 DRAWINGS: CONTENT EXPLANATION

A. Drawings, Dimensions and Measurements.

1. Where on any of the Drawings a portion of the work is drawn out and the remainder is indicated in outline, the parts drawn out shall apply also to all other portions of the Work.

2. Wherever a detail is referenced and developed for a specific condition, same or similar detail shall apply to identical or similar conditions elsewhere on Project even though not specifically referenced.

3. Where the word “similar” occurs on the Drawings, it shall be interpreted in its general sense and not as meaning identical, all details shall be worked out in relation to their locations and their connections with other parts of the work.

4. The figured dimensions on the Drawings or notes indicating dimensions shall be used instead of measurements of the Drawings by scale.

5. No scale measurements shall be used as a dimension to work with except on “full size” Drawings not dimensioned.

1.5 COMMON TERMINOLOGY

A. Certain items used generally throughout the Specifications (and Drawings) are used as follows:

1. Indicated: The term “indicated” is a cross reference to details, notes or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar means of recording requirements in the Contract Documents. Where terms such as “shown,” “noted”, “scheduled”, and “specified” are used in lieu of “indicate”, it is for the purpose of helping the reader accomplish the cross reference, and no limitation of location is intended except as specifically noted.

2. Installer: The person or entity engaged by CONTRACTOR, his Subcontractor or sub-subcontractor for the performance of a particular unit of Work at the Project site, including installation, erection, application and similar required operations. It is a general requirement that installers be recognized experts in the work they are engaged to perform.

3. Furnish: Except as otherwise defined in greater detail, the term “furnish” is used to mean “ . . . supply and deliver to the Project site, ready for unpacking, assembly and installation . ..”.

4. Provide: Except to the extent further defined, the term “provide” means to furnish and install, complete and ready for the intended use.

5. Guarantee and Warranty: “Warranty” is generally used in conjunction with products manufactured or fabricated away from the Project site, and “guarantee” is generally used in conjunction with units of work which require both products and substantial amounts of labor at the Project site. The resulting difference is that warranties are frequently issued by manufacturers, and guarantees are generally issued by CONTRACTOR and frequently supported (partially) by product warranties from manufacturers.

1.6 CONFLICTS

A. Report any conflicts to CBJ Project Manager for clarification.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 01073

SECTION 01200 – PROJECT MEETINGS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. CONTRACTOR participation in preconstruction conferences.

B. CONTRACTOR administration of progress meetings and pre-installation conferences.

1.2 RELATED REQUIREMENTS

A. Section 00100 - Instructions to Bidders

B. Section 01005 - Administrative Provisions

C. Section 01300 - Submittals: Progress Schedules

D. Section 01400 - Quality Control

E. Section 01780 - Contract Closeout

1.3 PRECONSTRUCTION CONFERENCES

A. The CBJ Project Manager will administer one preconstruction & site mobilization conference which will be held at Gastineau Elementary School. Reference Section 01001 – Summary, for school address and CBJ Project Manager contact information. Conference will be held for clarification of CONTRACTOR responsibilities in use of site, confirming extent of use of site, and for review of administrative procedures.

1.4 PROGRESS MEETINGS

A. Schedule and administer Project meetings throughout progress of Work at intervals as directed by the CBJ Project Manager, and called meetings, and as follows:

1. Schedule weekly on-site progress meetings on a consistent day with the OWNER and/or Architect.
2. CONTRACTOR to provide updated construction schedule at weekly progress meetings.

B. Attendance: Job superintendent, major Subcontractors and Suppliers; OWNER and Consultants as appropriate to agenda topics for each meeting.

1. The ARCHITECT and other consultants will generally participate if on-site for progress inspections, or as otherwise requested by CBJ Project Manager, or required by contract.

C. The CBJ Project Manager will make physical arrangements for meetings, prepare agenda with copies for participants, preside at meetings, and distribute copies within three days to CBJ Project Manager, the Architect, participants, and those affected by decisions made at meetings. CBJ Project Manager will record, prepare, and distribute meeting minutes.

D. Suggested Agenda: Review of Work progress, status of progress schedule and adjustments thereto, delivery schedules, submittals, maintenance of quality standards, pending changes and substitutions, and other items affecting progress of Work.

1.5 PREINSTALLATION CONFERENCES

A. When required in individual Specification section, or directed by the CBJ Project Manager, convene a pre-installation conference prior to commencing Work of the section.

B. Require attendance of entities directly affecting, or affected by, Work of the section.

C. Review conditions of installation, preparation and installation procedures, and coordination with related Work.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 01200

SECTION 01230 - ADDITIVE ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Additive Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost for each additive alternate is the net cost added to the Contract Sum to include the additive alternate in the Work. No other adjustments are made to the Contract Sum.

1.4 DOCUMENTS

A. The drawings and specifications illustrate all Work required for the base bid contract and all alternates. The Schedule of Additive Alternates included with this section define the general work requirements for each Additive Alternate. It shall be the Contractor's responsibility to identify relevant specification and drawing materials for those Additive Alternates which are added to the base bid.

1.5 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to complete finishes and systems consistent with the remaining Work. Include the cost of such coordination in the proposed Additive alternate amount stated on the Bid Form.

1. Include as part of each additive alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation of the remaining Work, whether or not indicated as part of the additive alternate.

B. Notification: Immediately following award of the Base Bid with Additive Alternates, notify each party involved, in writing, of the status of each additive alternate. Indicate if additive alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to additive alternates.

C. Review Meeting: After award of Base Bid with Additive Alternates identified, schedule a meeting with the Owner's Representative and major Sub-Contractors to review the scope of the Base Bid with consideration of the work to be modified by the Additive Alternates, document requirements, and special coordination issues raised.

D. Execute additional work associated with the Additive Alternates under the same conditions as other work of the Contract.

E. Schedule: A Schedule of Additive Alternates is included at the end of this Section.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 BASE BID

A. The project Additive Alternates scheduled below affect the Base Bid in that work not included in the overall scope may or may not result in minor additional work items associated with coordination and completion the Base Bid scope of work. Only the items listed are affected. Other portions of the project are not affected.

3.2 SCHEDULE OF ADDITIVE ALTERNATES

A. The following schedule is generalized. The Contractor will provide all miscellaneous items necessary to accomplish the described intent, whether identified specifically or not. Work items will include aspects related to many portions of the construction documents. It will be the Contractor's responsibility to identify related design requirements for the goals described.

Additive Alternate No. 1: Infill Construction at former mid-building entry. The intent of this Additive Alternate is to add additional square footage to the building by infilling a small exterior space between areas C and D. The foundation, wall and glazing, cabinetry, and heating fin-tube assembly included in the Base Bid will be constructed on gridline 1 instead of at the existing building perimeter. The Additive Alternate will include new roof structure, eave, and roof assembly, and new fill and interior slab. Finishes, electrical and lighting identified in Base Bid will be expanded into new area. The ventilation system will be modified for the larger space.

Additive Alternate No. 2: Kitchen Equipment. The intent of this Additive Alternate is to furnish and install equipment identified at the kitchen. In the Base Bid, the space is to be provided with all finishes, blocking, and mechanical and electrical rough-ins prepared for owner installation of all identified kitchen equipment items.

The following Kitchen Equipment as defined on sheet FS-2.0 shall be added to the Base Bid as part of Additive Alternate No. 2:

1. (6) Dry Storage Shelving
2. (1) Reach-in Freezer, One Door
3. (2) Transport Cabinets
4. (1) Pot Rack

5. (1) Filter System (Ice Maker)
6. (1) Ice Maker w/ Bin
7. (1) Utility Cart
8. (1) Convection Microwave
9. (1) Range, Restaurant, Electric
10. (1) Cashier Station
11. (1) Hot Food Station
12. (1) Milk Cooler

Additive Alternate No. 3: Civil and Landscape site work, Plan North of building along Douglas Highway, and Plan East of the building along I street. The intent of this Additive Alternate is to provide all components of the civil work between the building and Douglas Highway, and between the building and I Street. Architectural site plan drawings G0.6A and G0.6B describe the Base Bid conditions. Sheets Go.7A and G0.7B describe the Additive Alternate No. 3 scope. The Base Bid includes front entry stairs, ADA ramp, bike racks and canopy, and includes limited curb, walkway, pavement striping and speed bumps and bollards permitting temporary traffic control. With award of Additive Alternate #3, deduct curb and walkways, bollards, striping and speed bumps, and provide the new plaza and associated partial height walls and benches, an additional bike rack, the Drive Lane and Drop Off area with stair and ramp up to entry plaza, sidewalks, site lighting, signage, and flag pole. Along I Street, provide new drop-off and parking designations, with grading adjustments, new paved areas and curbs and signage indicated.

Additive Alternate No. 4: Civil and Landscape site work, Plan West of building along Douglas Highway. The intent of this Additive Alternate is to provide all components of the civil work associate with construction the 25-car parking lot on what is presently an undeveloped site. This work includes retaining wall, fencing, concrete ramps with free-standing handrails, stairs, earthwork, site lighting, and landscaping, and the area is describe generally on architectural sheets G0.6B and G0.8. Landscape, civil and site electrical drawings further define the scope of this effort. In the Base Bid, no work is done in this area.

Additive Alternate No. 5: Gymnasium upgrades. The intent of this Additive Alternate is to renovate specific components of the gymnasium. First, completely remove the existing gymnasium flooring system and replace it with a new flooring system with court striping. This will include the temporary removal and reinstallation of the bleachers. Second, remove all existing gymnasium lighting and replace it with new lighting and switching specified and noted in the electrical documents. Third, mask all art panels at gymnasium walls. Paint all plywood wall surfaces and unmask all art pieces. The Base Bid includes all other modifications illustrated in the construction documents, including mechanical grill relocation and associate wall patching identified.

Additive Alternate No. 6: Mechanical upgrades at fan room 202. The intent of this Additive Alternate is to improve energy performance of the equipment in the indicated space. Base Bid excludes work on this equipment, with the exception of the addition of a sound dampening device at the return air grill at the library wall. The Additive Alternate will include all mechanical and electrical equipment upgrades indicated in this fan room.

Additive Alternate No. 7: Video Surveillance System. The intent of this Additive Alternate is to improve facility security. Base Bid excludes Video Surveillance Work, including devices and wiring.. The Additive Alternate will include all electrical equipment and wiring associate with providing the specified system. Coordinate with electrical design.

Additive Alternate No. 8: Lighting at covered play area and playground. The intent of this Additive Alternate is to improve building and site lighting at the outdoor covered play area and the playground. Base Bid excludes lighting, conduit and wiring, and suspension systems in the indicated areas. The Additive Alternate will include all equipment components, conduit and wiring associate with providing the specified system. Coordinate with electrical design.

END OF SECTION 01230

SECTION 01300 – SUBMITTALS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Procedures

B. Construction Progress Schedules

C. Schedule of Values

D. Shop Drawings

E. Product Data

F. Manufacturer's Instructions

G. Samples

H. Manufacturer's Certificates & Warranties

I. Submittal Schedule

J. Permits and Licenses

1.2 RELATED REQUIREMENTS

A. Section 01005 - Administrative Provisions

C. Section 01400 - Quality Control

D. Section 01600 - Materials and Equipment

E. Section 01780 - Contract Closeout

F. Section 01355 – LEED Certification Procedures

1.3 PROCEDURES

A. Submittal Format: To the fullest extent practicable, all data shall be submitted at one time in neatly bound loose leaf three-ring binders. Binders to be tabulated in order of Construction Specifications with staggered tabs separating each section.

1. The cover of each binder shall provide the project name, CBJ project number, and name and contact information of all contractors working on the project.
2. The first section of each binder shall contain a complete copy of the CBJ Submittal Log that identifies the information provided for each specification section. If tabs between

specification sections do not bear specification section number, then an index correlating the divider tabs with the specification sections shall be provided.

3. Product data to be utilized shall be flagged and noted. All other data not relevant to the project shall be crossed out or otherwise flagged that it is not in the project.

B. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

1. No extension of the Contract Time will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing, including resubmittals.
2. Architect will return submittals, without review, received from sources other than Contractor.
3. Identify deviations from the Contract Documents on Submittals.
4. Unless otherwise noted, submit minimum of three copies of each submittal, plus additional copies required by the CONTRACTOR for its use. Unless otherwise noted, ARCHITECT shall retain three copies for its use.

C. Place permanent label or title block on each submittal for identification Provide a 6-foot by 8-inch space on the label or beside the title block to record review and approval markings and action taken. Include the following information on the label:

1. Project Name
2. Date.
3. Name and address of CONTRACTOR.
4. Name and address of subcontractor or supplier.
5. Number and title of appropriate Specification Section.

D. Submit initial progress schedules and Schedule of Values in duplicate in accordance with Section 00700 - General Conditions. After review by the CBJ Project Manager, revise and resubmit as required. Submit revised schedules with each Application for Payment, reflecting changes since previous submittal.

E. Comply with progress schedule for submittals related to Work progress. Coordinate submittal of related items.

F. After OWNER review of submittal, revise and resubmit as required, identifying changes made since previous submittal.

G. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the ARCHITECT by the second submission of a submittal item. The OWNER reserves the right to withhold monies due the CONTRACTOR to cover additional costs of the ARCHITECT to review beyond the second submittal.

H. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

1.4 CONSTRUCTION PROGRESS SCHEDULES

A. Submit a comprehensive, fully developed, horizontal Gant-chart-type schedule within 15 days of notice to proceed. Include separate bar for each trade and major task with a minimum as defined by Schedule of Values, identifying first work day of each week.

1. Show submittal dates required for Shop Drawings, inspections, and product purchase and delivery dates.
2. Show Critical Path on the project schedule. Show Critical Path on the project schedule.
3. No task on schedule can exceed 10 work days.

B. Time Frame: Extend schedule from date of receipt of Notice to Proceed to date of Final Completion. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Distribute approved copies of schedule to OWNER, ARCHITECT, subcontractors, testing and inspection agencies, and parties identified by CONTRACTOR with a need-to-know schedule responsibility.

D. Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule two days before each regularly scheduled progress meeting.

1. As work progresses, indicate actual completion percentage for each activity.
2. If actual completion is slower than original schedule, identify specific ways to maintain project on schedule at no additional cost to OWNER.

1.5 SCHEDULE OF VALUES

A. Type schedule on copy of form provided by the CBJ Project Manager.

B. CONTRACTOR's standard form or media-driven printout will be considered upon request.

C. Format: Table of Contents of this Project manual. Identify each line item with number and title of the major Specification section.

D. Include in each line item a directly proportional amount of CONTRACTOR's overhead and profit.

E. Revise schedule to list change orders, for each Application for Payment.

1.6 SHOP DRAWINGS

A. Submit the number of opaque reproductions which CONTRACTOR requires, plus three copies which will be retained by the CBJ Project Manager, unless a greater number is indicated in individual Specification Sections.

1.7 PRODUCT DATA

A. Mark each copy to identify applicable products, models, options, and other data; supplement manufacturers' standard data to provide information unique to the Work.

B. Submit the number of copies that CONTRACTOR requires, plus three copies that will be retained by the CBJ Project Manager, unless a greater number is indicated in individual Specification Sections.

C. Where products are specified in metric units, product submittals shall be made in metric units, metric specified products submitted in English units shall be considered a substitution and shall be submitted in accordance with Section 01600, paragraph 1.08.

1.8 MANUFACTURER'S INSTRUCTIONS

A. When required in individual Specification Section, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for product data.

1.9 SAMPLES

A. Submit full range of manufacturer's standard colors, textures, and patterns for OWNER selection.

B. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing Work.

C. Include identification on each sample, giving full information.

D. Submit two sets of samples unless otherwise noted.

1.10 MANUFACTURER'S CERTIFICATES & WARRANTIES

A. When required in individual Specification Section, submit manufacturer's printed Certificates and Warranties for the specified items and products.

1.11 SUBMITTAL SCHEDULE

A. Submittal schedule listing a summary of requirement listed in each specification section will be provided separately.

1.12 PERMITS & LICENSES

A. Submit all CONTRACTOR provided permits and licenses. Submit supporting documentation demonstrating CONTRACTOR and applicable Subcontractors are licensed and authorized to install the Work.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 01300

SECTION 01354 - LEED FOR SCHOOLS 2009 CREDIT SUMMARY

PART 1 GENERAL

1.1 DEFINITIONS

A. LEED Rating System: LEED for Schools, 2009 Edition.

B. Required: Achievement of this credit is essential for certification of this project.

C. Preferred: Achievement of this credit would be desirable but is not mandatory.

D. Not Required: Achievement of this credit is not expected or not possible for this project.

E. See Section 01355 - LEED Certification Procedures, for CONTRACTOR's responsibilities.

PART 2 CREDIT SUMMARY

2.1 CERTIFICATION TO BE ACHIEVED: LEED Certified, requiring minimum of 40 points. Points to be achieved by CONTRACTOR are identified as "CONSTRUCTON". CONTRACTOR activity shall support the Prerequisites and Design points through construction effort.

2.2 SUSTAINABLE SITES (SS):

A. SS Prerequisite 1 - Required - No points - Construction Activity & Community.

1. During Construction:
   a. Preventive measures and remediation are specified in Section 01500.
   b. Dust control and basic surface drainage are specified in Section 01732.
   c. Preventive measures prescribed by state law will be followed.

2. Permanent erosion and sedimentation prevention features are to be provided:
   a. Lawns and grasses are specified in Section 02920.
   b. Plants are specified in Section 02930.

B. SS Prerequisite 2 - Required - No points - Environmental Site Assessment: The requirements have been or will be complied with.

C. SS Credit 1 - Preferred- 1 point - Site Selection.

1. The project is not located on any of the inappropriate or environmentally sensitive lands defined for this credit.

D. SS Credit 2 - Preferred - 4 points - Development Density and Community Connectivity.

1. The project is on a site that meets the criteria for Option 2, Community Connectivity.

E. SS Credit 4.1 - Preferred - 4 points - Alternative Transportation: Public Transportation Access.

1. The project is on a site that meets the criteria for Option 2, Bus Stop Proximity.

2. Dedicated walking or bike routes are provided with no barriers on school property.

F. SS Credit 4.2 - Preferred - 1 point - Alternative Transportation: Bicycle Storage & Changing Rooms.

1. Bicycle racks are specified in Section 02870.

G. SS Credit 4.3 - Preferred - 2 points - Alternative Transportation: Low-Emitting & Fuel-Efficient Vehicles.

1. Preferred parking spaces have been provided, in the quantity required.

H. SS Credit 4.4 - Preferred - 2 points - Alternative Transportation: Parking Capacity.

1. Parking space is sized to meet this requirement.

2. Preferred parking spaces have been provided, in the quantity required, without adding new parking.

I. SS Credit 5.1 - Preferred - 1 point - Site Development: Protect or Restore Habitat.

1. The project site has previously been developed:
   a. At least 50 percent of the site area not occupied by the building is to be covered with native or adapted vegetation.

J. SS Credit 5.2 - Preferred - 1 point - Site Development: Maximize Open Space.

K. SS Credit 6.1 - Undecided - 1 point - Stormwater Design: Quantity Control.

1. The site design does not increase existing runoff rate and quantity.

2. Methods used are:
   a. Modifying existing stormwater flows:
      1) Grading is specified in Section 02300.
      2) Turf is specified in Section 02920.
      3) Plants are specified in Section 02930.

L. SS Credit 6.2 - Undecided - 1 point - Stormwater Design: Quality Control.

M. SS Credit 8 - Undecided - 1 point - Light Pollution Reduction.

1. Appropriate exterior lighting fixtures are specified in Section 16521.

2. Appropriate interior lighting fixtures are specified in Section 16511.

3. Lighting control devices for automatic control of lighting are specified in Section 16420.

N. SS Credit 9 - Preferred - 1 point - Site Master Plan: The requirements have been or will be complied with.

O. SS Credit 10 - Undecided - 1 point - Joint Use of Facilities.

1. The Owner will arrange for joint use of facilities.

2.3 WATER EFFICIENCY (WE):

A. WE Prerequisite 1 - Required - No points - Water Use Reduction, 20% Reduction.

1. Appropriate high efficiency and/or waterless fixtures are specified in Section 15410.

B. WE Credit 1.1 - Required - 2 points - Water Efficient Landscaping, Reduce by 50%.

1. The landscaping does not require irrigation and no permanent irrigation system is provided.
   a. The climate provides adequate rainfall for the landscaping intended without need for irrigation.
   b. Plants that do not require irrigation are specified in Section 02930.

C. WE Credit 1.2 - Preferred - 2 points - Water Efficient Landscaping: No Potable Use or No Irrigation.

1. The landscaping does not require irrigation and no permanent irrigation system is provided.
   a. The climate provides adequate rainfall for the landscaping intended without need for irrigation.
   b. Plants that do not require any irrigation are specified in Section 02930.

2.4 ENERGY & ATMOSPHERE (EA):

A. EA Prerequisite 1 - Required - No points - Fundamental Commissioning of Building Energy Systems.

1. Building commissioning is to be performed.

B. EA Prerequisite 2 - Required - No points - Minimum Energy Performance.

1. The building envelope, HVAC, lighting, etc., have been designed to meet the criteria.

2. The overall design solution is implemented in the drawings and many sections of the

specifications.

C. EA Prerequisite 3 - Required - No points - Fundamental Refrigerant Management.

1. New equipment: No CFC-based refrigerants are used in any equipment. Non-CFC refrigerants are specified in the following sections:

2. Re-Used Equipment: Replacement of refrigerants in the following equipment is specified in Section 15186:

D. EA Credit 1 - Required – points to be determined - Optimize Energy Performance.

1. The building envelope, HVAC, lighting, etc., have been designed to meet the criteria required for the number of points indicated.

2. The overall design solution is implemented in the drawings and many sections of the specifications.

E. EA Credit 4 - Preferred - 1 point - Enhanced Refrigerant Management.

1. No Halon is used in any equipment or extinguishing system.

2. Fire Suppression:
   a. Fire extinguishers specified in Section 10523 use agents other than Halon.
   b. Existing Halon-based fire extinguishing system is to be replaced.
   c. Fire extinguishing system using NFPA 2001 agents is specified in Section 13925.

F. EA Credit 6 - Undecided - 2 points - Green Power.

1. The City and Borough of Juneau & Juneau School District intends to or has already entered into a contract for electricity from renewable sources, but that is not part of the construction contract.

2.5 MATERIALS & RESOURCES:

A. MR Prerequisite 1 - Required - No points - Storage & Collection of Recyclables.

1. The area designated for collection and storage of recyclables is indicated on the drawings.

2. The area designated for collection and storage of landscape trimmings is indicated on the drawings.

3. Bins, waste cans, can crushers, etc., are considered furnishings and are therefore not part of the construction contract.

B. MR Credit 1.1 - Required - 1 point - CONSTRUCTON - Building Reuse: Maintain 75% of Existing Walls, Floors & Roof.

1. The overall design of the project achieves this credit.

2. Procedures for alterations and selective demolition are specified Section 01732.

C. MR Credit 2.1 - Preferred - 1 point - CONSTRUCTON - Construction Waste Management, Divert 50% from Disposal.

1. Construction procedures and measurement of diverted waste are specified in Section 01732. This section requires the CONTRACTOR to perform the measurement and computation.

2. Waste prevention and disposal procedures specific to certain types of work are specified in many sections.

D. MR Credit 4.1 – Required - 1 point - CONSTRUCTON - Recycled Content: 10% (post-consumer plus ½ pre-consumer).

1. The definition of recycled content for the purposes of the contract documents is established by ISO14021. Qualifying products do not include plumbing, HVAC, electrical, or communications equipment, piping, conduit, ductwork, or wiring.

2. This project is steel-framed and contains many other steel-containing products; submission of a complete list of all metal-containing products will be required, with documentation showing steel mill source and mill process, allowing computation by using industry-averages for recycled content.

3. Other specific products that must contain recycled content are specified in the appropriate section(s).

4. CONTRACTOR is required to achieve this credit through selection of products (materials and equipment) plus any mandatory recycled content specified in the contract documents.

5. CONTRACTOR's reporting and measurement requirements are specified in Section 01355; calculation of project totals is the responsibility of CONTRACTOR.

F. MR Credit 7 – Required - CONSTRUCION - 1 point - Certified Wood.

1. For the purposes of the contract documents, the term "sustainably harvested wood" is used instead of "certified wood" and is defined in the same way as for this credit.

2. Specific wood products that must be sustainably harvested are specified in the appropriate section(s).
   a. Lumber framing, sheathing, blocking, curbing, and miscellaneous carpentry are specified in Section 06100, 06150, and 06160.
   b. Wood decking is specified in Section 06100.
   c. Finish woodwork is specified in Section 06200.
   d. Custom cabinets are specified in Section 06410.
   e. Countertops are specified in Section 06410.
   f. Wood veneer paneling is specified in Section 06200.

3. CONTRACTOR's reporting and measurement requirements are specified in Section 01355; calculation of project totals is not the responsibility of CONTRACTOR.

2.6 INDOOR ENVIRONMENTAL QUALITY:

A. EQ Prerequisite 1 - Required - No points - Minimum IAQ Performance.

B. EQ Prerequisite 2 - Required - No points - Environmental Tobacco Smoke (ETS) Control.

1. City and Borough of Juneau & Juneau School District intends to prohibit smoking in the building.

2. Exterior smoking areas are located at least 25 feet (8 meters) away from entries, outdoor air intakes, and operable windows.

C. EQ Prerequisite 3 - Required - No points - Minimum Acoustical Performance.

1. Classrooms and other core learning spaces have been designed to achieve the stated acoustical performance criteria; the overall design solution is implemented in the drawings and many sections of the specifications.

D. EQ Credit 1 - Undecided - 1 point - Outdoor Air Delivery Monitoring.

1. Outdoor airflow measurement devices in HVAC system, integrated with HVAC control system, are specified in Section 15730.

2. CO2 sensing and measurement devices in HVAC system, integrated with HVAC control system, are specified in Section 15730.

4. Direct-digital HVAC control system is specified in Section 15926.

E. EQ Credit 2 - Undecided - 1 point - Increased Ventilation.

1. The building and HVAC design will provide additional ventilation air for occupied spaces sufficient to meet the credit criteria, using natural and mechanical ventilation.

2. The overall design solution is implemented in the drawings and many sections of the specifications.

F. EQ Credit 3.1 - Preferred - 1 point – CONSTRUCTION - Construction IAQ Management Plan, During Construction.

1. Good construction procedures intended to prevent future problems are specified in Section 01734.

G. EQ Credit 3.2 – Required - CONSTRUCTION - 1 point - Construction IAQ Management Plan, Before Occupancy.

1. CONTRACTOR is required to perform air quality testing prior to occupancy, specified in Section 01734.

H. EQ Credit 4.1 - Required - 1 point - Low-Emitting Materials, Adhesives & Sealants.

1. Product criteria and reporting requirements for VOC-restricted products are specified in Section 01616.

2. Firestopping sealants; specified in Section 07840.

3. Architectural joint sealants; specified in Section 07900.

4. Duct sealers and sealants; specified in Section 15810.
   a. All adhesives used on the project, whether explicitly specified or not, are considered VOC-restricted products.

I. EQ Credit 4.2 - Required - 1 point - Low-Emitting Materials, Paints & Coatings.

1. Product criteria and reporting requirements for VOC-restricted products are specified in Section 01616.

2. Paints and stains are specified in Section 09900.
   a. Water-based paints or solvent-based paints with VOC content meeting the credit criteria are used for all interior opaque applications.

3. High performance coatings specified in Section 09960.

J. EQ Credit 4.3 - Required - 1 point - Low-Emitting Materials, Flooring Systems.

1. Product criteria and reporting requirements for VOC-restricted products are specified in Section 01616.

2. The following products are used in this project and will comply with the specified VOC restrictions:
   a. Resilient flooring and base; specified in Section 09650.
   b. Resilient athletic flooring; specified in Section 09625.

3. Carpet; specified in Section 09680.

4. Adhesives used in connection with carpet systems.

K. EQ Credit 4.4 - Required - 1 point - Low-Emitting Materials, Composite Wood & Agrifiber Products.

1. Product criteria and reporting requirements for VOC-restricted products are specified in Section 01616.

2. The products covered by this credit include ONLY particleboard, plywood, medium density fiberboard (MDF), wheatboard, strawboard, panel substrates, door cores, and laminating

adhesives used on-site or in the shop.

3. A project-wide prohibition on use of these products if they contain added urea-formaldehyde is specified.

L. EQ Credit 4.5 - Preferred - 1 point - Low-Emitting Materials, Furniture.

1. Product criteria and reporting requirements for VOC-restricted products are specified in Section 01616.

2. All applicable furniture is more than one year old and is excluded from this credit.

3. All applicable furniture will meet the criteria but is not included in the construction contract.

M. EQ Credit 4.6 - Preferred - 1 point - Low-Emitting Materials, Ceiling and Wall Systems.

1. Product criteria and reporting requirements for VOC-restricted products are specified in Section 01616.

2. The following products are used in this project and will comply with the requirements:
   a. Insulation in exterior walls; specified in Section 07212.
   b. Acoustical insulation; specified in Section 07212.
   c. Acoustical insulation; specified in Section 09850.
   d. Gypsum board; specified in Section 09260.
   e. Acoustical ceilings; specified in Section 09511.
   f. Wall coverings; specified in Section 09841 and 10121.

N. EQ Credit 5 - Required - 1 point - Indoor Chemical & Pollutant Source Control.

1. At High Volume Entryways: Permanent grilles or grates to capture dirt, etc., are provided.
   a. Metal gratings are specified in Section 05530.

2. Rooms Where Hazardous Gases or Chemicals May Be Present: Independent exhaust is provided for each room; this is a design solution involving building construction and HVAC.
   a. These rooms include: Janitor closets, laundry, high-volume copy rooms, and garage.
   b. Closers for self-closing doors are specified in Section 08710.
   c. Gypsum board construction is specified in Section 09260.
   d. Ducts are specified in Section 15810.
   e. Exhaust fans are specified in Section 15833.

3. Air Filtration Media: Outside air and return air are to be provided with filtration media meeting the criteria.
   a. Air filters are specified in Section 15720.

O. EQ Credit 6.1 - Preferred - 1 point - Controllability of Systems: Lighting.

1. Lighting controls meeting the criteria are to be provided.
   a. Manual switching devices are specified in Section 16140.
   b. Lighting control devices are specified in Section 16140 and 16410.

P. EQ Credit 6.2 - Preferred - 1 point - Controllability of Systems: Thermal Comfort.

1. Operable Windows: Windows in lieu of comfort controls are to be provided for occupants of areas that are 20 feet inside of and 10 feet to either side of the operable part of the window.
   a. Aluminum windows are specified in Section 08520.

Q. EQ Credit 7.1 - Required - 1 point - Thermal Comfort: Design.

1. Thermal comfort meeting the credit criteria is to be provided, with ventilation by natural and mechanical means.

2. The overall design solution is implemented in the drawings and many sections of the specifications.

R. EQ Credit 7.2 - Required - 1 point - Thermal Comfort: Verification.

1. City and Borough of Juneau & Juneau School District's O&M program will address procedures for identifying and implementing corrective actions.

2. A survey of building occupants will be conducted by City and Borough of Juneau & Juneau School District within 6 to 18 months after building occupancy to determine level of comfort; City and Borough of Juneau & Juneau School District will develop a plan for corrective action if more than 20 percent of occupants report dissatisfaction with thermal comfort in building.

3. The HVAC control system to be provided includes permanent, automatic and operator-adjustable thermal and humidity monitoring controls that will operate throughout all seasons.

4. Direct-digital HVAC control system is specified in Section 15926.

5. Commissioning of these controls is specified in the sections referenced for EA Prerequisite 1, Fundamental Building Systems Commissioning.

S. EQ Credit 8.1 - Preferred - 1 point - Daylight & Views: Daylighting.

1. Daylighting to meet the credit criteria is to be provided.

2. The overall design solution is implemented in the drawings with light-admitting materials specified in many sections of the specifications, including:
   a. Glazed aluminum storefront specified in Section 08410.
   b. Aluminum windows specified in Section 08520.

T. EQ Credit 8.2 - Preferred - 1 point - Daylight & Views, Views for 90% of Spaces.

1. Views meeting the credit criteria are to be provided.

2. The overall design solution is implemented in the drawings with vision glazing specified in

many sections of the specifications, including:
a. Glazed aluminum storefront specified in Section 08410.
b. Aluminum windows specified in Section 08520.

U. EQ Credit 9 – Required - 1 point - Enhanced Acoustical Performance.

1. Classrooms and other core learning spaces have been designed to achieve the stated acoustical performance criteria; the overall design solution is implemented in the drawings and many sections of the specifications.

V. EQ Credit 10 - Preferred - 1 point - Mold Prevention.

1. EQ Credits 3.1, 7.1, and 7.2 are required.

2. The HVAC system design complies with the criteria.

3. The Owner will implement an on-going IAQ management program meeting the criteria.

2.7 INNOVATION & DESIGN PROCESS (ID):

A. ID Credit 3 - Preferred - 1 point - The School as a Teaching Tool.

1. City and Borough of Juneau & Juneau School District will implement the curriculum described.

2.8 LEED ACREDITED PROFESSIONAL (ID):

A. ID Credit 2 - Required - 1 point – Appointed principal participant is a LEED Accredited Professional.

2.9 REGIONAL PRIORITY (RP):

A. RP Credit 1.1 - Undecided - 1 point - Region Specific Environmental Priority : Verify with registration.

END OF SECTION 01354

SECTION 01355 - LEED CERTIFICATION PROCEDURES

PART 1 GENERAL

1.1 PROJECT GOALS

A. This project has been designed to achieve the LEED Certified (minimum 40 points) rating as defined in the LEED(r) Green Building Rating System(tm) for Schools, 2009 Edition.

B. A LEED Consultant has been employed by Owner to co-review LEED submittals and reports.

C. CONTRACTOR is responsible for achieving LEED point credits in categories identified in Section 01354. CONTRACTOR is to employ an individual representative to be responsible for completion of the on-line LEED application documentation for these credits, to quantify these points, and to certify these points have actually been achieved. The on-line template forms, available through the United Stated Green Building Council (USGBC) website, are to be use in this effort. CONTRACTOR shall coordinate template access and submittal for this project with the Project Manager.

D. Many of the LEED credits can be achieved only through intelligent design of the project and are beyond the control of the CONTRACTOR. However, certain credits relate to the products and procedures used for construction. Therefore, the full cooperation of the CONTRACTOR and subcontractors is essential to achieving final certification.

E. CONTRACTOR shall familiarize himself with the relevant requirements and provide the necessary information and instruction to all subcontractors and installers.

F. Since CONTRACTOR and subcontractors may not be familiar with LEED requirements, this section includes a summary of the products and procedures intended to achieve LEED credits.

1. Some credits are marked PREREQUISITE; these must be achieved regardless of the level of certification; many are dependent on proper performance by CONTRACTOR and subcontractors.

2. Other credits involve quantifying percentages by weight and cost; these require careful recordkeeping and reporting by the CONTRACTOR.

3. See www.usgbc.org for more information.

1.2 RELATED REQUIREMENTS

A. Sections that include requirements intended to achieve LEED credits include, but are not limited to, the following:

B. Section 01100 - Summary:

1. Contractor use of premises; SS Credit 5.1.

2. List of materials and equipment to be salvaged from existing building for re-use or relocation on project; MR Credits 3.1 and 3.2.

C. Section 01356 - LEED Submittal Forms: Coordinate with Template forms provided through the USGBC..

1. LEED Material Cost Summary; to report material only cost categories for computations necessary for MR Credits 3.1, 3.2, 4.1, 4.2, 5.1, 5.2, 6, and 7.

2. LEED Wood-Containing Product List; for documentation of wood and wood-based products used on project; MR Credit 7.

3. LEED Metal-Containing Product List; for documentation of steel and other metals used on project; MR Credits 4.1 and 4.2.

4. LEED New Product Content Form; for content percentages for recycled, rapidly renewable, and certified wood credits, with material cost; MR Credits 4.1, 4.2, 6, and 7; used in conjunction with Wood-Containing and Metal-Containing Product Lists as well as separately.

5. LEED New Product Source Form; for documenting source of new products; MR Credit 5.1 and 5.2.

6. LEED Reused Product Form; for documenting type, source, and cost of reused products; MR Credits 3.1, 3.2, 5.1, and 5.2.

7. LEED Prohibited Content Installer Certification; for each installer to certify compliance with VOC requirements for adhesives and sealants, including duct sealers, and to certify no use of urea-formaldehyde-containing wood products; EQ Credits 4.1 and 4.4.

D. Section 01575 - Temporary Erosion and Sedimentation Control: Preventive measures and remediation; SS PREREQUISITE 1..

E. Section 01734 - Indoor Air Quality:

1. Testing of ventilation; EQ Credit 2.

2. Contractor's IAQ management plan and construction procedures; EQ Credit 3.1.

F. Section 01600 - Product Requirements: Overall project requirements for:

1. Reused products; MR Credits 3.1 and 3.2.

2. Recycled content; MR Credits 4.1 and 4.2.

3. Regionally-sourced products; MR Credits 5.1 and 5.2.
   a. CONTRACTOR is not required to provide any particular minimum percentage of

regionally-sourced products; however, to collect the information necessary to determine whether these credits can be achieved, CONTRACTOR is required to submit the LEED New Product Source Form for every product for which application for payment is made.

4. Rapidly renewable material content; MR Credit 6.

5. Certified (sustainably harvested) wood; MR Credit 7.

G. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions: List of product categories having VOC content restrictions, evidence required, and reporting requirements.

H. Section 01700 - Execution Requirements:

1. Dust control and basic surface drainage; SS Prerequisite 1.

2. Alterations procedures and selective demolition for preserving existing construction; MR Credit 1.

3. Alterations procedures and selective demolition for preserving existing construction; MR Credit 1.2 and 1.3.

I. Section 01732 - Waste Management:

1. Construction and demolition waste management; MR Credit 2.1 and 2.2.

J. Section 01780 - Closeout Submittals:

1. Maintenance and operation manuals for commissioned systems; EA Credit 2.

2. Maintenance and operation manuals for commissioned systems; EA Credit 3.

K. Section 11790 - Demonstration and Training:

1. Fundamental commissioning; EA PREREQUISITE 1.

2. Demonstration of commissioned systems and training of personnel: EA Credit 3.

L. Section 01911 - Commissioning:

1. Fundamental commissioning; EA PREREQUISITE 1.

2. Additional commissioning; EA Credit 3.

M. Section 01815 - Commissioning Authority Responsibilities:

1. Fundamental commissioning; EA PREREQUISITE 1.

N. Section 01733 – Selective Demolition:

1. Demolition of existing pavements; SS Credit 5.1.

2. Demolition of existing impervious surfacing; SS Credit 6.1.

3. Partial demolition for preserving existing construction; MR Credit 1.1.

P. Section 05531 - Gratings:

1. Floor gratings at high volume entryways; EQ Credit 5.

Q. Section 06100 - Rough Carpentry:

1. Requirement to use sustainably harvested wood; MR Credit 7.

R. Section 06160 - Sheathing:

1. Requirement to use sustainably harvested wood; MR Credit 7.

S. not used

T. Section 06200 - Finish Carpentry:

1. Requirement to use sustainably harvested wood; MR Credit 7.

U. Section 06410 - Custom Cabinets:

1. Requirement to use sustainably harvested wood; MR Credit 7.

V. not used

W. Section 07840 - Firestopping: LEED-VOC-compliant firestopping sealants; EQ Credit 4.1.

X. Section 07900 - Joint Sealers: LEED-VOC-compliant sealants; EQ Credit 4.1.

Y. Section 08410 - Metal-Framed Storefronts:

1. Daylighting; EQ Credit 8.1.

2. Views; EQ Credit 8.2.

Z. Section 08520 - Aluminum Windows:

1. Operable windows; EQ Credit 6.2.

2. Daylighting; EQ Credit 8.1.

3. Views; EQ Credit 8.2.

AA. Section 08710 - Door Hardware:

1. Door closers at rooms where hazardous gases or chemicals may be present: EQ Credit 5.

2. Door closers at copy/print/fax rooms: EQ Credit 5.2.

AB. Section 08800 - Glazing:

1. Daylighting; EQ Credit 8.1.

2. Views; EQ Credit 8.2.

AC. Section 09260 - Gypsum Board Assemblies:

1. Deck-to-deck sealed partitions around certain rooms where hazardous gases or chemicals may be present; EQ Credit 5.

2. Deck-to-deck sealed partitions around copy/print/fax rooms: EQ Credit 5.2.

AD. Section 09680 - Carpet: Carpet complying with CRI Green Label Plus requirements and installation materials complying with CRI Green Label requirements; EQ Credit 4.3.

AE. Section 09900 - Paints and Coatings: LEED-VOC-compliant interior opaque paints and coatings; EQ Credit 4.2.

AF. Section 09960 - High-Performance Coatings: High-performance coatings meeting regulatory requirements; EQ Credit 4.2.

AG. Section 10523 - Fire Extinguishers, Cabinets, and Accessories: Fire extinguishers that use agents other than Halon: EA Credit 4.

AH. Section 11450 - Residential Equipment: Energy Star rated; EA Credit 1.4.

AI. Section 11400 - Food Service Equipment: Energy Star rated; EA Credit 1.4.

AJ. Not used

AK. Section 02870 – Site Furnishings:

1. Bicycle racks; SS Credit 4.2.

AL. Section 15128 - Gages and Meters:

1. Plumbing metering devices; EA Credit 5.

AM. Section 15410 - Plumbing Fixtures:

1. High efficiency and dry toilet fixtures; occupant sensors; WE Credit 3.1 and 3.2.

AN. Not Used

AO. Not Used

AP. Section 01911 - Commissioning of HVAC:

1. Commissioning of HVAC controls; EQ Credit 7.2.

AQ. Section 15926 - building automation system and automatic controls:

1. HVAC monitoring and metering devices; EA Credit 5.

2. For minimum ventilation performance; EQ PREREQUISITE 1.

3. Outdoor airflow measurement devices in HVAC system; EQ Credit 1.

4. General ventilation control devices; EQ Credit 2.

5. Carbon dioxide monitoring devices for ventilation control; EQ Credit 1.

6. Humidity control devices; EQ Credit 10.

AR. Section 15926 - building automation system and automatic controls:

1. To support building systems monitoring; EA Credit 3.3.

2. For minimum ventilation performance; EQ PREREQUISITE 1.

3. Permanent, automatic and operator-adjustable temperature and humidity monitoring; EQ Credit 7.2.

AS. Section 15950 – Testing, Adjusting, and Balancing:

1. For minimum ventilation performance; EQ PREREQUISITE 1.

2. Ventilation control utilizing carbon dioxide monitoring; EQ Credit 1.

3. Individual HVAC controls; EQ Credit 6.2.

AT. Section 15182 - Hydronic Piping:

1. Non-potable water distribution for mechanical systems; WE Credit 3.1 and 3.2.

AU. Section 15810 - Ducts:

1. For minimum ventilation performance; EQ PREREQUISITE 1.

2. Low-VOC duct sealers; MR Credit 3.

3. Low-VOC duct sealers; EQ Credit 4.1.

4. Separate ductwork for certain rooms where hazardous gases and chemicals may be present; EQ Credit 5.

5. Separate ductwork for high-volume copy/print/fax rooms; EQ Credit 5.2.

6. For mechanical ventilation for thermal comfort; EQ Credit 7.1.

7. Separate ductwork for janitor closets; EQ Credit 10.2.

AV. Section 15835 - Power Ventilators: Exhaust fans:

1. For minimum ventilation performance; EQ PREREQUISITE 1.

2. For effective ventilation; EQ Credit 2.

3. For certain rooms where hazardous gases and chemicals may be present; EQ Credit 5.

4. For high-volume copy/print/fax rooms; EQ Credit 5.2.

5. For mechanical ventilation for thermal comfort; EQ Credit 7.1.

6. For janitor closets; EQ Credit 10.2.

AW. Section 15720 - Air Handling Units:

1. Air filters: EQ Credit 5.

2. Replacement filters; EQ Credit 5.1.

AX. Section 16442 – Panel Boards and Switches:

1. Continuous metering of lighting, motor, and other loads; EA Credit 5.

AY. Section 16442 – Panel Boards and Switches:

1. Automatic lighting controls to reduce light pollution; SS Credit 8.

2. Lighting controls for controllability of lighting; EQ Credit 6.1.

AZ. Not Used

BA. Section 16140 - Wiring Devices: Manual lighting control devices; EQ Credit 6.1.

BB. Section 16511 - Interior Luminaires.

1. Replacement lighting ballasts; EQ PREREQUISITE 4.

2. Interior lighting fixtures selected and laid out to minimize light spillover through windows; SS Credit 8.

BC. Section 16521 - Exterior Luminaires:

1. Site lighting fixtures that reduce light pollution; SS Credit 8.

BD. Not Used

BE. Section 02230 - Site Clearing: Vegetation protection and removal limits; site clearing waste management; SS Credit 5.1.

BF. Section 02300 - Earthwork:

1. For sediment traps and retention ponds; SS Prerequisite 1.

2. For restoration of developed site; SS Credit 5.1.

3. For modifying existing stormwater flows; SS Credit 6.1.

4. For natural storm water treatment; SS Credit 6.2.

BG. Not Used

BH. Not Used

BI. Section 02810 - Irrigation System: Water efficient landscape irrigation system; WE Credit 1.1 and 1.2.

BJ. Not Used

BK. Section 02920 - Lawns and Grasses:

1. Turf for modifying existing stormwater flows; SS Credit 6.1.

BL. Section 02930 - Exterior Plants:

1. For erosion and sedimentation control; SS PREREQUISITE 1.

2. Restoration of natural vegetation on site; SS Credit 5.1.

3. For modifying existing stormwater flows; SS Credit 6.1.

4. Plants that do not require irrigation; WE Credit 1.1 and 1.2.

5. Plants that do not require much irrigation; WE Credit 1.1 and 1.2.

BM. Section 02630 – Storm Utility Drainage Piping.

1. For reducing run-off rate and quantity; SS Credit 6.1.

BN. Not Used

1.3 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for additional submittal procedures.

B. Submit LEED submittals and reports to ARCHITECT, unless otherwise indicated.

C. LEED Submittal/Report: For each product with the notation "show quantity on LEED submittal or report," submit a report with the following information:

1. Submit with each Application for Payment; update the Report each period with latest period shown separately:

2. Identify each product with:
   a. Name and manufacturer.
   b. Specification section number.
   c. Applicable Credit(s).
   d. Net weight per unit.
   e. Quantity installed.
   f. Material cost per unit.
   g. Total material cost.

3. Attach evidence of compliance from either the manufacturer or an independent agency.

1.4 INFORMATION SOURCES

A. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE); 1791 Tullie Circle, NE, Atlanta, GA 30329. Tel: (404) 636-8400. Fax: (404) 321-5478. www.ashrae.org.

B. Green Seal; 1001 Connecticut Avenue, NW, Suite 827, Washington, DC 20036-5525. Tel: (202) 872-6400. Fax: (202) 872-4324. www.greenseal.org.

C. U.S. Green Building Council (USGBC); 1015 18th Street, NW, Suite 805, Washington, DC 20036. Tel: (202) 82-USGBC or (202) 828-7422. Fax: (202) 828-5110. www.usgbc.org.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01355

SECTION 01370 - SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Procedures for preparation and submittal of Schedule of Values.

1.2 RELATED REQUIREMENTS

A. Section 00700 - General Conditions

B. Section 01027 - Application for Payment

1.3 FORMAT

A. On form provided or approved by the CBJ Project Manager. Type the Schedule of Values on copy of form provided by OWNER.

B. CONTRACTOR's standard form or media-driven printout will be considered upon request.

C. Follow Table of Contents of Project Manual for listing component parts. Identify each line item by number and title of major Specification section.

1.4 CONTENT

A. List installed value of each major item of work and each subcontracted item or work as a separate line item to serve as a basis for computing values for Progress Payments. Round off values to nearest dollar.

B. For each major subcontract, list products and operations of that subcontract as separate line items.

C. Coordinate listings with Progress Schedule.

D. Component listings shall each include a directly proportional amount of CONTRACTOR's overhead and profit.

E. For items on which payment will be requested for stored products, list sub-values for cost of stored products.

F. Provide receipts, invoices, etc., showing proof of payment, shipping costs, taxes, liens, etc., as may be applied.

G. Specific line item values as indicated below shall be minimum acceptable amount and must be included on all approved Schedules of Values and Application for Payment.

1. Section 01780 - Contract Closeout. Value of all required Substantial Completion Submittals and Closeout Submittals shall be not less than one half of one percent of the total Contract Price.

H. The sum of values listed shall equal total Contract Price.

1.5 SUBMITTAL

A. Submit one (1) copy of Schedule of Values fifteen (15) days after Notice to Proceed. Form and content shall be reviewed and approved by the CBJ Project Manager. Subsequent updated Schedule of Values shall be presented for review ten (10) days prior to each Application for Payment.

B. Transmit under CBJ Project Manager accepted form transmittal letter. Identify Project by Title and State project number.

1.6 SUBSTANTIATING DATA

A. When CBJ Project Manager requires substantiating information, submit data justifying line item amounts in question.

B. Provide one copy of data with cover letter for each copy of Application. Show Application number and date, and line item by number and description.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 01370

SECTION 01400 – QUALITY CONTROL

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. General Quality Control

B. Workmanship

C. Manufacturer's Instructions

D. Testing Laboratory Services

E. OWNER Inspection Services

1.2 RELATED REQUIREMENTS

A. Section 00700 - General Conditions

B. Section 01005 - Administrative Provisions

C. Section 01300 - Submittals

1.3 GENERAL QUALITY CONTROL

A. Maintain quality control over Suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

1.4 WORKMANSHIP

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform Work by persons qualified to produce workmanship of specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.5 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from the CBJ Project Manager before proceeding.

1.6 TESTING LABORATORY SERVICES

A. CONTRACTOR shall employ and pay for services of an independent testing laboratory to perform inspections, tests, and other services required by individual Specification sections.

B. Services will be performed in accordance with requirements of governing authorities and with specified standards.

C. Reports will be submitted to the CBJ Project Manager in duplicate giving observations and results of tests, indicating compliance or non-compliance with specified standards and with Contract Documents.

D. CONTRACTOR shall cooperate with testing laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage and assistance as requested.

1. Notify the CBJ Project Manager and testing laboratory 24 hours prior to expected time for operations requiring testing services.
2. Make arrangements with testing laboratory and pay for additional samples and tests for CONTRACTOR's convenience.

1.7 OWNER INSPECTION SERVICES

A. When required within the Contract Documents, the CONTRACTOR shall submit a written request for inspection services to be performed by the OWNER.

B. Said request shall be received by the CBJ Project Manager (4) working days prior to the requested time of inspection.

C. Request shall identify the Project, its location, the CONTRACTOR and a contact person, and describe the nature of the desired inspection.

D. If request is for a re-inspection of previous Work, include OWNER's prior report, listing deficiencies, and remedies provided since prior inspection.

1.8 PERMIT INSPECTIONS

A. CONTRACTOR responsible for scheduling all required City and Borough of Juneau building permit inspections of the Work.

B. CONTRACTOR to notify CBJ Project Manager (4) working days prior to the requested time of inspection.

C. CONTRACTOR to provide inspection documentation to CBJ Project Manager.

D. CONTRACTOR responsible for obtaining certificate of occupancy at the end of each construction season.

E. CONTRACTOR responsible for obtaining final building permit approval.

PART 2 – PRODUCTS NOT USED

PART 3 – EXECUTION NOT USED

END OF SECTION 01400

SECTION 01420 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Section 00700 General Conditions and Section 00800 Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

J. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

K. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to OWNER for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to OWNER for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.

E. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	 (800) 872-2253 (202) 272-5434
CFR	Code of Federal Regulations Available from Government Printing Office	 (888) 293-6498

	www.access.gpo.gov/nara/cfr	(202) 512-1530
CRD	Handbook for Concrete and Cement Available from Army Corps of Engineers Waterways Experiment Station www.wes.army.mil	(601) 634-2355
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from General Services Administration www.fss.gsa.gov/pub/fed-specs.cfm	(202) 619-8925
	Available from National Institute of Building Sciences www.nibs.org	(202) 289-7800
FTMS	Federal Test Method Standard (See FS)	
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-5434
USGBC	United States Green Building Councel www.usgbc.org	(202) 828-7422

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(202) 862-5100
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
ACI	American Concrete Institute/ACI International www.aci-int.org	(248) 848-3700
AIA	American Institute of Architects (The) www.AIA.org	(202) 626-7300

AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALA	American Laminators Association (See LMA)	
ALSC	American Lumber Standard Committee	(301) 972-1700
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASTM	American Society for Testing and Materials www.astm.org	(610) 832-9585
AWCI	AWCI International (Association of the Wall and Ceiling Industries International) www.awci.org	(703) 534-8300
AWI	Architectural Woodwork Institute www.awinet.org	(800) 449-8811 (703) 733-0600
AWPA	American Wood-Preservers' Association www.awpa.com	(817) 326-6300
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
CCFSS	Center for Cold-Formed Steel Structures www.umr.edu/~ccfss	(573) 341-4471

CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200

CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIA/TIA	Electronic Industries Alliance/Telecommunications Industry Association www.eia.org	(703) 907-7500
FGMA	Flat Glass Marketing Association (See GANA)	
FM	Factory Mutual System (See FMG)	
FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmglobal.com	(401) 275-3000
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America (Formerly: FGMA - Flat Glass Marketing Association) www.glasswebsite.com/gana	(785) 271-0208
GTA	Glass Tempering Division of Glass Association of North America (See GANA)	
HMMA	Hollow Metal Manufacturers Association (See NAAMM)	
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(508) 394-4424
ICRI	International Concrete Repair Institute (The) www.icri.org	(703) 450-0116
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900

IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IWS	Insect Screening Weavers Association (Now defunct)	
LEED	Leadership in Energy and Environmental Design Certification program by USGBC www.usgbc.org	(202) 828-7422
LGSI	Light Gage Structural Institute www.loseke.com	(972) 370-0967
LMA	Laminating Materials Association (Formerly: ALA - American Laminators Association) www.lma.org	(201) 664-2700
LSGA	Laminated Safety Glass Association (See GANA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NAIMA	North American Insulation Manufacturers Association (The) www.naima.org	(703) 684-0084
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(303) 697-8441
NFPA	National Fire Protection Association www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-6372

NGA	National Glass Association www.glass.org	(703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933?0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
PDCA	Painting and Decorating Contractors of America www.pdca.com	(800) 332-7322 (703) 359-0826
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIGMA	Sealed Insulating Glass Manufacturers Association www.sigmaonline.org/sigma	(312) 644-6610
SMA	Screen Manufacturers Association	(561) 533-0991
SPI	The Society of the Plastics Industry www.plasticsindustry.org	(202) 974-5200
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SPI/SPFD	The Society of the Plastics Industry Spray Polyurethane Foam Division (See SPFA)	
SSMA	Steel Stud Manufacturers Association (Formerly: ML/SFA - Metal Lath/Steel Framing Association) www.ssma.com	(312) 456-5590
SWRI	Sealant, Waterproofing, and Restoration Institute www.swrionline.org	(816) 472-7974
UL	Underwriters Laboratories Inc. www.ul.com	(800) 704-4050 (847) 272-8800
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association	(800) 506-4653

	(Formerly: AWCMA - American Window Covering Manufacturers Association) www.windowcoverings.org	(212) 661-4261
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WIC	Woodwork Institute of California www.wicnet.org	(916) 372-9943
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

BOCA	BOCA International, Inc. www.bocai.org	(708) 799-2300
CABO	Council of American Building Officials (See ICC)	
IAPMO	International Association of Plumbing and Mechanical Officials (The) www.iapmo.org	(909) 595-8449
ICBO	International Conference of Building Officials www.icbo.org	(800) 284-4406 (562) 699-0541
ICC	International Code Council (Formerly: CABO - Council of American Building Officials) www.intlcode.org	(703) 931-4533
SBCCI	Southern Building Code Congress International, Inc. www.sbcci.org	(205) 591-1853

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers www.usace.army.mil

CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-0990
DOC	Department of Commerce www.doc.gov	(202) 482-2000
EPA	Environmental Protection Agency www.epa.gov	(202) 260-2090
FCC	Federal Communications Commission www.fcc.gov	(202) 418-0190
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(202) 708-5082
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley Laboratory (See LBNL)	
LBNL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-5605
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(202) 693-1999

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01420

SECTION 01500 – CONSTRUCTION FACILITIES / TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Electricity, Lighting.

B. Heat, Ventilation.

C. Telephone Service.

D. Water.

E. Sanitary Facilities.

F. Barriers.

G. Enclosures.

H. Protections of Installed Work and Existing Finishes.

I. Security.

J. Water Control.

K. Cleaning During Construction.

L. Removal.

M. Construction Surveying.

1.2 RELATED REQUIREMENTS

A. Section 01005 - Administrative Provisions

B. Section 01780 - Contract Closeout

C. Section 01350 - Sustainable Design Requirement

D. Section 01732 – Waste Management

1.3 ELECTRICITY, LIGHTING

A. Provide tie-in to existing facility power required for construction operations, extended to work areas to allow service and lighting by means of construction-type power cords.

B. Provide lighting for construction operations.

C. Permanent lighting may be used during construction. Maintain lighting and make routine repairs.

1.4 HEAT, VENTILATION

A. CONTRACTOR use of OWNER heating and ventilation systems is prohibited.

B. Construction will occur during summer months when the building is unoccupied. See Section 01001-3, 1.6. Temporary heat and ventilation is not required. Do not use the building's hydronic heating system and ventilation systems during construction.

B. Provide ventilation of enclosed areas to cure materials, to disperse humidity, and to prevent accumulations of dust, fumes, vapors, or gases.

C. CONTRACTOR is responsible for repairing any damage to OWNER'S heating systems and equipment that the CONTRACTOR's activities may incur.

1.5 TELEPHONE SERVICE

A. CONTRACTOR to provide phone service on site. Cell phone service is acceptable.

1.6 WATER

A. Provide tie-in to existing facility service as required for construction operations. Extend branch piping as necessary with outlets located so that water is available by use of hoses.

D. CONTRACTOR is responsible for repairing any damage to OWNER's water systems and equipment that the CONTRACTOR's use or activities may incur.

1.7 SANITARY FACILITIES

A. For the duration of the project, provide and maintain required temporary facilities and enclosures. Use of the OWNER's toilet facilities is not permitted.

1.8 BARRIERS

A. Provide temporary fencing as required to maintain security of stored materials and CONTRACTOR's equipment.

B. Provide temporary fencing as required to separate public and work areas of the site, and to protect existing facilities and adjacent properties from damage from construction operations. Temporary fencing to be 6 feet high chain link with freestanding posts and bases.

1.9 ENCLOSURES

A. Provide temporary weather-tight closures of openings in exterior surfaces to provide acceptable working conditions and protection for materials, to allow for temporary heating, and to prevent entry of unauthorized persons. Provide doors with self-closing hardware and locks.

1.10 PROTECTION OF INSTALLED WORK AND EXISTING FINISHES

A. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.

B. Protect finished floors from traffic, movement of heavy objects, and storage.

1.11 SECURITY

A. Provide security program and facilities to protect from unauthorized entry, vandalism, and theft. Coordinate with OWNER.

1.12 WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide and operate pumping equipment as necessary.

1.13 CLEANING DURING CONSTRUCTION

A. Control accumulation of waste materials and rubbish; periodically dispose of off-site.

B. Clean interior areas prior to start of finish Work; maintain areas free of dust and other contaminants during finishing operations.

1.14 REMOVAL

A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion inspection.

B. On removal, clean and repair damage caused by installation or use of temporary facilities. Remove underground installations to a depth 3 feet.

1.15 CONSTRUCTION SURVEYING

A. Existing Monument Search: Prior to the establishment of construction stakes, a monument search shall be conducted and a record made in the survey control field book stating which monuments were found and which ones were not found. Record plats within the construction limits should be obtained by the Contractor to assist in monument recovery.

B. Requirement to Establish Monumentation: The Contractor shall replace any monument that exists within the construction limits if it is disturbed or removed due to project activity.

All monumentation disturbed or removed shall be replaced with the same type monument or monument approved by the Architect. If the monument had a self-identifying cap, a new cap shall be attached bearing the same information which was stamped on the original cap. The new cap shall bear the license number of the Surveyor and the year the monument was replaced. Monuments that are locate d in gravel road surfaces, fill slopes, back slopes or ditches shall be installed six (6) inches below the finished surface.

When a monument cannot be re-established in the proper location, one or more reference marks shall be established. The establishment of the reference marks shall be coordinated with the Architect.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

B. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 01001- Summary.

C. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

END OF SECTION 01500

SECTION 01575 - TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of City and Borough of Juneau & Juneau School District for fines levied by authorities having jurisdiction due to non-compliance by CONTRACTOR.

1.2 RELATED REQUIREMENTS

A. Section 01355 - LEED Certification Procedures: LEED credits relating to erosion and sedimentation control.

B. Section 02300 - Earthwork: Temporary and permanent grade changes for erosion control.

C. Section 02300 - Earthwork: Base Course for temporary and permanent roadways.

D. Section 02930 - Exterior Plants: Permanent plantings for erosion control.

E. Section 03300 - Cast-in-Place Concrete: Concrete for temporary and permanent erosion control structures indicated on drawings.

1.3 REFERENCE STANDARDS

A. ASTM D 4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus; 2007.

B. ASTM D 4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2009).

C. ASTM D 4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2004 (Reapproved 2009).

D. ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2008.

E. ASTM D 4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2004.

F. ASTM D 4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2002 (Reapproved 2009).

G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; current edition.

1.4 PERFORMANCE REQUIREMENTS

A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP), whether the project is required by law to comply or not.

B. Also comply with all more stringent requirements of Alaska Erosion and Sedimentation Control Manual.

C. Comply with all requirements of City and Borough of Juneau for erosion and sedimentation control, even though this project is not required by law to comply.

D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

1. City and Borough of Juneau & Juneau School District will obtain permits.

E. No separate bond required.

F. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

G. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.

1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.

2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

H. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.

1. Control movement of sediment and soil from temporary stockpiles of soil.
2. Prevent development of ruts due to equipment and vehicular traffic.
3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to City and Borough of Juneau & Juneau School District.

I. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.

1. Prevent windblown soil from leaving the project site.
2. Prevent tracking of mud onto public roads outside site.
3. Prevent mud and sediment from flowing onto sidewalks and pavements.
4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to City and Borough of Juneau & Juneau School District.

J. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to City and Borough of Juneau & Juneau School District; remove deposited sediments; comply with requirements of authorities having jurisdiction.
2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

K. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to City and Borough of Juneau & Juneau School District; remove deposited sediments; comply with requirements of authorities having jurisdiction.

L. Open Water: Prevent standing water that could become stagnant.

M. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

N. Temporary Erosion and Sedimentation Control: SWPPP shall comply with requirements of EPA Construction General Permit and in accordance with the Alaska Department of Transporation and Public Facilities "*Storm Water Contractor Guidance for Preparing and Excavating Storm Water Pollution Prevention Plans*", dated October 1993, which will comply with the NPDES General Permits for Storm Water Discharges from Construction Activities.

In addition to complying with the requirements of the NPDES General Permits for Storm Water Discharges from Construction Activities, all state and local regulatory requirements for the collection, control and discharge of strom water will be complied by the Contractor.

1.5 SUBMITTALS

A. See Section 01300 for submittal procedures.

B. LEED Submittals: Submit all submittals required in this section in accordance with procedures specified in Section 01355.

C. Erosion and Sedimentation Control Plan:

1. Submit within 2 weeks after Notice to Proceed.
2. Include:

   a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
   b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
   c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
   d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
   e. Other information required by law.
   f. Format required by law is acceptable, provided any additional information specified is also included.

3. Obtain the approval of the Plan by authorities having jurisdiction.
4. Obtain the approval of the Plan by City and Borough of Juneau & Juneau School District.

D. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

E. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

F. Erosion- and Sedimentation-Control Plan: Contractor shall prepare a StormWater Pollution Prevention Plan (SWPPP).

PART 2 PRODUCTS

2.1 MATERIALS

A. Mulch: Use one of the following:

1. Straw or hay.
2. Polyethylene film, where specifically indicated only.

B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

C. Bales: Air dry, rectangular straw bales.

1. Cross Section: 14 by 18 inches (350 by 450 mm), minimum.
2. Bindings: Wire or string, around long dimension.

D. Bale Stakes: One of the following, minimum 3 feet (1 m) long:

1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot (1.98 kg per linear m).
2. Wood, 2 by 2 inches (50 by 50 mm) in cross section.

E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:

1. Average Opening Size: 30 U.S. Std. Sieve (0.600 mm), maximum, when tested in accordance with ASTM D 4751.
2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D 4491.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D 4355 after 500 hours exposure.
4. Tensile Strength: 100 lb-f (450 N), minimum, in cross-machine direction; 124 lb-f (550 N), minimum, in machine direction; when tested in accordance with ASTM D 4632.
5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D 4632.
6. Tear Strength: 55 lb-f (245 N), minimum, when tested in accordance with ASTM D 4533.
7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

F. Silt Fence Posts: One of the following, minimum 5 feet (1500 mm) long:

1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot (1.98 kg per linear m).
2. Softwood, 4 by 4 inches (100 by 100 mm) in cross section.

G. Gravel: See Section 02721 for aggregate.

H. Concrete: See Section 03300.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.2 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.3 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.

1. Width: As required; 20 feet (7 m), minimum.
2. Length: 50 feet (16 m), minimum.
3. Provide at each construction entrance from public right-of-way.
4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.

1. Provide linear sediment barriers:

a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.

2. Space sediment barriers with the following maximum slope length upslope from barrier:

a. Slope of Less Than 2 Percent: 100 feet (30 m)..
b. Slope Between 2 and 5 Percent: 75 feet (23 m).
c. Slope Between 5 and 10 Percent: 50 feet (15 m).
d. Slope Between 10 and 20 Percent: 25 feet (7.5 m).
e. Slope Over 20 Percent: 15 feet (4.5 m).

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:

1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
2. Straw bale row blocking entire inlet face area; anchor into pavement.

E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

G. Soil Stockpiles: Protect using one of the following measures:

1. Cover with polyethylene film, secured by placing soil on outer edges.

2. Cover with mulch at least 4 inches (100 mm) thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches (150 mm) of straw or hay.

H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.

I. Temporary Seeding: Use where temporary vegetated cover is required.

3.4 INSTALLATION

A. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways. The Contractor shall:

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
5. Maintain the SWPPP current including all project updates and revision which affect it.

B. Traffic-Bearing Aggregate Surface:

1. Excavate minimum of 6 inches (150 mm).
2. Place geotextile fabric full width and length, with minimum 12 inch (300 mm) overlap at joints.
3. Place and compact at least 6 inches (150 mm) of 1.5 to 3.5 inch (40 to 90 mm) diameter stone.

C. Silt Fences:

1. Store and handle fabric in accordance with ASTM D 4873.
2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch (405 mm) high barriers with minimum 36 inch (905 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 4 inches (100 mm) in ground.
3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch (710 mm) high barriers, minimum 48 inch (1220 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet (6 m), use nominal 32 inch (810 mm) high barriers with woven wire

   reinforcement and steel posts spaced at 4 feet (1220 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
5. Install with top of fabric at nominal height and embedment as specified.

6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches (460 mm), with extra post.
7. Fasten fabric to wood posts using one of the following:

    a. Four 3/4 inch (19 mm) diameter, 1 inch (25 mm) long, 14 gage nails.
    b. Five 17-gage staples with 3/4 inch (19 mm) wide crown and 1/2 inch (12 mm) legs.

8. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
9. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches (300 mm) high with post spacing not more than 4 feet (1220 mm).

D. Straw Bale Rows:

1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
2. Install bales so that bindings are not in contact with the ground.
3. Embed bales at least 4 inches (100 mm) in the ground.
4. Anchor bales with at least two stakes per bale, driven at least 18 inches (450 mm) into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
5. Fill gaps between ends of bales with loose straw wedged tightly.
6. Place soil excavated for trench against bales on the upslope side of the row, compacted.

E. Temporary Seeding:

1. When hydraulic seeder is used, seedbed preparation is not required.
2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft (0.5 kg per 100 sq m).
4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft (6 to 8 kg per 100 sq m).
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep (12 to 25 mm) deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.5 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches (13 mm) or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:

1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Straw Bale Rows:

1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
2. Remove silt deposits that exceed one-half of the height of the bales.
3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Clean out temporary sediment control structures weekly and relocate soil on site.

F. Place sediment in appropriate locations on site; do not remove from site.

3.6 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by ARCHITECT.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

D. Temporary Erosion and Sediment Control: Upon completion of the project, the Contractor shall return the original SWPPP with all amendments to the City and Borough of Juneau.

END OF SECTION

SECTION 01600 – MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Products.

B. Transportation and Handling.

C. Storage and Protection.

D. Product Options.

E. Products List.

F. Substitutions.

G. Systems Demonstration.

1.2 RELATED REQUIREMENTS

A. Section 01005 - Administrative Provisions.

B. Section 01400 - Quality Control.

C. Section 01780 - Contract Closeout.

1.3 PRODUCTS

A. Products include material, equipment, and systems.

B. Comply with Specifications and referenced standards as minimum requirements.

C. Components required to be supplied in quantity within a Specification section shall be the same, and shall be interchangeable.

1.4 TRANSPORTATION AND HANDLING

A. Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturer’s unopened containers or packaging, dry.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage.

C. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

1.5 STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity gauges required by manufacturer's instructions.

B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

D. Arrange storage to provide access for inspection. Periodically inspect to assure products undamaged, and are maintained under required conditions.

1.6 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards.

B. Products Specified by Naming One or More Manufacturers: Submit a request for substitution for any manufacturer not specifically named.

C. Products Specified by Naming One or More Manufacturer's followed by the term "No Substitutions": Use only specified manufacturers, no substitutions allowed.

1.7 PRODUCTS LIST

A. Within 15 days after date established in Notice to Proceed, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

1.8 SUBSTITUTIONS

A. Only within 21 days after date established in Notice to Proceed will the OWNER consider requests from CONTRACTOR for substitutions. Subsequently, substitutions will be considered only when a product becomes unavailable due to no fault of CONTRACTOR, or if the substitution is advantageous to the OWNER.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

C. Request constitutes a representation that CONTRACTOR:

1. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.
2. Will provide the same warranty for substitution as for specified product.
3. Will coordinate installation and make other changes which may be required for Work to be complete in all respects.
4. Waives claims for additional costs which may subsequently become apparent.

D. Substitutions will not be considered when they are indicated or implied on Shop Drawings or product data submittals without separate written request, or when acceptance will require substantial revision of Contract Documents.

E. The OWNER will determine acceptability of proposed substitution, and will notify CONTRACTOR of acceptance or rejection in writing within a reasonable time.

F. Only one request for substitution will be considered for each product. When substitution is not accepted, provide specified product.

1.9 SYSTEMS DEMONSTRATION

A. Prior to final inspection, demonstrate operation of each system to OWNER's personnel.

B. Instruct OWNER's personnel in operation, adjustment, and maintenance of equipment and systems, using the operation and maintenance data as the basis of instruction.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 01600

SECTION 01616 - VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. VOC restrictions for product categories listed below under "DEFINITIONS."

B. All products of each category that are installed in the project must comply; City and Borough of Juneau & Juneau School District's project goals do not allow for partial compliance.

1.2 RELATED REQUIREMENTS

A. Section 01300 - Submittals.

B. Section 01355 - LEED Certification Procedures.

C. Section 01734 - Indoor Air Quality: Procedures and testing; LEED requirements.

1.3 DEFINITIONS

A. VOC-Restricted Products: All products of each of the following categories when installed or applied on-site in the building interior:

1. Adhesives, sealants, and sealer coatings.
2. Carpet.
3. Carpet tile.
4. Resilient floor coverings.
5. Paints and coatings.
6. Insulation.
7. Gypsum board.
8. Acoustical ceilings and panels.
9. Cabinet work.
10. Wall coverings.
11. Composite wood and agrifiber products used either alone or as part of another product.

12. Other products when specifically stated in the specifications.

B. Interior of Building: Anywhere inside the exterior weather barrier.

C. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

D. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

1.4 REFERENCE STANDARDS

A. CAL (CHPS LEM) - Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at www.chps.net/.

B. CAL (VOC) - Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers (including Addendum 2004-01); State of California Department of Health Services; 2004.

C. CRI (GLP) - Green Label Plus Carpet Testing Program - Approved Products; Carpet and Rug Institute; Current Edition.

D. GEI (SCH) - GREENGUARD "Children and Schools" Certified Products; GREENGUARD Environmental Institute; current listings at www.greenguard.org.

E. GreenSeal GS-36 - Commercial Adhesives; Green Seal, Inc.; 2000.

F. SCS (CPD) - SCS Certified Products; Scientific Certification Systems; current listings at www.scscertified.com.

1.5 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Evidence of Compliance: Submit for each different product in each applicable category.

1. Identify evidence submittals with the words "LEED Report".

C. Product Data: For each VOC-restricted product used in the project, submit product data showing compliance, except when another type of evidence of compliance is required.

D. Installer Certifications for Accessory Materials: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of his products, or 2) that such products used comply with these requirements.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1 MATERIALS

A. All VOC-Restricted Products: Provide products having VOC content of types and volume not greater than those specified in State of California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers.

1. Evidence of Compliance: Acceptable types of evidence are:
   a. Current GREENGUARD Children & Schools certification; www.greenguard.org.
   b. Current Carpet and Rug Institute Green Label Plus certification; www.carpet-rug.org.
   c. Current SCS Floorscore certification; www.scscertified.com.
   d. Current SCS Indoor Advantage Gold certification; www.scscertified.com.
   e. Product listing in the CHPS Low-Emitting Materials Product List at www.chps.net/manual/lem_table.htm.
   f. Current certification by any other agencies acceptable to CHPS.
   g. Report of laboratory testing performed in accordance with CHPS requirements for getting a product listed in the Low-Emitting Materials Product List; report must include laboratory's statement that the product meets the specified criteria.

2. Product data submittals showing VOC content are NOT acceptable forms of evidence.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. City and Borough of Juneau & Juneau School District reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to City and Borough of Juneau & Juneau School District.

B. All additional costs to restore indoor air quality due to installation of non-compliant products will be borne by CONTRACTOR.

END OF SECTION 01616

SECTION 01700 - EXECUTION REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of City and Borough of Juneau & Juneau School District personnel.

H. Closeout procedures, except payment procedures.

I. General requirements for maintenance service.

1.2 RELATED REQUIREMENTS

A. Section 01001 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01005: Administrative Procedures.

C. Section 01300 - Submittals: Submittals procedures.

D. Section 01500 - Construction Facilities / Temporary Controls: Temporary exterior enclosures.

E. Section 01500 - Construction Facilities / Temporary Controls: Temporary interior partitions.

F. Section 01500 - Construction Facilities / Temporary Controls: Temporary heating, cooling, and ventilating facilities.

G. Section 01575 - Temporary Erosion and Sedimentation Control: Additional erosion and sedimentation control requirements.

H. Section 01731 – Cutting and Patching: Cutting, Patching, general demolition.

H. Section 01732 - Waste Management: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

I. Section 01780 - Contract Closeout: Project record documents, operation and maintenance data, warranties and bonds.

J. Section 01911 - Commissioning: CONTRACTOR's responsibilities in regard to commissioning.

K. Section 07840 - Firestopping.

L. Individual Product Specification Sections:

1.3 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2004.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.

1. On request, submit documentation verifying accuracy of survey work.

2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.

3. Submit surveys and survey logs for the project record.

C. Cutting and Patching, Demolition: Coordinate with Section 01731.

E. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.5 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.

B. For survey work, employ a land surveyor registered in Alaska and acceptable to OWNER. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in Alaska.

1.6 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.

2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by City and Borough of Juneau & Juneau School District.

F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

1. Minimize amount of bare soil exposed at one time.

2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.

3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

H. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.7 COORDINATION

A. See Section 01001 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. After City and Borough of Juneau & Juneau School District occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of City and Borough of Juneau & Juneau School District's activities.

PART 2 PRODUCTS: NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work,

assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify OWNER four days in advance of meeting date.

D. Prepare agenda and preside at meeting:

1. Review conditions of examination, preparation and installation procedures.

2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to ARCHITECT, City and Borough of Juneau & Juneau School District, participants, and those affected by decisions made.

3.4 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify OWNER of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to OWNER the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to OWNER.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.

2. Grid or axis for structures.

3. Building foundation, column locations, ground floor elevations.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.5 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.6 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.

1. Verify that construction and utility arrangements are as shown.

2. Report discrepancies to ARCHITECT before disturbing existing installation.

3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.

1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01500.

C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.

1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.

2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.

D. Remove existing work as indicated and as required to accomplish new work.

1. Remove items indicated on drawings.

2. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.

3. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and Access Control Systems): Remove, relocate, and extend existing systems to accommodate new construction.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.

2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.

3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
   b. See Section 01001 for other limitations on outages and required notifications.
   c. Provide temporary connections as required to maintain existing systems in service.

4. Verify that abandoned services serve only abandoned facilities.

5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

F. Protect existing work to remain.

1. Prevent movement of structure; provide shoring and bracing if necessary.

2. Perform cutting to accomplish removals neatly and as specified for cutting new work.

3. Repair adjacent construction and finishes damaged during removal work.

G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to ARCHITECT.

2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.

3. Where a change of plane of 1/4 inch (6 mm) or more occurs in existing work, submit recommendation for providing a smooth transition for ARCHITECT review and request instructions.

H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

I. Refinish existing surfaces as indicated:

1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.

2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

L. Do not begin new construction in alterations areas before demolition is complete.

M. Comply with all other applicable requirements of this section.

3.7 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements. Coordinate with Section 01731 – Cutting and Patching.

C. Perform whatever cutting and patching is necessary to:

1. Complete the work.

2. Fit products together to integrate with other work.

3. Provide openings for penetration of mechanical, electrical, and other services.

4. Match work that has been cut to adjacent work.

5. Repair areas adjacent to cuts to required condition.

6. Repair new work damaged by subsequent work.

7. Remove samples of installed work for testing when requested.

8. Remove and replace defective and non-conforming work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07840, to full thickness of the penetrated element.

J. Patching:

1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

2. Match color, texture, and appearance.

3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.8 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.9 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate with requirements of Section 01911 - Commissioning.

B. Coordinate schedule for start-up of various equipment and systems.

C. Notify ARCHITECT and owner seven days prior to start-up of each item.

D. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

E. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

F. Verify that wiring and support components for equipment are complete and tested.

G. Execute start-up under supervision of applicable CONTRACTOR personnel and manufacturer's representative in accordance with manufacturers' instructions.

H. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

I. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. See Section 01790 - Demonstration and Training.

3.12 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Notify ARCHITECT when work is considered ready for Substantial Completion.

C. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for ARCHITECT's review.

D. City and Borough of Juneau & Juneau School District will occupy entire building as specified in Section 01001.

E. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to City and Borough of Juneau & Juneau School District-occupied areas.

F. Accompany OWNER and ARCHITECT on preliminary final inspection.

G. Notify ARCHITECT when work is considered finally complete.

H. Complete items of work determined by ARCHITECT's final inspection.

3.15 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the City and Borough of Juneau & Juneau School District.

END OF SECTION 01700

SECTION 01731 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. See Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the WORK.

1.2 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
2. Products: List products to be used and firms or entities that will perform the WORK.
3. Dates: Indicate when cutting and patching will be performed.
4. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
5. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
6. Architect's Approval: Obtain approval of cutting and patching and demolition proposal before proceeding. Approval does not waive right to later require removal and replacement of unsatisfactory WORK.

1.3 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in CBJ Project Manager's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

C. New Materials: As specified in product sections; match existing products and work for patching and extending work.

D. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01600.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of WORK to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage and protect from dust and debris generated by cutting and patching activities.

C. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
5. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other WORK. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01731

SECTION 01732 - WASTE MANAGEMENT

PART 1 GENERAL

1.1 WASTE MANAGEMENT REQUIREMENTS

A. City and Borough of Juneau & Juneau School District requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. City and Borough of Juneau & Juneau School District may decide to pay for additional recycling, salvage, and/or reuse based on Landfill Alternatives Proposal specified below.

E. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:

1. Aluminum and plastic beverage containers.

2. Corrugated cardboard.

3. Clean dimensional wood: May be used as blocking or furring.

4. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.

5. Concrete masonry units: May be used on project if whole, or crushed and used as sub-base material or fill.

6. Asphalt paving: To be delivered to CBJ asphalt stockpile site for later recycle.

7. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.

8. Glass.

9. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: Coordinate with reclamation program of project carpet supplier.

10. Mechanical and electrical equipment: see Metals.

F. LEED Certification for this project is dependent on diversion of 50 percent, by weight, of

potential landfill trash/waste by recycling and/or salvage.

G. CONTRACTOR shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

H. CONTRACTOR shall develop and follow a Waste Management Plan designed to implement these requirements.

I. Methods of trash/waste disposal that are not acceptable are:

1. Burning on the project site.

2. Burying on the project site (other than materials previously noted)

3. Dumping or burying on other property, public or private.

4. Other illegal dumping or burying.

J. Regulatory Requirements: CONTRACTOR is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.2 RELATED REQUIREMENTS

A. Section 01005 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01500 - Construction Facilities / Temporary Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 01600 - Materials and Equipment: Waste prevention requirements related to delivery, storage, and handling.

D. Section 01700 - Execution Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.3 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. LEED Submittals: Submit Landfill Alternatives Proposal, Waste Management Plan, and Waste Disposal Reports in accordance with procedures specified in Section 01355.

C. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.

1. Submit to ARCHITECT for City and Borough of Juneau & Juneau School District's review

and approval.

2. If City and Borough of Juneau & Juneau School District wishes to implement any cost alternatives, the Contract Price will be adjusted as specified elsewhere.

3. Include an analysis of trash/waste to be generated and landfill options as specified for Waste Management Plan described below.

4. Describe as many alternatives to landfilling as possible:
   a. List each material proposed to be salvaged, reused, or recycled.
   b. List the proposed local market for each material.
   c. State the estimated net cost resulting from each alternative, after subtracting revenue from sale of recycled or salvaged materials and landfill tipping fees saved due to diversion of materials from the landfill.

5. Provide alternatives to landfilling for at least the following materials:
   a. Wood pallets.
   b. Gypsum drywall and plaster.
   c. Plastic buckets.
   d. Rigid foam insulation.
   e. Windows, doors, and door hardware.
   f. Plumbing fixtures.
   g. Acoustical ceiling tile and panels.

D. Once City and Borough of Juneau & Juneau School District has determined which of the landfill alternatives addressed in the Proposal above are acceptable, prepare and submit Waste Management Plan; submit within 10 calendar days after notification by ARCHITECT.

E. Waste Management Plan: Include the following information:

1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.

2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).

3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
   a. List each material proposed to be salvaged, reused, or recycled.
   b. List the local market for each material.
   c. State the estimated net cost, versus landfill disposal.

4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.

5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.

6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

F. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.

1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.

2. Submit Report on a form acceptable to City and Borough of Juneau & Juneau School District.

3. Landfill Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project disposed of in landfills.
   c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

4. Incinerator Disposal: Include the following information:
   a. Identification of material.
   b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project delivered to incinerators.
   c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

5. Recycled and Salvaged Materials: Include the following information for each:
   a. Identification of material, including those retrieved by installer for use on other projects.
   b. Amount, in tons or cubic yards (cubic meters), date removed from the project site, and receiving party.
   c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards (cubic meters).
   c. Include weight tickets as evidence of quantity.

7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 3 EXECUTION

2.1 WASTE MANAGEMENT PROCEDURES

A. See Section 01300 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01500 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01600 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 01700 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, City and Borough of Juneau & Juneau School District, and ARCHITECT.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.

1. Pre-bid meeting.

2. Pre-construction meeting.

3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

1. As a minimum, provide:
   a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
   b. Separate dumpsters for each category of recyclable.

2. Provide containers as required.

3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.

4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.

5. Locate enclosures out of the way of construction traffic.

6. Provide adequate space for pick-up and delivery and convenience to subcontractors.

7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.

8. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 01732

SECTION 01733 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Section 00700 – General Conditions and Section 00800 Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of identified portions of building or structure, and site items.
2. Salvage of existing items to be reused or recycled.

B. Related Sections include the following:

1. Section 01001 - Summary
2. Section 01500 - Construction Facilities/Temporary Controls
3. Section 01731 – Cutting and Patching
4. Section 01732 – Waste Management
5. Section 02080 - Asbestos Abatement
6. Section 02090 – Lead Abatement

1.3 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. Remove and Salvage: Detach items from existing construction and deliver them to OWNER ready for reuse.

C. Reinstall: Prepare Remove and Salvage items for reuse, and reinstall them where indicated.

D. 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.

1.4 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Include annotated building and site plans to support sequence proposed.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.

4. Locations of proposed dust- and noise-control temporary partitions and means of egress.
5. Coordination of OWNER's continuing occupancy of portions of existing building and of OWNER's partial occupancy of completed Work.
6. Means of protection for items to remain and items in path of waste removal from building.

B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

D. Recycling Center Records: Receipt indicating material type and quantity, with dates and shipping invoices.

1.5 QUALITY ASSURANCE

A. Demolition Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

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

1.6 PROJECT CONDITIONS

A. OWNER's equipment and materials will occupy portions of building immediately adjacent to selective demolition areas. Conduct selective demolition so OWNER's operations will not be disrupted or materials damaged.

1. Comply with requirements specified in Section 01001 - Summary.

2. Note that OWNER's personnel access to and occupation of the premises will be limited when school is not in session. However, OWNER's furnishings and other property will not be removed from the areas adjacent to the work zone and must be protected from dust and weather. Contractor shall coordinate the protection of this property with the CBJ Project Manager.

B. Conditions existing at time of inspection for bidding purpose will be maintained by OWNER as far as practical.

1. Before selective demolition, OWNER will remove the following items:

a. All furnishings and other articles of movable property within the area of the Work.

C. Notify CBJ Project Manager of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: Hazardous materials are present in construction to be selectively demolished. Remediation of these materials is a part of the Work.

1. Coordinate with requirements specified in Section 02080 - Asbestos Abatement.

2. Coordinate with requirements specified in Section 02090 - Lead Abatement.
3. If additional materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify the OWNER.

E. Storage or sale of removed items or materials on-site is not permitted. Salvaged items identified for reinstallation may be stored on the site until which time they are reinstalled. Locations to be coordinated with the OWNER.

F. 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that affected 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 CBJ Project Manager.

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.

3.2 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.

1. Comply with requirements for existing services/systems interruptions specified in Section 01001 - Summary.

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.

    a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 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.

1. Comply with requirements for access and protection specified in Section 01500 - Construction Facilities / Temporary Controls.

B. 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.

1. Strengthen or add new supports when required during progress of selective demolition.

2. CONTRACTOR is responsible for structural design of all Temporary Shoring.

3.4 SELECTIVE DEMOLITION, GENERAL

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. Proceed with selective demolition systematically, from higher to lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. 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.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

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 off-site, designated by OWNER.
5. Protect items from damage during transport and storage.

C. Removed, Salvaged 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 salvaged items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, adjustments, 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 OWNER, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

B. Windows: Remove glazing panels from frames. Glass is to be disposed of at local recycling facility, provided facility will accept panels. Aluminum windows and storefront entry frames and panels to be removed are to be disassembled, with all aluminum pieces sent to recycling center by the CONTRACTOR as a part of the Work.

C. Doors: Indicated doors for removal and disposal are to be removed and disassembled. All hardware is to be retained and turned over to the OWNER. Door panels and frames are to be disposed of by CONTRACTOR.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled**,** 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, or as approved by the CBJ Project Manager.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Coordinate with Section 01732 – Waste Management.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off OWNER's property and legally dispose of them. Recycling of non-salvage aluminum window and door frames is required. Material is to be removed and cleaned of ferrous metals, and free of ACM's.

3.7 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.

3.8 PATCHING

A. Where items are removed and not replaced with new items or construction, patch all unused penetrations and surface marks with materials to match surrounding. Patching to preserve integrity of wall, floor ceiling and roofing assemblies as applicable.
   1. Patch concrete with suitable cement patching material.
   2. Patch gypsum wallboard with reinforced gypsum patching compound, painted.
   3. Patch roofing with manufacturer approved roofing material.
   4. Patch sheet metal with new material to match in thickness and finish. Seal all joints for weatherproof installation.

3.9 SELECTIVE DEMOLITION SCHEDULE

A. Existing Items to Be Removed:
   1. Architectural Items: All indicated exterior wall assembly, including interior finishes and insulation indicated, all indicated doors and frames, all indicated glass and window units, all indicated window and storefront frames. Note that aluminum storefront frames and doors are to be recycled, not disposed of in landfill.
   2. Civil: subsurface material excavated and not reincorporated in to the Work.
   3. Mechanical and Electrical Items: As indicated on the Mechanical and Electrical Drawings and Specifications. Note all Copper Piping and wiring is to be recycled, not disposed of in landfill.

B. Existing Items to Be Removed and Salvaged:
   1. Architectural Items: Doors and windows as indicated on the drawings and scheduled. All door hardware removed as a part of the work. All installation art panels.
   2. Mechanical and Electrical Items: As indicated on the Mechanical and Electrical Drawings and Specifications.

C. Existing Items to Be Removed and Reinstalled:
   1. Architectural items: Doors and hardware as indicated in the drawings and schedules. All installation art panels.
   2. Mechanical and Electrical Items: As indicated on the Mechanical and Electrical Drawings and Specifications.

END OF SECTION 01733

SECTION 01734 - INDOOR AIR QUALITY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

B. Building flush-out after construction and before occupancy.

C. Testing indoor air quality after completion of construction.

D. Testing air change effectiveness after completion of construction.

1.2 PROJECT GOALS

A. See Section 01355 - LEED Certification Procedures, for overall project goals relating to environment and energy.

B. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.

1. Cleaning of ductwork is not anticipated under this Contract, unless otherwise specifically required as a part of mechanical design.

2. CONTRACTOR shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.

3. Establish condition of existing ducts and equipment prior to start of alterations.

C. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.

1. Furnish products meeting the specifications.

2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

D. Ventilation: HVAC system has been designed to achieve the minimum requirements for ventilation specified in ASHRAE 62.1.

E. Ventilation: HVAC system has been designed to achieve the minimum requirements for ventilation specified in ASHRAE 62.1 with air change effectiveness of 0.9 or greater.

1.3 RELATED REQUIREMENTS

A. Section 01355 - LEED Certification Procedures: LEED credits relating to indoor air quality.

B. Section 01400 - Quality Control: Testing and inspection services.

C. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

D. Section 15950 - Balancing: Testing HVAC systems for proper air flow rates, adjustment of dampers and registers, and settings for equipment.

1.4 REFERENCE STANDARDS

A. ASHRAE Std 62.1 - Ventilation For Acceptable Indoor Air Quality; 2007 (errata 2008).

B. ASHRAE Std 129 - Measuring Air-Change Effectiveness; 1997 (Reaffirmed 2002).

C. SMACNA (OCC) - IAQ Guideline for Occupied Buildings Under Construction; 2007.

1.5 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.6 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. LEED Submittals: Submit all submittals required in this section in accordance with procedures specified in Section 01355.

C. Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA IAQ Guidelines for Occupied Buildings Under Construction as a guide.

1. Submit not less than 60 days before enclosure of building.

2. Identify potential sources of odor and dust.

3. Identify construction activities likely to produce odor or dust.

4. Identify areas of project potentially affected, especially occupied areas.

5. Evaluate potential problems by severity and describe methods of control.

6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.

7. Describe cleaning and dust control procedures.

D. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

E. Duct and Terminal Unit Inspection Report.

F. Air Contaminant Test Plan: Identify:

1. Testing agency qualifications.

2. Locations and scheduling of air sampling.

3. Test procedures, in detail.

4. Test instruments and apparatus.

5. Sampling methods.

G. Air Contaminant Test Reports: Show:

1. Location where each sample was taken, and time.

2. Test values for each air sample; average the values of each set of 3.

3. HVAC operating conditions.

4. Certification of test equipment calibration.

5. Other conditions or discrepancies that might have influenced results.

H. Ventilation Effectiveness Test Plan: Identify:

1. Testing agency qualifications.

2. Description of test spaces, including locations of air sampling.

3. Test procedures, in detail; state whether tracer gas decay or step-up will be used.

4. Test instruments and apparatus; identify tracer gas to be used.

5. Sampling methods.

I. Ventilation Effectiveness Test Reports: Show:

1. Include preliminary tests of instruments and apparatus and of test spaces.

2. Calculation of ventilation effectiveness, E.

3. Location where each sample was taken, and time.

4. Test values for each air sample.

5. HVAC operating conditions.

6. Other information specified in ASHRAE 129.

7. Other conditions or discrepancies that might have influenced results.

1.7 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

PART 2 PRODUCTS (not used)

PART 3 EXECUTION

3.1 CONSTRUCTION PROCEDURES

A. Prevent the absorption of moisture and humidity by adsorptive materials by:

1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.

2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.

3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.

D. Do not store construction materials or waste in mechanical or electrical rooms.

E. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.

1. Inspect duct intakes, return air grilles, and terminal units for dust.

2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.

3. Clean tops of doors and frames.

4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.

5. Clean return plenums of air handling units.

6. Remove intake filters last, after cleaning is complete.

F. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

G. Use other relevant recommendations of SMACNA IAQ Guideline for Occupied Buildings Under Construction for avoiding unnecessary contamination due to construction procedures.

3.2 AIR CONTAMINANT TESTING

A. CONTRACTOR's Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Perform air contaminant testing before starting construction, as base line for evaluation of post-construction testing.

C. Perform air contaminant testing before occupancy.

D. Do not start air contaminant testing until:

1. All construction is complete, including interior finishes.

2. HVAC systems have been tested, adjusted, and balanced for proper operation.

3. New HVAC filtration media have been installed.

E. Indoor Air Samples: Collect from spaces representative of occupied areas:

1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.

2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet (2300 square meters); take samples from areas having the least ventilation and those having the greatest presumed source strength.

3. Collect samples from height from 36 inches (915 mm) to 72 inches (1830 mm) above floor.

4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.

5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.

6. When retesting the same building areas, take samples from at least the same locations as in first test.

F. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.

G. Analyze air samples and submit report.

H. Air Contaminant Concentration Determination and Limits:

1. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.

2. Airborne Mold and Mildew: Measure in relation to outside air; not higher than outside air.

3. Formaldehyde: Not more than 50 parts per billion.

4. Formaldehyde: Measure in micrograms per cubic meter, in relation to outside air; not more than 20 micrograms per cubic meter higher than outside air.

5. Total Volatile Organic Compounds (TVOC): Not more than 500 micrograms per cubic meter.

6. Total Volatile Organic Compounds (TVOC): Measure in micrograms per cubic meter, in relation to outside air; not more than 200 micrograms per cubic meter higher than outside air.

7. Particulates (PM10): Not more than 50 micrograms per cubic meter.

8. Total Particulates (PM): Measure in micrograms per cubic meter, in relation to outside air; not more than 20 micrograms per cubic meter higher than outside air.

I. If air samples show concentrations higher than those specified, ventilate with 100 percent outside

air and retest at no cost to City and Borough of Juneau & Juneau School District, or conduct full building flush-out specified above.

3.3 VENTILATION EFFECTIVENESS TESTING

A. Perform ventilation effectiveness testing before occupancy.

B. Do not begin ventilation effectiveness testing until:

1. HVAC testing, adjusting, and balancing has been satisfactorily completed.

2. Air contaminant testing has been completed satisfactorily.

3. New HVAC filtration media have been installed.

C. Test each air handler zone in accordance with ASHRAE 129.

D. If calculated air change effectiveness for a particular zone is less than 0.9 due to inadequate balancing of the system, adjust, and retest at no cost to City and Borough of Juneau & Juneau School District.

END OF SECTION 01734

SECTION 01780 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Closeout Timetable
B. Substantial Completion
C. Inspection Procedures
D. Final Acceptance
E. Closeout Procedures
F. Final Cleaning.
G. Project Record Documents.
H. Operation and Maintenance Data.
I. Warranties and Bonds.
J. Spare Parts and Maintenance Materials.
K. Commissioning, Testing and Training.
K. Final Payment

1.2 RELATED REQUIREMENTS.

A. Section 00700 - General Conditions
B. Section 00800 – Supplementary General Conditions
C. Section 01005 - Administrative Provisions
D. Section 01500 - Construction Facilities/ Temporary Controls
E. Section 01781 - Project Record Documents
F. Section 01911 - Commissioning

1.3 CLOSEOUT TIMETABLE

A. The CONTRACTOR shall establish dates for equipment testing, acceptance periods, and on-site instructional periods (as required under the contract). Such dates shall be established not less than one week prior to beginning any of the foregoing items, to allow the OWNER, the OWNER, and their authorized representatives sufficient time to schedule attendance at such activities.

1.4 SUBSTANTIAL COMPLETION

A. Before requesting inspection for certification of Substantial Completion, complete the following:

1. In the Application for Payment that coincides with the date Substantial Completion is claimed, show 100 percent completion for the portion of the WORK claimed substantially complete.
2. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
3. Submit record Drawings, maintenance manuals, damage or settlement survey, property survey, and similar record information.

4. Change over permanent locks and transmit keys to the OWNER.
5. Complete start-up testing of systems, and instruction of CBJ Maintenance personnel. Remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
6. Complete final clean-up. Touch-up and repair and restore marred exposed finishes.

1.5 INSPECTION PROCEDURES

A. Upon receipt of a request for inspection for Substantial Completion, the OWNER will proceed and advise the CONTRACTOR of unfilled requirements. The OWNER will prepare the Certificate of Substantial Completion following inspection, or advise the CONTRACTOR of construction that must be completed or corrected before the certificate will be issued.

B. The OWNER will reinspect the WORK upon receipt of notice by the CONTRACTOR that the WORK has been completed, except items whose completion has been delayed because of circumstances acceptable to the OWNER. If reinspection is requested and the CONTRACTOR has not completed all punch list items, the cost of that inspection will be paid by the CONTRACTOR. Upon completion of reinspection, the OWNER 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. If necessary, reinspection will be repeated.

The OWNER will repeat inspection when requested and assured by the CONTRACTOR that the WORK has been substantially completed.

D. Results of the completed inspection will form the basis of requirements for final acceptance.

1.6 FINAL ACCEPTANCE

A. Before requesting inspection for certification of final acceptance and final payment, complete and submit the following:

1. Submit final payment request.
2. Submit a final Change Order request.
3. Submit a copy of the final inspection list stating that each item has been completed or otherwise resolved for acceptance.
4. Submit final meter readings for utilities, a record of stored fuel, and similar data as of Substantial Completion.
5. Submit consent of surety to final payment.
6. Submit evidence of continuing insurance coverage complying with insurance requirements.
7. Written guarantees, where required.
8. Maintenance stock items; spare parts; special tools, where required.
9. Certificates of inspection and acceptance by local governing agencies having jurisdiction.
10. Releases from all parties who are entitled to claims against the subject Project, property, or improvement pursuant to the provisions of law.
11. Completed Certificate of Compliance and Release for the CONTRACTOR involved in the WORK included as part of this section, form attached with this section.
12. Final Subcontractor list complete with final subcontract amounts and include all equipment rentals (with operators).

13. Submit original Items 11 and 12 to CBJ Project Manager.

1.7 CLOSEOUT PROCEDURES

A. Comply with procedures stated in General Conditions of the Contract for issuance of Certificate of Substantial Completion.

B. The OWNER will occupy Project for the purpose of conducting business under provisions stated in certificate of Substantial Completion.

A. When CONTRACTOR considers Work has reached Final Completion, submit written certification that Contract Documents have been reviewed, Work has been inspected, and the Work is complete in accordance with Contract Documents and requesting OWNER inspection.

D. In addition to submittals required by the Contract, provide submittals required by governing authorities, and submit a final statement of accounting giving total adjusted Contract Price, previous payments, and sum remaining due.

E. If necessary to reflect final adjusted cost of the Work, the OWNER will issue a summary Change Order containing final adjustments to Contract Price not previously made by Change Order.

F. The final progress payment will include the remaining balance for Schedule of Values, Mobilization and Demobilization. The final payment will be made upon completion of all close-out submittals, completion of all requirements of Section 01781 – Project record Drawings, and the removal of all of the CONTRACTOR's equipment from property.

1.8 FINAL CLEANING

A. Execute prior to substantial completion inspection.

B. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances. Clean equipment and fixtures to a sanitary condition, clean or replace filters of mechanical equipment.

C. Clean site; sweep paved areas, rake clean other surfaces.

1.9 PROJECT RECORD DOCUMENTS

A. Store documents separate from those used for construction.

B. Keep documents current; do not permanently conceal any Work until required information has been recorded.

C. Upon request by the OWNER, submit complete collection of record documents for review and duplication as desired.

D. At Contract closeout, submit documents with transmittal letter containing date, Project title, CONTRACTOR's name and address, list of documents, and signature of the CONTRACTOR.

1.10 OPERATION AND MAINTENANCE DATA

A. Provide data for:

1. Aluminum Windows, Door hardware - Division 8.
2. Specialties – Division 10
3. Equipment – Division 11.
4. Furnishings – Division 12.
5. Special Construction – Division 13.
6. Mechanical equipment - Division 15.
7. Electrical equipment and controls - Division 16.

B. Submit two sets prior to final inspection, bound in letter size, 8½" x 11", three-ring side binders with durable plastic covers.

C. Part 1: Directory listing names, addresses, and telephone numbers of OWNER, and CONTRACTOR.

D. Part 2: Operation and maintenance instructions, arranged by Specification for each Specification Division, give names, addresses, and telephone numbers of subcontractors and Suppliers. List:

1. Appropriate design criteria.
2. List of equipment.
3. Parts list.
4. Operating instructions.
5. Maintenance instructions, equipment.
6. Shop drawings and product data.
7. Warranties.

1.11 WARRANTIES AND BONDS

A. Provide duplicate, notarized copies. Execute CONTRACTOR's submittals and assemble documents executed by Subcontractors and Suppliers. Provide table of contents and assemble in binder with durable plastic cover.

B. Submit material prior to final Application for Payment. For equipment put into use with the OWNER's permission during construction, submit within ten days after first operation. For items of Work delayed materially beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.12 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, and maintenance materials in quantities specified in each Section, in addition to that used for construction of Work. Coordinate with the OWNER, deliver to Project site and obtain receipt prior to final payment.

1.13 COMISSIONING, TESTING AND TRAINING

A. CONTRACTOR to provide qualified representatives to act on behalf of the Contractor and Subcontractors in coordinating and conducting Commissioning activities with the OWNER as outlined in Section 01911. Personnel-hours shall be dedicated expressly towards orchestrating maintenance orientation and inspections, discussing procedures for testing, analysis of test

results, and for adjustments made for compensating system deficiencies within design parameters. A minimum of 8 personnel-hours on site shall be dedicated to operations and maintenance training for the OWNER's staff, and reviewing the final commissioning document.

1.14 FINAL PAYMENT

A. Prior to requesting Final Payment, CONTRACTOR is to provide:
1. Consent of surety to final payment and insurance certificates.
2. Alaska Department of Labor Employment Security Tax clearance.
3. Signed Alaska Department of Labor Prevailing Wage Notice of Completion of Public Works form.
4. Alaska Department of Revenue Corporate Income Tax clearance.
5. Signed City and Borough of Juneau Compliance Certificate and Release form.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations in the area of the WORK before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Sweep concrete floors broom clean in unoccupied spaces.
h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
i. Clean glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Remove labels that are not permanent.
j. Touch up and otherwise repair and restore existing finishes marred by construction activities. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

    1. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

k. Wipe surfaces of mechanical and electrical and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
l. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
m. Clean ducts, blowers, and coils if units were operated without filters during construction.
n. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

COMPLIANCE CERTIFICATE AND RELEASE FORM

PROJECT: Gastineau Elementary School Renovations – Phase 1
CONTRACT NO: E11-137

The CONTRACTOR must complete and submit this to the Contract Administrator. The CONTRACTOR shall complete this form with respect to the entire contract.

Completed forms must be submitted upon completion of the Project. All requirements and submittals must be met before final payment will be made to the CONTRACTOR.

I certify that the following and any referenced attachments are true:

- All WORK has been performed, materials supplied, and requirements met in accordance with the applicable plans, specifications, and Contract Documents.
- All suppliers and Subcontractors have been paid in full with no claims for labor, materials, or other services outstanding. If all Subcontractors and suppliers are not paid in full, please explain on a separate sheet.
- All employees have been paid not less that the current prevailing wage rates set by the State of Alaska (or U.S. Department of Labor, as applicable).
- All equal employment opportunity, certified payroll and other reports have been filed in accordance with the prime contract.
- The Contract Administrator was advised and approved of all Subcontractors before WORK was performed and has approved any substitutions, additions or deletions of Subcontractors.
- All DBE firms listed as a precondition of the prime contract award must have performed a commercially useful function in order for the work to count to a DBE goal. All DBE firms performed the WORK stated and have received at least the amount claimed for credit in the Contract Documents.
- All DBE Subcontractors must attach a signed statement of the payment amount received, the nature of WORK performed, whether any balance is outstanding, and indicate that no rebates are involved.
- If the amount paid is less than the amount originally claimed for DBE credit, the CONTRACTOR has attached approval from the City Engineer for underutilization.

I understand it is unlawful to misrepresent information in order to receive a payment which would otherwise be withheld if these conditions were not met. I am an authorized agent of this firm and sign this freely and voluntarily. The foregoing statements are true and apply to the following project contractor.

_____ Capacity: CONTRACTOR
Firm Name

_____	_____	_____
Signed	Printed Name and Title	Date

Return completed form to: Jennifer Mannix, Engineering Department, City and Borough of Juneau, 155 South Seward Street, Juneau, AK 99801. Call (907) 586-0873 if we can be of further assistance or if you have any questions.

END OF SECTION 01780

SECTION 01781 – PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Section 00700 General Conditions and Section 00800 - Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections include the following:
1. Section 01780 – Contract Closeout
2. Divisions 2 through 17 for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Submit copies of Record Drawings as follows:

a. Initial Submittal: Submit one set of plots from corrected Record CAD Drawings. Architect and Engineer will initial and date each plot and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return plots and prints for organizing into sets, printing, binding, and final submittal.

b. Final Submittal: Submit ONE set of Record prints, and THREE COPIES printed from Record prints. Print each Drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit TWO copies of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit TWO copies of each Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Revisions to electrical circuitry and mechanical systems.
d. Actual equipment locations.
e. Changes made by Change Order or Work Change Directive.
f. Changes made following CBJ Project Managers written orders.
g. Details not on the original Contract Drawings.
h. Field records for variable and concealed conditions.
i. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's and CBJ Project Manager's reference during normal working hours.

END OF SECTION 01781

SECTION 01790 – DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Section 00700 General Conditions and Section 00800 Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for instructing OWNER's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.
   3. Demonstration and training videotapes.

B. Related Sections include the following:
   1. Section 01200 - Project Meetings
   2. Section 01911 - Commissioning
   3. Divisions 2 through 17 for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

A. Instruction Program: Submit one outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   1. At completion of training, submit one complete training manual(s) for OWNER's use.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01200 - Project Meetings. Review methods and procedures related to demonstration and training including, but not limited to, the following:
   1. Inspect and discuss locations and other facilities required for instruction.
   2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
   3. Review required content of instruction.
   4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with OWNER's operations. Adjust schedule as required to minimize disrupting OWNER's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by CBJ Project Manager.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

   1. Systems and equipment in list below are examples only. Revise to suit Project. See Evaluations.
   2. Heat generation, including boilers, pumps, and water distribution piping.
   3. HVAC instrumentation and controls.
   4. Electrical service and distribution, including transformers, switchboards, panelboards, and motor controls.
   5. Lighting equipment and controls.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

   1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
      a. System, subsystem, and equipment descriptions.
      b. Performance and design criteria if CONTRACTOR is delegated design responsibility.
      c. Operating standards.
      d. Regulatory requirements.

e. Equipment function.
f. Operating characteristics.
g. Limiting conditions.
h. Performance curves.

2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project Record Documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.

5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.

7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.

d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between CONTRACTOR and OWNER for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct OWNER's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. CBJ Project Manager will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
   2. OWNER will furnish an instructor to describe OWNER's operational philosophy.
   3. OWNER will furnish CONTRACTOR with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with CBJ Project Manager with at least seven days' advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written and a demonstration performance-based test.

E. Cleanup: Collect used and leftover educational materials and give to OWNER. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION 01790

SECTION 01911 – COMMISSIONING

PART 1 - GENERAL

1.1 SCOPE

A. Commission the following equipment, systems, and work in accordance with this section and the rest of the contract documents:

1. HVAC Systems

a. Hydronic heating equipment and systems

b. Air handling equipment and systems

c. Cooling equipment and systems

d. Domestic hot water equipment and systems

e. Testing, Adjusting and Balancing

f. Building automation system and controls

2. Lighting systems and controls

3. Intrusion alarm system

B. This work includes, but is not limited to:

1. Coordinating the commissioning effort with the Owner's Commissioning Authority (CxA).

2. Scheduling the commissioning activities with specific dates coordinated with the overall construction schedule.

3. Completing critical items in the commissioning process so that the next operation can proceed.

4. Establishing a process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.

5. Following step-by-step procedures for testing systems, subsystems, and equipment with descriptions for methods of verifying relevant data, recording the results obtained, and listing parties involved in performing and verifying tests.

6. Operation and maintenance manuals.

7. Training, including required training materials.

C. Retesting Costs: If retesting is required due to equipment failure, incorrect programming, omission, error, incomplete startup or verification of systems, and/or failure of the functional performance tests:

1. The contractor will pay all of the Owner's costs for retesting the systems, including the CxA's costs for attending and directing additional tests.

2. The Owner will deduct their costs from the payments due the contractor.

D. Related Sections

E. 15926 – Building Automation System and Automatic Controls

F. 15950 – Testing, Adjusting, and Balancing

1.2 COMMISSIONING PLAN

A. The purpose of the commissioning plan is to provide a procedure for commissioning the equipment and systems.

B. Schedule: Develop a schedule for commissioning the systems that includes the following milestones. Submit the schedule at the preconstruction conference and provide regular updates at each progress meeting.

1. Construction Seasons: Commissioning will occur during Season 1 of the systems that are completely installed. This includes, but is not limited to, the classroom wing AHU-1 fan system and terminal units, Server 127 cooling system, and the secondary hydronic heating pumps. Submit all prerequisite documentation and verification reports that are applicable to the Session 1 commissioning prior to performing functional performance tests.

2. Prerequisites

a. Initial Commissioning Schedule: Submit at the preconstruction conference

b. O&M Manuals

1) Submit the complete set of O&M manuals a minimum of 30 days prior to startup of equipment or systems.

2) Submit one approved set to CxA 14 days prior to functional performance test.

c. System Startup and Certification: Submit to CxA 14 days prior to performing verification tests.

d. TAB Reports and Certification: Submit to CxA 14 days prior to performing verification tests.

e. Controls Calibration Report and Certification: Submit to CxA 14 days prior to performing verification tests.

f. Lighting Reports and Certificate: Submit to CxA 14 days prior to performing verification tests.

3. Verification Tests

a. Confirm proper operation of the equipment and systems and the accuracy of the final testing, adjusting, and balancing (TAB) report prior to scheduling the functional performance tests. As a minimum, perform the functional performance tests included in this section to verify that the systems operate properly.

b. Submit Verification Report and Certificate of Readiness to the CxA 14 days prior to the functional performance tests.

4. Training Agenda: Submit an agenda for each training session to the CxA 14 days prior to the functional performance tests.

5. Functional Performance Tests: Schedule the functional performance tests to occur sequentially from beginning to end over several days.

C. Milestones: Schedule the following milestones in the commissioning schedule.

Commissioning Schedule

Milestone	Scheduled Completion Date
Prerequisites	
Initial Commissioning Schedule	
O&M Data	
System startup and certification	
TAB reports and certification	
Lighting reports and certificate	
Controls calibration and certification	
Verification	
Verification report	
Certificate of readiness	
Functional Tests	
Functional performance test data records	
Training	
Agenda for each training session	
Schedule for all training sessions	
Training record for each session	

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PREREQUISITES

A. General: Perform and document the following prerequisites prior to performing verification tests. For each task, submit a statement certifying that the work has been completed and equipment and systems are operational in accordance with contract documents. A certification document is provided at the end of this section.

B. Data: Submit approved submittal data and O&M manuals to the CxA. Include the manufacturer's installation, startup and checkout data in the O&M Manuals.

C. System Startup

1. General Requirements

a. Startup the systems in accordance with the manufacturer's requirements, acceptable practice, industry standards, and other sources. Inform the CxA of any deviations or additions from the manufacturer's requirements prior to starting the systems.

b. Startup Report

1) Develop and submit a startup report for each piece of equipment showing step-by-step conformance with the startup requirements and manufacturer's startup instructions.

2) Copies of the manufacturer's printed startup requirements may be used for documenting the startup procedures. Note the project name, equipment tag, startup technician and date at the top of the page. Specifically note the completion of each step and any other relevant information.

2. Hydronic Heating System Startup

a. Hydronic Heating Piping System

1) Pre-charge the expansion tank to 12 psig before the system is filled with water in conformance to manufacturer's instructions.

2) Clean, drain, and flush entire system, including boilers.

3) Open all control valves

4) Fill system (use water feeder or bypass)

5) Purge air from system at all air vents.

6) Verify water feeder maintains system at correct pressure.

7) Pressure test: Reference Division 15. Protect boilers and other equipment.

b. Secondary Hydronic Heating Loop

1) Secondary Pumps: Perform the manufacturer's installation, pre-starting checks, and start-up procedures.

2) Air Separator: Blow down air separator after operating pumps for one hour.

3) Variable Frequency Drives: Perform the manufacturer's installation, pre-starting checks, and start-up procedures.

c. Primary Hydronic Heating Loops

1) Diverting Valve: Set so that full primary flow is supplied to the secondary loop.

2) Primary Pumps: Perform the manufacturer's installation, pre-starting checks, and start-up procedures.

3) Strainer: Clean pump strainer after 30 minutes of primary pump operation.

d. Boilers

1) Perform a boiler hydrostatic pressure test in accordance with the manufacturer's installation, pre-starting checks, and start-up procedures.

2) Verify operation of all safeties (high limit thermostats and low-water cutoff.

3) Prepare and startup the burner in accordance with the manufacturer's installation, pre-starting checks, and start-up procedures.

4) Perform a combustion test in accordance with the manufacturer's and Owner's instructions.

e. Hydronic Heating System Final Checks

1) Strainers and Air Separator: Prior to the testing, adjusting, and balancing work:

a) Blow down the air separator

b) Clean the primary pump strainers

c) Remove the secondary pump strainers and tie to suction diffuser.

2) Water Feeder and Expansion Tank: Verify that water feeder pressure and expansion tank pre-charge are correct.

3. Domestic Hot Water System

a. Domestic Hot Water Heater: Perform the manufacturer's installation, pre-starting checks, and start-up procedures.

b. Tempering Valve: Perform the manufacturer's installation, pre-starting checks, and start-up procedures.

c. Expansion Tank: Verify factory pre-charge.

d. Hot Water Recirculating Pump: Perform the manufacturer's installation, pre-starting checks, and start-up procedures.

4. Ventilating System

a. Air Handling Units

1) Install filters prior to startup.

2) Perform the manufacturer's installation, pre-starting checks, and start-up procedures.

b. Supply Fans: Perform the manufacturer's installation, pre-starting checks, and start-up procedures.

c. Exhaust Fans: Perform the manufacturer's installation, pre-starting checks, and start-up procedures.

d. Kitchen Hood: Perform the manufacturer's installation, pre-starting checks, and start-up procedures.

5. Testing, Adjusting, and Balancing (TAB): Confirm that testing, adjusting, and balancing procedures have been completed. Submit TAB reports and certification.

6. Lighting Systems and Controls: Perform the manufacturer's installation, pre-starting checks, and start-up procedures.

7. Building Automation and Automatic Control Systems

a. Perform static and dynamic point-to-point tests of the system.

b. Check operation of all valve and damper actuators.

c. Confirm that the automatic control systems have been completed and calibrated and are operating in accordance with contract documents. Submit calibration reports and certification to the CxA.

3.2 VERIFICATION TESTING

A. Perform verification testing prior to the functional testing. Verification comprises a full range of checks and tests, performed by the contractor, to determine that all components, equipment, systems, and interfaces between systems operate in accordance with contract documents.

B. Verification testing includes all operating modes, all interlocks, all control responses, and all specified responses to abnormal or emergency conditions. Verification of the proper operation of the control system also includes verifying the interface of the control system with the TAB criteria and the response of monitoring and control system controllers and sensors. Verification of operating modes, etc., can be done concurrently with controllers and sensors. Verification will also validate the TAB report.

C. Correction of Deficiencies: If any deficiencies are identified in the systems or at the interface with other building systems during verification, the deficiencies must be documented and reported to the commissioning team. The CxA shall determine whether to remedy the situation and if further verification tests are required.

D. Verification Report: Assemble the final tabulated checklist data sheets into a verification report and submit to the CxA for review. Document any unresolved deficiencies and suggest a method of correction. The responsible party shall determine if verification is complete and whether the HVAC system is functioning in accordance with the contract documents.

E. Certificate of Readiness: Submit a Certificate of Readiness stating that all equipment, systems, and controls are now complete and ready for functional performance testing to begin. This certificate shall be supported by completed pre-start/start-up checklists, signed by the responsible parties, and the final verification report, demonstrating that systems passed functional performance tests.

3.3 FUNCTIONAL PERFORMANCE TESTING

A. General Requirements

1. The CxA will oversee, witnesses, and document the functional testing of all equipment and systems according to the Specifications and the Cx Plan. The contractor executes the tests. The functional test requirements provide a guideline for performance of the tests.

2. The scope of functional performance testing covers the entire installation, from central equipment through distribution of services to each space. It includes measured capacities, effectiveness of operation, and all control functions.

3. Attendees: All trades responsible for the proper operation of the systems shall be present for the functional performance testing. This includes, but is not limited, to:

   a. General contractor

   b. Hydronic heating, air-conditioning, and plumbing contractor.

   c. Sheet metal, ventilation and exhaust system contractor

   d. Electrical contractor

   e. Testing, Adjusting, and Balancing contractor

   f. Controls contractor

4. Functional performance testing will progress from tests of individual components of the central equipment and systems to tests of the systems that distribute the services throughout the building.

5. Submit data on the procedure to be used for any tests that require temporary modifications to control functions to simulate desired load conditions up to design load conditions. Include measuring instruments and logging devices to record the test data for the required test period. The instrumentation shall meter and record all operating conditions to allow for complete evaluation of the test results.

6. During functional performance testing of the HVAC system, a failure in performance of a part of the system or of a component may be revealed. Any performance deficiencies must be evaluated to determine the cause and whether they are part of the contractual obligations. After necessary corrective measures are completed, repeat the necessary functional performance tests.

7. Monitoring

   a. Trend all building automation system points which are control system points at five minute intervals for the week prior to the functional tests, during the functional tests, and for a week after the functional tests.

b. Provide electronic copies of the monitored data in usable format (PDF, XLS, DOC, TXT).

c. Graphical output is required for all output, if the system can produce it. If the system is incapable of graphical output, provide data in a columnar format with time down the left column and at least 5 columns of point values on the same page.

d. Other points may be monitored by the CxA using dataloggers. At the option of the CxA, some control system monitoring may be replaced with datalogger monitoring.

B. Hydronic Heating System

1. Water Feeder

a. Close water supply and drain sufficient water from the system to drop system pressure 2 psig.

b. Open water supply and verify that water feeder returns the system to proper pressure.

2. Air Separator

a. Verify that the automatic air vent is removing air from the system.

3. Secondary Hydronic Heating Loop

a. Secondary Pumps P-1A and P-1B: Perform the following for each pump.

1) VFD Operation

a) Verify pump is off when VFD is in OFF position.

b) Verify full speed operation when the VFD is in BYPASS. Verify proper rotation.

c) Verify manual control of speed when the VFD is in HAND.

d) Verify automatic speed control of the pump from a differential pressure sensor when the VFD is in AUTO. Verify that the VFD responds to changes in differential pressure by opening and closing heating automatic valves or by simulating pressure sensor input to the VFD.

e) Verify that a low current condition produces a VFD generated status alarm and BAS alarm.

2) Sequencing: Verify lead/lag operation:

a) Verify lead pump operation from the BAS occupied/unoccupied schedule with pump speeds from 25% to 100%.

b) Verify outside air temperature disabling of the pumps.

c) Lag pump operates when lead pump fails. Alarm is generated.

d) Lead pump operates at 100% for 10 minutes prior to operating both pumps.

e) Lag pump is disabled when flow drops below 130 gpm for 10 minutes.

f) Verify that the minimum flow control valve modulates to maintain a minimum flow rate of 50 gpm.

3) Verify BAS display of:

a) Heating supply temperature setpoint

b) Pump status (lead/lag status, speed, alarms)

b. Flow Meter

1) Verify accuracy of flow meter.

2) Verify display on BAS.

c. Terminal Units

1) Booster Coils: Verify that a minimum of 20% of the booster coils operate on call for heat.

2) Heating Units: Verify that a minimum of 20% of finned pipe, convectors, unit heaters, and cabinet unit heaters, operate on call for heat. Verify that the automatic valves open on failure of control power.

4. Primary Hydronic Heating Loop

a. Primary Pumps P-2 and P-3: Perform the following for each pump.

1) Verify proper rotation.

2) Verify pump is off in OFF position.

3) Verify continuous pump operation in HAND position.

4) Verify DDC control of pump in AUTO position:

a) Lead boiler pump operates for 2 minutes prior to and following burner operation.

b) Lag boiler pump operates for 2 minutes prior to operating lag boiler and for 2 minutes after boiler is disabled.

5) Verify outside air temperature disabling of the pumps.

6) Verify current sensor alarm of pump failure.

b. Boilers: Perform for each boiler. False load boilers, if necessary.

1) Safeties

a) Verify that the safeties disable the boiler in Auto and Manual mode.

b) Verify calibration and operation of the operating thermostat, high limit thermostat, extra high limit thermostat, and low-water cutoff.

2) Manual Mode

a) Verify Hand operation of respective boiler pump prior to operating burner.

b) Verify manual operation of boiler burner utilizing the operating aquastat installed on each boiler.

c) Verify aquastat control of 180°F on and 200°F off.

3) Automatic Mode: Verify lead/lag operation of the boilers.

a) Lead boiler enabled if outside temperature is less than 65°F.

b) Boiler Heating Return Temperature Control: Verify that diverting valve maintains boiler return temperature at or above 135°F.

c) Heating Supply Reset: Verify boiler operation to maintain the heating supply temperature according to the following heating supply reset schedule:

(1) Outside temp = 0°F; heating supply temperature = 180°F

(2) Outside temp = 60°F; heating supply temperature = 150°F

d) Verify stable low-high-low fire of the burner to maintain heating supply temperature.

(1) Verify boiler pump operates for 2 minutes prior to enabling burner.

(2) Enable boiler operation at low fire.

(3) Switch to high fire if the heating supply temperature is not within 5°F of setpoint and is not increasing at a rate of 1F per 10 minutes.

(4) Switch back to low fire when heating supply temperature is within 2°F of setpoint.

(5) Disable boiler when heating supply temperature reaches setpoint.

e) Verify lead/lag operation.

(1) Lag boiler enabled if the lead boiler or pump fails.

(2) Enable lag boiler if heating setpoint is not reached after 30 minutes of lead boiler operation on high fire.

(3) Lag boiler low-high sequence same as lead boiler.

5. Calibration Tests

a. Verify sensor and actuator calibration by comparing BAS readout against hand-held calibrated instruments. Readout must be within 0.5°F for temps. or within a tolerance equal to 10% of the pressure setpoint, with a test gage.

b. Verify flow meter calibration using pump curves or other method.

6. Acceptance Criteria

a. For the conditions, sequences and modes tested, the boilers, integral components and related equipment respond to varying loads and changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

b. Boiler shall maintain the supply water setpoint to within +/- 1.0F of setpoint deadband without excessive hunting.

c. Pumping system and controls shall maintain the current desired pressure setpoint to within an amount equal to 10% of the setpoint value either side of the deadband without excessive hunting.

C. Domestic Hot Water System

1. Domestic Hot Water Heater DWH-1

a. Verify sequential operation of heating stages up to 100% recovery.

b. Verify cycling of stages in response to small hot water loads.

2. Tempering Valve TV-1: Verify constant temperature output under the following conditions:

a. 1 gpm flow

b. 5 gpm flow

c. 30 gpm flow

3. Hot Water Recirculating Pump HWRP-1
    a. Verify manual operation and thermostatic control of the pump to maintain 95°F.
    b. Verify proper rotation.
4. Acceptance Criteria: For the conditions, sequences and modes tested, the components and related equipment respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice.

D. Ventilating System
1. Classroom Air Handling Unit (AHU-1)
    a. Supply Fan
        1) Hand: Verify fan operates with the system in occupied mode. Verify proper rotation.
        2) Auto: Verify the fan operates according to an occupied/unoccupied schedule.
        3) Monitoring: Display fan status.
        4) Alarm: Verify alarm if fan is off when scheduled on or on when scheduled off.
    b. Return Fan
        1) Hand: Verify fan operates. Verify proper rotation.
        2) Auto: Verify the fan operates when the supply fan operates.
        3) Monitoring: Display fan status.
        4) Alarm: Verify alarm if fan is off when scheduled on or on when scheduled off.
    c. Safeties
        1) Verify low limit thermostat override of supply and return fan operation in all operating modes. Verify the low limit thermostat moves the dampers to full-recirculation and the heating coil to full heating. Verify low limit alarm annunciation.
        2) Verify smoke sensor override of supply and return fan operation in all operating modes.
    d. Filters
        1) Monitoring: Verify display of filter differential pressure
        2) Alarm: Verify alarm if filter differential pressure is above 0.5”
    e. Off Mode: Verify fans are off, mixing dampers in full recirculation positions, heat recovery pumps are off, heat exchanger damper in full face position, heating coil automatic valve is closed.
    f. Occupied Mode:
        1) Mixing Box: Verify minimum outside air flow for normal occupied (7,500 cfm) and extended occupied schedules (3,500 cfm).
        2) Heat Recovery Coils
            a) Verify pump P-4 operates when outside temperature is below 50°F and are off when outside temperature is above 52°F.

3) Internal Heat Exchanger

a) Verify that the face damper is open and the bypass closed during “normal” operation.

b) Verify face and bypass damper modulation to provide frost control by maintain outlet setpoint of 36°F.

4) Heating Coil

a) Verify that the heating coil automatic valve fails to full heating.

b) Verify heating coil flow of 10% when outside temperature is below 32°F and the air handling unit is off.

5) Supply Air Temperature Control

a) Verify supply air temperature setpoint rest according to the following:

(1) Outside temp = 0°F; supply air temperature = 63°F

(2) Outside temp = 60°F; supply air temperature = 60°F

b) Verify sequential operation of the mixing dampers, heat recovery coils, heat exchanger face and bypass dampers, and heating coil automatic valve to maintain the supply air setpoint.

(1) Verify that during warm weather, mixing box is in full outside air position, face and bypass dampers are in bypass position, and heating coil automatic valve is closed.

(2) Verify that as outside temperature drops:

(a) Operate heat recovery pump P-4.

(b) Modulate mixing dampers until outside air flow drops to 10,000 cfm.

(c) Modulate internal heat exchanger face and bypass dampers to maintain setpoint.

(d) When face and bypass dampers are in full face position, modulate mixing dampers down to minimum position to maintain setpoint.

(e) When face and bypass dampers are in full face position and mixing dampers are in minimum position, modulate heating coil automatic valve to maintain setpoint.

(f) Reverse the sequence on outside temperature rise.

6) Air flow measuring stations: Verify the accuracy of each air flow measuring station.

7) Booster Coils: Verify that the booster coil automatic valve modulates to maintain a discharge air temperature of 68°F.

2. Admin/Commons Air Handling Unit (AHU-2)

a. Supply Fan

1) Hand: Verify fan operates with the system in occupied mode. Verify proper rotation.

2) Auto: Verify the fan operates according to an occupied/unoccupied schedule.

3) Monitoring: Display fan status.

4) Alarm: Verify alarm if fan is off when scheduled on or on when scheduled off.

b. Return Fan

1) Hand: Verify fan operates. Verify proper rotation.

2) Auto: Verify the fan operates when the supply fan operates.

3) Monitoring: Display fan status.

4) Alarm: Verify alarm if fan is off when scheduled on or on when scheduled off.

c. Safeties

1) Verify low limit thermostat override of supply and return fan operation in all operating modes. Verify the low limit thermostat moves the dampers to full-recirculation and the heating coil to full heating. Verify low limit alarm annunciation.

2) Verify smoke sensor override of supply and return fan operation in all operating modes.

d. Filters

1) Monitoring: Verify display of filter differential pressure

2) Alarm: Verify alarm if filter differential pressure is above 0.5”

e. Off Mode: Verify fans are off, mixing dampers in full recirculation positions, heat recovery pumps are off, and heating coil automatic valve is closed.

f. Occupied Mode:

1) Mixing Box

a) Verify minimum outside air flow of 1200 cfm.

b) Verify CO_2 sensor modulation of mixing dampers to maintain less than 800 ppm CO_2 in the Administration return air, commons, and AHU-2 return air.

2) Heat Recovery Coils

a) Verify pump P-5 operates when outside temperature is below 50°F and are off when outside temperature is above 52°F.

3) Internal Heat Exchanger

a) Verify that the face damper is open and the bypass closed during “normal” operation.

b) Verify face and bypass damper modulation to provide frost control by maintain outlet setpoint of 36°F.

4) Heating Coil

a) Verify that the heating coil automatic valve fails to full heating.

b) Verify heating coil flow of 10% when outside temperature is below 32°F and the air handling unit is off.

5) Supply Air Temperature Control

a) Verify supply air temperature setpoint rest according to the following:

(1) Outside temp = 0°F; supply air temperature = 63°F

(2) Outside temp = 60°F; supply air temperature = 60°F

b) Verify sequential operation of the mixing dampers, heat recovery coils, heat exchanger face and bypass dampers, and heating coil automatic valve to maintain the supply air setpoint.

(1) Verify that during warm weather, mixing box is in full outside air position, heat recovery pump is off, and heating coil automatic valve is closed.

(2) Verify that as outside temperature drops:

(a) Operate heat recovery pump P-4.

(b) Modulate mixing dampers.

(c) When mixing dampers are in their minimum position, or are modulating to maintain CO_2 setpoint, modulate heating coil automatic valve to maintain setpoint.

(d) Reverse the sequence on outside temperature rise.

6) Air flow measuring stations: Verify the accuracy of each air flow measuring station.

3. Kitchen Hood (AHU-3 and EF-3)

a. Supply Fan

1) Verify fan operation when VFD is in manual position.

2) Verify proper rotation.

3) Verify when the VFD is in AUTO position, the fan operates when EF-4 operates and is modulated by kitchen hood control panel.

b. Exhaust Fan

1) Verify fan operation when VFD is in manual position.

2) Verify proper rotation.

3) Verify when the VFD is in auto position, the fan operates according to an occupied schedule and is modulated by the kitchen hood control panel.

c. Safeties

1) Verify low limit thermostat override of supply and return fan operation in all operating modes. Verify the low limit thermostat moves the dampers to full-recirculation and the heating coil to full heating. Verify low limit alarm annunciation.

2) Verify smoke sensor override of supply and return fan operation in all operating modes.

d. Filters

1) Monitoring: Verify display of filter differential pressure

2) Alarm: Verify alarm if filter differential pressure is above 0.5”

e. Off Mode: Verify fan is off, outside air damper is closed, and heating coil automatic valve is closed.

f. Occupied Mode:

1) Outside Air Damper: Verify damper is open when fan operates.

2) Heating Coil

a) Verify that the heating coil automatic valve fails to full heating.

b) Verify heating coil flow of 10% when outside temperature is below 32°F and the air handling unit is off.

3) Supply Air Temperature Control: Verify heating coil automatic valve modulates to maintain 60°F supply air temperature.

4. Library Ventilating Unit (VU-6) (Alternate Bid Item)

a. Supply Fan

1) Verify fan is off when VFD is in OFF position.

2) Verify when the VFD is in Bypass, the fan operates at full speed. Verify proper rotation.

3) Verify when the VFD is in Hand, fan speed is controlled manually.

4) Verify when the VFD is in Auto, the fan operates according to an occupied schedule and the speed modulates to maintain 0.8" SP.

5) Verify that a low current condition produces a VFD generated status alarm and BAS alarm.

b. Safeties

1) Verify low limit thermostat override of supply fan operation in all operating modes. Verify the low limit thermostat stops the fan, positions the dampers to full-recirculation and the heating coil to full heating. Verify low limit alarm annunciation.

2) Verify smoke sensor override of supply and return fan operation in all operating modes.

c. Filters

1) Monitoring: Verify display of filter differential pressure

2) Alarm: Verify alarm if filter differential pressure is above 0.5"

d. Off Mode: Verify fans are off, mixing dampers in full recirculation positions, heat recovery pumps are off, heat exchanger damper in full face position, heating coil automatic valve is closed.

e. Night Setback Mode: Verify that system operates with mixing dampers in full recirculation when room temperature drops to 58°F and turns off when room temperature rises to 62°F.

f. Occupied Mode:

1) Mixing Box: Verify that the dampers modulate to maintain a maximum of 800 ppm of CO2 in the spaces. Verify that the mixed air temperature does not drop below 45°F.

2) Supply Air Temperature Control

a) Verify that the dampers modulate to provide natural cooling when any room is too warm and the zone VAB box is fully open.

b) Verify that the mechanical cooling equipment operates when outside temperature is above 60°F and any zone is 4°F above its setpoint.

c) Verify cooling unit operates for a minimum of 10 minutes.

d) Verify minimum supply air temperature of 55°F.

3) Zone Temperature Control

a) Heating Mode

(1) Verify that the VAV box is in minimum position.

(2) Verify that the zone booster coil modulates to maintain setpoint.

b) Cooling: Verify that the zone VAV box modulates to maintain setpoint.

5. Exhaust Fan EF-1

a. Verify EAD is closed when fan is off.

b. Verify that EAD opens prior to fan operation.

c. Verify that fan operates when in HAND. Verify proper rotation.

d. Verify fan operation in AUTO when AHU-1 operates.

e. Monitoring: Verify fan status alarm.

6. Exhaust Fan EF-2

a. Verify EAD is closed when fan is off.

b. Verify that EAD opens prior to fan operation.

c. Verify that fan operates when in HAND. Verify proper rotation.

d. Verify fan operation in AUTO when AHU-2 operates.

e. Monitoring: Verify fan status alarm.

7. Exhaust Fan EF-4

a. Verify EAD is closed when fan is off.

b. Verify that EAD opens prior to fan operation.

c. Verify that fan operates when in HAND. Verify proper rotation.

d. Verify fan operation in AUTO to maintain room setpoint of 75°F.

e. Monitoring: Verify fan status alarm.

8. Air-conditioning System

a. Perform the manufacturer's test run procedures.

b. Verify that the unit maintains the room setpoint.

9. Acceptance Criteria: The systems, integral components and related equipment respond as specified and according to acceptable operating practice.

E. Test, Adjustment, and Balancing (TAB)

1. Purpose. The purpose of this test is to spot check the TAB work to verify that it was done in accordance with the contract documents and acceptable practice and that the TAB report is accurate.
2. The following tests and checks will be conducted. The following testing requirements are in addition to and do not replace any testing requirements elsewhere in the contract documents.
    a. A random sample of up to 50% of the TAB report data shall be selected for verification (air velocity, air or water flow rate, pressure differential, electrical or sound measurement, etc.). The original TAB contractor will execute the checks, witnessed by the CxA. The TAB contractor will use the same test instruments as used in the original TAB work.
        1) A failure of more than 10% of the selected items of a given system shall result in the failure of acceptance of the system TAB report. The TAB contractor shall be responsible to rebalance the system, provide a new system TAB report, and repeat random verifications of the new TAB report.
    b. Verify that final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked by the TAB Contractor.
    c. Verification that the air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity. This shall include a review of TAB methods, control setpoints established by TAB and a physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all TUs taking off downstream of the static pressure sensor, the TU on the critical leg has its damper 90% or more open.
    d. Verification that the water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity. This shall include a review of TAB methods, control setpoints established by TAB and a physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90% or more open.
    e. Definitions
        1) Examples of a “system” are: the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system. Systems can be defined smaller if inaccuracies in TAB work within the smaller defined system will have little or no impact on connected systems.
        2) Cooling season, Heating season or Both. “Design” means within 5° of season design (ASHRAE 2 1/2%), or 95% of loading design. A blank cell denotes no special seasonal test is required and that test can be executed during any season, if condition simulation is appropriate.
3. Acceptance Criteria: Failure of an item is defined as follows:
    a. For air flow of supply and return: a deviation of more than 10% of instrument reading.
    b. For minimum outside air flow: 20% of instrument reading (30% for reading at intermediate supply flow for inlet vane or VFD OSA compensation system using linear proportional control)
    c. For temperatures: a deviation of more than 1°F

d. For air and water pressures: a deviation of more than 10% of full scale of test instrument reading.

e. For sound pressures: a deviation of more than 3 decibels. (Variations in background noise must be considered).

F. Lighting Systems and Controls

1. Light Fixtures

a. Verify operation of each fixture.

b. Verify emergency lighting operation by interrupting the power supply to the fixtures.

2. Occupancy Sensors: Verify lighting control under conditions that that simulate actual operational conditions. Perform test for 20% of classrooms and all of the other rooms with occupancy sensor control.

3. Lighting Control

a. Corridors and Vestibules: Verify BAS scheduled control of lighting.

b. Commons: Verify BAS scheduled control of lighting.

c. Gym: Verify BAS scheduled control of lighting.

d. Exterior: Verify BAS scheduled control of lighting.

e. Covered Play Area: Verify BAS scheduled control of lighting.

f. Verify that the control module features are operational.

g. Verify BAS or local switch control of lighting.

G. Intrusion Alarms

1. Verify operation of intrusion alarms.

H. Building Automation System (BAS)

1. A significant part of the BAS functional testing requirements is the successful completion of the functional tests of equipment the BAS controls or interlocks with. Uncompleted equipment functional tests or outstanding deficiencies in those tests lend the required BAS functional testing incomplete.

2. Integral or stand-alone controls are functionally tested with the equipment they are attached to, including any interlocks with other equipment or systems and thus are not covered under the BAS testing requirements, except for any integrated functions or interlocks listed below.

3. Verify that the BAS display accurately reflects system layout and control.

3.4 TRAINING

A. Scope: Provide training of the following equipment and systems:

1. Fuel-oil boilers

2. VFD drives

3. Air-conditioning Unit

4. Electric hot water heater

5. Building Automation System and Automatic Controls

6. Lighting controls
7. Uninterruptible Power Supply
8. Intrusion alarm system

B. Agenda: For each training session, submit a form describing the subjects to be covered during training, along with the name and qualifications of the trainer(s).

C. Training Record: Document each training session (duration and general subjects covered). The trainer signs for the session and obtains the signature of each trainee.

3.5 CERTIFICATIONS

A. Prerequisite Certifications: Provide the following certifications at each commissioning milestone and submit to the Owner and CxA.

1. Prefunctional Checklists and Systems Startup: I certify that the systems are installed in accordance with the contract documents and prefunctional checklists. I certify that the HVAC systems and associated subsystems are completed, calibrated, and started up in accordance with the startup requirements and are believed to be operating in accordance with contract documents.

General Contractor	Mechanical Contractor	BAS / Controls Contractor

2. Testing, Adjusting, and Balancing (TAB): I certify that the testing, adjusting, and balancing procedures are completed in accordance with the contract documents.

General Contractor	Mechanical Contractor	TAB Contractor

3. Lighting Systems and Controls: I certify that the lighting systems and controls are completed in accordance with the contract documents.

General Contractor	Electrical Contractor	Controls Contractor

4. Automatic Control Systems: I certify that the automatic control systems are completed, calibrated, and operating in accordance with contract documents.

General Contractor	Mechanical Contractor	BAS / Controls Contractor

END OF SECTION 01900

SECTION 02080 – ASBESTOS ABATEMENT

PART 1 -- GENERAL

1.1 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplementary Conditions;

B. Division 1 through Division 13 Specification Sections;

C. Contract drawings, including HAZ0.0, HAZ1.0, HAZ1.2, and HAZ1.3.

1.2 SUMMARY

A. The asbestos abatement work is in support of renovation of Gastineau Elementary School in Douglas, Alaska.

B. Bulk sampling and historical information has identified the following asbestos containing material (ACM) in Gastineau Elementary School that will impact the overall Project:

1. Brown ACM vinyl floor tile (VAT) with ACM black mastic found in the throughout the building;

2. ACM mastic residue on floors in the Library and at entrances;

3. Gypsum wall board with ACM taping mud (GWB/mud) found in Fan Room 9;;

4. Pipe and fitting TSI on piping hidden inside walls;

5. Cement Asbestos Board (CAB) on exterior soffits and above doors and windows; and

6. ACM asphaltic roofing on the canopy at the main entrance.

C. The intent of the abatement portion of the overall Project is to perform all demolition and abatement of all ACM within the various abatement areas on each floor. The following elements are included as part of the abatement effort, although the drawings may show some exceptions in each abatement area:

1. Brown ACM vinyl floor tile (VAT) with ACM black mastic found both exposed and under carpet in the throughout the building, as shown on drawing HAZ1.0, HAZ1.2, and HAZ1.3;

2. ACM mastic residue under carpet on floors as shown on HAZ1.0 and HAZ1.2;

3. GWB/mud found in Fan Room 009, as shown on drawing HAZ1.0;

4. Pipe and fitting TSI encountered in walls during demolition;

5. CAB found on exterior soffits and above doors and windows as shown on HAZ1.0, HAZ1.2, and HAZ1.3; and

6. ACM asphaltic roofing on the canopy at the main entrance, as shown on drawing HAZ1.0.

D. ASBESTOS ABATEMENT includes all material, labor, equipment and other related costs for:

1. mobilization (including moving all plant and equipment onto the site; providing temporary construction power, wiring, and lighting facilities; developing construction water supply, providing all on-site communication facilities, arranging for approved storage areas, issuing and posting all notices, and submitting all submittals);

2. erecting non-permanent asbestos control areas;

3. completing all project elements in accordance with these specifications and as described on the drawings;

4. cleaning all spaces within the confines of the asbestos control areas, and applying lockdown sealant as appropriate;

5. providing air monitoring (including all elements summarized in Asbestos Air Monitoring in DEFINITIONS below);

6. providing all lab analysis for required monitoring;

7. disposing of ACM and related debris in accordance with these contract documents (the solid waste facility in Juneau does not accept friable ACM, but their permit allows them to accept non-regulated ACM);

8. removing the non-permanent asbestos control areas; and

9. general cleanup and demobilization.

E. Contract Drawings illustrate the locations where the above-described WORK is necessary and allow quantification for bidding purposes.

1.3 COORDINATION and timing OF ABATEMENT ACTIVITIES

A. The building will be unoccupied during the project. The abatement subcontractor shall coordinate with the general contractor for timing of this work. The work is expected to be accomplished during a single summer break between school years.

B. It is the responsibility of the Abatement Subcontractor to coordinate with the General Contractor for scheduling abatement activities, in particular, lead-based paint removal activities on structural steel.

C. The OWNER will provide access to temporary power and to water for direct Project use. The Abatement Subcontractor is responsible for all costs and effort required to develop those utilities for his or her use.

D. Security to the site shall be maintained for the duration of the work.

1.4 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1. Code of Federal Regulations (CFR) Publications:

29 CFR 1910.1001	Asbestos (for general industry standards)
29 CFR 1910.134	Respiratory Protection
29 CFR 1910.145	Specifications for Accident Prevention Signs and Tags
29 CFR 1910.1200	Hazard Communications
29 CFR 1926.1101	Asbestos (for construction and demolition standards)
40 CFR 61 Sub-part A	General Provisions
40 CFR 61 Sub-part M	National Emission Standard for Asbestos
40 CFR 241	Guidelines for Land Disposal of Solid Wastes

2. Alaska Department of Labor Construction Code:
Subchapter 05.045 (as amended November 27, 1991)-Construction Code (Asbestos)
Subchapter 15.0101-Hazard Communication

3. Additional References:
US EPA Publication 560/5-85-024: Guidance for Controlling Asbestos Containing Materials in Buildings

1.5 DEFINITIONS

A. ACM: See Asbestos Containing Material (ACM).

B. Abandonment: Leaving in place existing asbestos materials. An example is leaving pipes inside walls when new piping is to be routed differently. Complete documentation must be made of the exact location and condition of the asbestos before abandonment, including the type and method of use of any encapsulant.

C. Action Level: See Exposure Standards.

D. Aggressive Conditions: Required technique to prepare an area that has passed visual inspection for clearance sampling. Before starting the sampling pumps, the exhaust from forced air equipment (such as a 1 horsepower leaf blower) shall be directed against all walls, ceilings, floors, ledges and other surfaces in the room. This effort shall take at least 5 minutes per 1,000 square feet of floor. Next, a 20-inch fan shall be placed in the center of the space (one such fan shall be employed for every 10,000 cubic feet of room volume),directed towards the ceiling, and set to run on slow speed. Once the fans are set up and operational, the sampling pumps shall be started and run for the required time. Once sampling is complete all 20-inch fans shall be secured.

E. Amended Water: Water containing a wetting agent specifically designated by the manufacturer for the wetting of asbestos.

F. Approved Laboratory: An independent laboratory properly staffed and equipped for the collection and analysis of asbestos bulk and/or air samples, and who maintains demonstrable satisfactory performance from all technicians involved in the performance of these analyses. For air samples, participation and a documented record of satisfactory performance in either the NIOSH Proficiency Analytical Testing (PAT) program, equivalent American Industrial Hygiene Association (AIHA) program, or an equivalent inter-laboratory testing protocol in accordance with 29 CFR 1926.1101, Appendix A is required. The lab must be capable of performing both phase contract illumination microscopy, and transmission electron microscopy, and be capable of the required short turnaround times. For bulk analysis, participation in and maintenance of a satisfactory record with the bulk asbestos analysis program with the Research Triangle Park, NC 27709-2194, (919) 541- 6000, is required. If any participation in any equivalent program is proposed to meet this requirement, the details of the program, documentation of satisfactory performance, and name, address and telephone number of the operator of the program must be submitted as part of the Asbestos Work Plan for approval (see Paragraph 1.6 A below).

G. Area Monitoring: See Asbestos Air Monitoring.

H. Asbestos: A class of six naturally occurring fibrous hydrous mineral silicates. Minerals included in this group are chrysotile, crocidolite, amosite and the fibrous forms of anthophyllite, tremolite and actinolite.

I. Asbestos Air Monitoring: An approved air monitoring plan is required if air monitoring is part of the abatement work. To be approved such a plan must include the following elements:

1. Area Monitoring: Sampling for airborne concentrations of asbestos fibers within the existing or planned asbestos control area that is representative of the fiber levels that may reach the worker's breathing zone. Area pumps drawing 10 liters per minute through the filter cassette are used for area monitoring and should pull at least 1,200 liters of air for each sample.

2. Environmental Monitoring: Sampling for airborne concentrations of asbestos fibers outside the asbestos control area to assure that no asbestos fibers are escaping the enclosure, and that personnel outside the control area are not being exposed. Where a sealed area is not used, such as during exterior siding removal, this will refer to sampling conducted at the perimeter of the control area to assure that a sufficient buffer zone

around the work in progress has been established, and that personnel outside this zone are not being exposed. Area pumps drawing 10 liters per minute through the filter cassette are used for environmental monitoring and should pull at least 1,200 liters of air for each sample.

3. Baseline (Background) Monitoring: Sampling conducted to determine the initial level of airborne asbestos fibers present prior to the start of asbestos work. Area pumps drawing at least one and less than ten liters per minute through the filter cassette are used for this monitoring and should pull at least 1,200 liters of air for each sample. This sampling can be subdivided into three parts:

    a. Natural Background Sampling: Sampling conducted outside the structure where the work will be accomplished to determine the naturally occurring fiber levels present in that locale. When results indicate that this level may reach or exceed 0.01 f/cc, a minimum of 5 consecutive days of sampling will be used to establish an arithmetic average. This average will be used as the background level.
    b. Environmental Background Sampling: Sampling conducted to determine the background fiber levels within a structure, but outside the planned asbestos work area. This sampling is accomplished to ascertain the normal background fiber level within these areas of the structure. Special care must be taken during this sampling to minimize sample contamination by non-asbestos fibers, such as from cloth, paper and carpet.
    c. WORK Area Background Sampling: Sampling conducted in the area where asbestos WORK is planned, normally used to determine the level of personal and other protective measures required by personnel preparing the area for asbestos work and to establish the level of contamination present prior to the beginning of asbestos operations.

4. Initial Exposure Assessment Monitoring: Sampling conducted by a “competent person” immediately before or at the initiation of the operation to ascertain the expected exposures during that operation. Initial Exposure Assessment Monitoring must be completed in time to allow compliance with requirements which are triggered by exposure data or the lack of a "negative exposure assessment”, and to provide information necessary to assure that all control systems planned are appropriate for the operation and will function properly. Until Initial Exposure Assessment Monitoring confirms that employees on the job will not be exposed in excess of the Permissible Exposure Level (PEL), or a “negative exposure assessment” for non-friable asbestos has been accepted, it shall be assumed that employees are exposed in excess of the Time Weighted Average (TWA) and excursion limit.

5. Negative Exposure Assessment: For any one specific asbestos job involving non-friable material which will be performed by trained employees, it may be demonstrated that employee exposures will be below the PEL by data which conform to the following criteria:

    a. Objective data demonstrating that the product or material containing asbestos minerals or the activity involving such product or material cannot release airborne fibers in concentrations exceeding the TWA and excursion limit under those WORK conditions having the greatest potential for releasing asbestos.

b. Where the employer has monitored prior asbestos jobs for the PEL and the excursion limit within 12 months of the current or projected job, the monitoring and analyses were performed in compliance with the asbestos standard in effect; and the data were obtained during work operations conducted workplace conditions “closely resembling” the processes, type of material, control methods, WORK practices, and environmental conditions in the current operations, the operations were conducted by employees whose training and experience are no more extensive than that of employees performing the current job, and these data show that under the conditions prevailing and which will prevail in the current workplace there is a high degree of certainty that employee exposures will not exceed the TWA and excursion limit.

c. The results of initial exposure monitoring of the current job made from breathing zone air samples that are representative of the 8-hour TWA and 30 minute short-term exposures of each employee covering operations that are most likely during the performance of the entire asbestos job to result in exposures over the PEL.

6. Clearance Monitoring: Sampling occurring at the completion of the asbestos work, or at the completion of a specific phase of asbestos WORK, prior to removing the enclosure. It is accomplished to prove that the clean-up activities have been effective, and that remaining fiber levels both inside and outside the enclosure comply with airborne fiber concentrations defined in “Clearance Levels” below. Clearance sampling is normally accomplished in the same locations and by the same methods as the baseline monitoring, and is done using aggressive conditions (see “Aggressive Conditions” above). Transmission Electron Microscopy (TEM) analysis is required for clearance monitoring inside schools and sometimes for inside public buildings to assure that the area is truly safe for reoccupancy. For public buildings the requirement for TEM analysis can be waived in favor of Phase Contrast Illumination Microscopy (PCM) at the ARCHITECT’s option. See PART 3-EXECUTION, MONITORING for project specific requirements.

7. Personal Monitoring: Sampling for asbestos fiber concentrations at the breathing zone of a worker, used to document individual exposures, and, in conjunction with the WORK area sampling, to determine the required degree of personal and respiratory protection. A minimum of two samples shall be collected per eight-hour shift at a flow rate of 0.5 to 2.5 liters per minute. At least 25% of the workers doing a particular job shall be sampled each eight-hour shift. See Exposure Standards for more information.

J. Asbestos Containing Material (ACM): Material composed of asbestos of any type, and in any amount equal to or greater than 1 percent by weight, either alone or mixed with other fibrous or non-fibrous materials.

K. Asbestos Control Area: An area where operations involving asbestos are performed which is isolated by physical barriers designed to prevent the spread of asbestos dust, fibers, and debris, and to prevent or deter the entry or unauthorized and unprotected personnel. For areas where isolation is not feasible, it will be an area that is physically demarcated, e.g., bounded by a physical barrier such as a rope, barricade, etc., separating the known "clean" zone from the asbestos WORK area and buffer zone.

L. Asbestos Fibers: This expression refers to a particular form of asbestos, fibrous tremolite, anthophyllite, or actinolite having a length to diameter aspect ratio of 3:1 or greater, and an overall length of 5.0 micrometers or longer. Where specialized analytical techniques, such as electron microscopy, are utilized for analysis, this shall refer to the number of fibers considered to equate to a specific weight of asbestos.

M. Asbestos Survey: A detailed survey accomplished by specially trained, experienced technicians of a specific area to determine the presence, absence, condition, and amount of asbestos and asbestos contamination present in that area.

N. Asbestos Workers' Personal Hygiene Area: A dedicated area containing shower(s), change room and, if required, toilet facilities where personnel working with asbestos (where a control area is not established) can change into protective clothing, and can disrobe, shower, and change into clean clothing without danger of transferring contamination to themselves or others.

O. Baseline Monitoring: See Asbestos Air Monitoring.

P. Bulk Sampling and Analysis: Representative samples taken from materials suspected to contain asbestos, analyzed by an approved laboratory using polarized light microscopy (PLM). When specialized methodology, such as electron microscopy is required, collection and analysis shall be in accordance with the recommendations of the laboratory providing the analysis, and the result expressed as both mass per unit volume and percent by weight shall be given.

Q. Clean: As used in these documents, “clean” means that the surface in question is free of visible asbestos, to the point where no physical sample can be collected for analysis.

R. Clean Room: An uncontaminated room having facilities for storage of employees' street clothing, uncontaminated materials and equipment.

S. Clearance Levels: The maximum fiber levels present after completion of the asbestos WORK, or a given phase of WORK, sampled during initial or final clearance monitoring. This level shall be the lower of the baseline WORK area monitoring value for the location, or less than 0.01 fibers/cc, whichever is lower. In the special case where the naturally occurring outdoor background levels outside the structure are greater than or equal to 0.01 f/cc, averaged arithmetically over a minimum 5-day period, the clearance level shall be the interior WORK area background level prior to the start of CONTRACTOR work, or less than or equal to the average natural background level, wherever is lower.

T. Clearance Monitoring: See Asbestos Air Monitoring.

U. Competent Person: An individual experienced in the abatement and control of asbestos who has received specialized additional training in the supervision and management of asbestos abatement projects. This individual is the full-time on-site manager responsible for ensuring that all safety, health and environmental protection requirements are met, that approved operational methods are followed, and that all personnel on the site comply with these requirements. Specialized training must include an EPA recognized course in the management of asbestos abatement projects. The Competent Person shall report to the Industrial Hygienist.

V. Containment: See Enclosure.

W. Decontamination Area: An enclosed area adjacent and connected to a sealed asbestos control area and consisting of an equipment room, shower area, and clean room used for the decontamination of workers, materials and equipment. This also forms the only authorized entry and exit for the control area, except as required in Equipment Decontamination Area below.

X. Encapsulant: A liquid material which can be applied to ACM which reduces the potential for release of asbestos fibers from a material, either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant).

Y. Encapsulate: The process whereby an encapsulant is applied to ACM to seal in or bind together the individual asbestos fibers, thereby reducing the potential for the release of these fibers.

Z. Enclosure: Construction of a sealed, permanent structure around asbestos. Complete documentation must be made of the exact location and condition of the asbestos before the enclosure is finished, including the type and method of use of any encapsulant.

AA. Equipment Decontamination Area: When used, a separate area designed similarly to the personnel decontamination area, but on a large scale. Used to decontaminate large items, or for the purpose of a separate exit for asbestos waste removal where the normal means of egress is not effective (such as the removal of long pieces of pipe from the basement of a structure).

BB. Equipment Room (Change Room): A room located within the decontamination area that is supplied with impermeable bags or receptacles for the disposal or storage of contaminated protective clothing and equipment, and lockers for the storage and contaminated tools and work shoes.

CC. Exposure Standards

1. Workers:

    a. Action Level: An action level concept shall be used by the abatement Subcontractor to ensure that no personnel are exposed to airborne concentrations of asbestos, actinolite, anthophyllite, or tremolite fibers, or a combination of these mineral fibers, equaling or exceeding 0.1 fibers per cubic centimeter (0.1 f/cc) expressed as an 8-hour time weighted average (TWA) without placement on a medical monitoring program for asbestos. Personnel exposed at or above this level must be provided proper training in the removal of asbestos containing materials, and must be provided proper personal protective equipment.
    b. Excursion Limit (EL): An airborne concentration of asbestos of 1.0 fiber per cubic centimeter of air (1 f/cc) as averaged over a sampling period of 30 minutes.
    c. Permissible Exposure Level (PEL): The abatement Subcontractor shall ensure that no employee is exposed to an airborne concentration of asbestos, actinolite, anthophyllite, or tremolite fibers, or a combination of

these mineral fibers, exceeding 0.1 fibers per cubic centimeter (0.1 f/cc) expressed as an 8-hour time weighted average (TWA) as defined by the NIOSH sampling and analytical method 7400. (Reference 29 CFR 1926.1101, Appendix A.)

2. Non-Workers:

a. Personnel who are not asbestos workers as defined by OSHA and this Specification shall not be exposed to levels of asbestos fibers exceeding the EPA clearance level criteria of 0.01 f/cc.

DD. Fibers: All fibers, regardless of composition, as determined by analysis in accordance with the method described in 29 CFR 1926.1101, Appendix A. When specialized methodology, such as electron microscopy is required, collection and analysis shall be in accordance with the recommendations of the laboratory providing the analysis, and the equivalent fiber level, expressed in both mass per unit volume and fibers per cubic centimeter shall be given.

EE. Glovebag Technique: A method with limited applications for removing small amounts of friable asbestos-containing material from HVAC ducts, short piping runs, valves, joints, elbows, and other non planar surfaces not isolated inside an enclosure. The glovebag assembly is a manufactured or fabricated device consisting of a glovebag (typically constructed of 6-mil transparent polyethylene or polyvinyl chloride plastic), two inward projecting long sleeve gloves, an internal tool pouch, and an attached, labeled receptacle for asbestos waste. The glovebag is constructed and installed in such a manner that it surrounds the object or material to be removed and contains all asbestos fibers released during the process. All workers who are permitted to use the glovebag technique must be highly trained, experienced and skilled in this method.

FF. HEPA Filter Equipment: High Efficiency Particulate Air (HEPA) filtered vacuuming, local exhaust, or respiratory protective equipment equipped with specialized filters capable of collecting and retaining asbestos fibers. Filters must be of 99.97 percent or greater efficiency at collection of 0.3-micron diameter particles. Filters must be factory tested and certified as meeting this filtration requirement.

GG. Industrial Hygienist: An individual certified by the American Board of Industrial Hygiene, and having significant prior experience in managing and evaluating the health and safety aspects on asbestos projects of similar nature and scope to ensure capability of performing asbestos WORK in a satisfactory manner. Prior project similarities shall be in areas related to material composition, project size, number of employees, and in the engineering, WORK practice, environmental, and personal protection control required. An equivalent individual, such as a Licensed Professional Safety Engineer, Certified Safety Professional, and other qualified person with a minimum of 5 years of experience in industrial hygiene, including extensive experience in the management and evaluation of health and safety aspects of asbestos abatement, may substitute for the Certified Industrial Hygienist, subject to approval by the ENGINEER. The Industrial Hygienist shall be responsible for all monitoring, training and asbestos WORK, for ensuring that all safety and health requirements prescribed by State and Federal regulations, as well as these specifications, are compiled with, and for ensuring that the competent person performs all assigned duties in accordance with this specification and applicable Federal and State regulations.

HH. Initial Exposure Assessment Monitoring: See Asbestos Air Monitoring.

II. Lockdown Sealant: A spray-on liquid-type sealant applied to surfaces from which ACM has been removed. It is applied after final cleaning and visual inspection has occurred, but prior to initial clearance sampling. Its purpose is to control and minimize the amount of airborne asbestos fiber generation that might result from any residual ACM debris on the substrate. All lockdown sealant shall be acrylic copolymer blend that forms a durable non-combustible barrier that when cured becomes an excellent primer for spray back insulation and water based architectural coatings.

JJ. Lower Limit of Detection (LLD): The smallest quantifiable amount of a substance, or number of fibers, present in a given sample that can be determined accurately by the sampling and analysis methods in use. A LLD is normally specified to represent a 95% confidence level. All samples taken for baseline, background, environmental or clearance sampling shall have an LLD of 0.01 f/cc or less. Samples taken for bulk analysis shall have an LLD of less than 0.1 percent by weight of the sample of homogeneous samples.

KK. Negative Exposure Assessment: See Asbestos Air Monitoring.

LL. Negative Pressure: A minimum of minus 0.02 inches of water pressure (negative pressure) differential between the asbestos control area and all adjacent areas, at a minimum flow rate of four air changes per hour at all points within the asbestos control area. See PART 3-EXECUTION; SAFETY AND HEALTH COMPLIANCE; Vacuums and local exhaust systems for additional information.

MM. Permissible Exposure Level (PEL): See Exposure Standards.

NN. Personal Monitoring: See Asbestos Air Monitoring.

OO. Phase Contrast Illumination Microscopy (PCM): An analytical method for counting fibers in air sampling filters.

PP. Polarized Light Microscopy (PLM): An analytical method for determining asbestos content in bulk samples.

QQ. Time Weighted Average (TWA): The TWA is an average of the airborne concentration of asbestos fibers, expressed as the number of fibers per cubic centimeter (f/cc) of air, measured and calculated for a minimum of 8 hours, and taken into account the relative proportions of time exposed when averaging different exposure levels.

RR. Transmission Electron Microscopy (TEM): A procedure whereby an electron beam is scanned through a specially prepared air-sampling filter. The beam diffraction pattern is then analyzed by computer, which differentiates between the patterns of asbestos and the non-asbestos materials, and quantifies the mass of the asbestos present on the filter. This mass can then be referenced to an equivalent number of fibers per cubic centimeter. By far the most sensitive and specific test for airborne asbestos, it is expensive and results cannot normally be provided for several days. Used for detection of extremely low levels, or when suspected non-asbestos fibers are believed to be interfering with the accuracy or readability of normal sampling methods. TEM clearance sampling, done in accordance with methods set forth in 40 CFR

760, Subpart E, is required by regulation for all projects inside school buildings. TEM clearance sampling is optional (at the OWNER's discretion) for all projects not in school buildings.

1.6 PRE-WORK SUBMITTALS

A. Six copies of the Pre-WORK Submittal shall be submitted. The following items shall be included and submitted as a complete package in a three ring binder complete with index and divider tabs. Modify as necessary to obtain approval by the ARCHITECT five working days prior to any work on the project. The CONTRACTOR shall perform its WORK in compliance with the approved Pre-WORK Submittal:

1. Asbestos WORK Plan: Prepare a detailed plain language plan covering the WORK procedures to be used during each and all operations involving asbestos. Annotated building plans or site plans no larger than 11 inches by 17 inches shall be included to detail locations for asbestos control areas, monitoring locations, access and disposal routes, and other activities where needed. The plan shall include as a minimum the following elements:

    a. Estimated electrical load requirements for each abatement area (for successful planning of temporary power);
    b. Location and construction of each asbestos control area;
    c. Sequencing of asbestos WORK to include phasing sequences if the WORK is to be accomplished in separate sections or phases. This item shall include a timeline for completing the WORK;
    d. Transport and disposal plans;
    e. A contingency plan for potential emergencies/accidents/incidents covering, but not limited to:
        - Medical emergencies/accidents inside the control area;
        - Violation of the control area;
        - Spills inside the control area;
        - Spills outside the control area;
        - Fire inside and outside the control area;
        - Loss of power;
        - Loss of negative pressure in the controlled area;
        - Discovery that fiber levels inside or outside the control area have exceeded prescribed limits;
        - Water intrusion from the abatement area into occupied areas of the building; and
        - Spills during transport or disposal.
    f. A notification listing of personnel and organizations to be contacted by the CONTRACTOR in the event of an incident, emergency or contingency.
    g. The 24-hour contact point for the CONTRACTOR and the designated "competent person" to contact in case of an on-site problem. Response time to the site shall not exceed 1 hour from the time of the notification.

2. Notifications: Copies of EPA and OSHA notifications submitted prior to WORK.

3. Competent Person: Submit the name(s) proposed, address(es), telephone number(s) and complete documentation of each individual's qualifications proving their qualifications meet the requirements described in DEFINITIONS above and PART 3-EXECUTION below.

4. Industrial Hygienist: Submit the name, address and telephone number of the Industrial Hygienist selected to prepare the asbestos WORK plan, and direct monitoring and training. Include documentation proving the person's qualification meet the requirements described in DEFINITIONS above and PART 3-EXECUTION below.

5. Testing Laboratory: Submit the name, address, telephone number and qualifications of the independent testing laboratory selected to perform the monitoring, testing and reporting of airborne asbestos fibers. Include documentation certifying that all technicians performing the analysis have been judged proficient by successful participation within the last year in the NIOSH PAT program or the equivalent AIHA program, or an equivalent inter-laboratory testing program.

6. Training: Submit certificates signed by each employee and the Industrial Hygienist that each employee has received the training required by 29 CFR 1910.1001, 29 CFR 1926.1101, and appropriate State of Alaska Regulations and this specification. Include proof that each employee is certified as an asbestos worker in the State of Alaska in accordance with current state regulations.

7. Protective Equipment and Protective Method Plans: Details of planned personnel protective equipment requirements and protective methods, including respirators as will be required for each specific type of operation or condition. Include supporting justification when alternate (e.g., less than the maximum specified) protection is proposed.

8. Manufacturer's Data: Provide complete manufacturer's information, including maintenance and usage instructions, on all specialized equipment to be used for asbestos WORK, including, but not limited to:

    a. Sealants, adhesives, and foams.
    b. Lockdown encapsulant.
    c. Local Exhaust Equipment.
    d. Vacuum Equipment.
    e. Respirators.
    f. Pressure Differential Monitor/Airflow Monitor (including an audible alarm that sounds if negative pressure is lost).
    g. Decontamination Units (including a provision to filter any discharge from the unit).

9. Material Safety Data Sheets (MSDS): Provide copies of the MSDS for each chemical, adhesive, sealant, foam, glue, encapsulant, additive for creation of the amended water, and paints to be utilized, as well as any other material requiring this reporting in accordance with Federal Standard 313B. This requirement is in addition to the requirement for submittal of material data sheets specified elsewhere in the specifications.

B. Any changes to procedures, methods, conditions, etc., identified in the approved Pre-WORK Submittal must be submitted in writing for review and approval by the ARCHITECT prior to the inception of the change. The changes must be reviewed and approved by the Certified Industrial Hygienist prior to being submitted to the ARCHITECT for review. Where changes must be implemented immediately for the protection of workers, personnel outside the WORK area, the structure or the environment, and the change established an environment more stringent than that previously existing, the changes may be implemented by the competent person or other individuals with appropriate authority, and the ARCHITECT notified immediately. These changes will then be submitted in writing within 24 hours for final review and approval.

1.7 POST-WORK SUBMITTALS

A. Six copies of a post-WORK submittal shall be submitted. The following items shall be included, submitted as a complete package in a three ring binder complete with index and divider tabs, and approved by the ARCHITECT as complete before final payment is approved:

1. WORK Log: Upon completion of the Project, or upon completion of each phase of asbestos WORK if the work is performed in phases or sections, prepare a detailed log of all operations involving the asbestos portion of the WORK, to include but not be limited to:

    a. The names, entry and exit dates and times, duties performed, and protective equipment worn by each individual during their time within the asbestos control area, covering all personnel, (including inspectors, monitoring personnel and visitors) entering each asbestos control area. This information is normally provided in the form of fully legible copies of the entry/exit control log for the control area. Each day's listing should also include a summary of the WORK performed (quantity, type, location, etc.).
    b. A listing of all personnel performing asbestos related WORK outside the control area, showing duties performed, date, time, duration, and location of the WORK, and protective equipment worn while performing these duties. Each day's listing should also include a summary of the WORK performed (quantity, type, location, etc.).
    c. A list of the exact placement of each sampling device, and a summary of sampling results on a chronological basis.
    d. Copies of the complete and reviewed sampling results as an attachment.
    e. A summary of each problem, incident, contingency, and emergency that occurred, and the actions taken to resolve the situation.
    f. A copy of all shipping manifests that document disposal of all ACM at an approved solid waste facility.

PART 2 -- PRODUCTS

2.1 LOCKDOWN ENCAPSULANT

A. All lockdown encapsulant shall be acrylic copolymer blend that forms a durable non-combustible barrier that when cured becomes an excellent primer for spray back insulation and

water based architectural coatings. Specifically, all lockdown encapsulant used on the abatement project shall be compatible with all materials applied afterwards by other trades.

2.2 MASTIC REMOVER

A. Mastic remover shall be a no odor product. The mastic remover shall be "Control ZerO Mastic Remover" manufactured by Grayling Industries or approved equal.

2.3 FINAL WASH

A. A final wash cleaner shall be used to provide final surface preparation for the concrete floor to accept adhesive for new flooring. The final wash cleaner shall be a concentrated high-phosphate liquid approved by the manufacturer of the mastic removal product.

PART 3 -- EXECUTION

3.1 PROTECTION OF ADJACENT AREAS

A. Perform all asbestos WORK in such a way as to not contaminate adjacent areas, or interior spaces of components within the abatement area (such as cabinets, ducts, or electrical junction boxes). Where such areas or spaces are contaminated, they shall be cleaned and/or restored to their original condition as directed by the ARCHITECT at the CONTRACTOR's expense.

3.2 NOTIFICATIONS AND PERMITS

A. The CONTRACTOR shall notify the regional office of the United States Environmental Protection Agency (US EPA) in accordance with 40 CFR 61 Subpart M.

B. The CONTRACTOR shall also notify the Alaska Department of Labor, Occupational Safety and Health Division (AK OSHD) in accordance with current State of Alaska asbestos regulations.

C. The CONTRACTOR shall notify the ARCHITECT 48 hours prior to commencement of any abatement WORK, and immediately upon completion or termination of the WORK. Where any emergency removal is required, notifications will be made immediately, but WORK schedules will not be contingent on the notification timing specified in the paragraph.

D. The CONTRACTOR shall carry out disposal in accordance with state and federal requirements, and shall secure necessary permits in conjunction with asbestos removal and transport, and provide timely notification of such actions as may be required by Federal, State, regional and local authorities.

3.3 COMPETENT PERSON

A. All asbestos WORK, including setup and teardown of the asbestos enclosure(s) and control area(s), and all asbestos disposal operations shall be under the direct and continuous on-site

supervision of the Competent Person (who is identified in the Pre-WORK Submittal and whose qualifications and duties are defined in DEFINITIONS above). The Industrial Hygienist shall oversee all activities of the competent person.

3.4 INDUSTRIAL HYGIENIST

A. The CONTRACTOR shall conduct all training and asbestos WORK under the direction of the Industrial Hygienist (who is identified in the Pre-WORK Submittal and whose qualifications and duties are defined in DEFINITIONS above).

3.5 PROJECT INSPECTION

A. While performing asbestos WORK, the CONTRACTOR may be subject to on-site inspection by the ARCHITECT, OWNER's designated representative, fire, safety, and health personnel, and Federal and State inspectors. If the WORK is in violation of specification requirements, or applicable Federal or State regulations, the ARCHITECT may issue a stop-WORK order to be in effect immediately, and which will remain in place until the violation(s) are resolved and, if required by the ARCHITECT, a new or amended asbestos WORK plan is submitted. Restart will not be accomplished without approval of the ARCHITECT. Standby time and expenses required to resolve the violation(s) and provide new or amended submittals shall be at the abatement Subcontractor's expense.

B. The Project WORK Log (see Paragraph 1.6A.1 above) shall be subject to review by the ARCHITECT on a daily basis and at each Application for Payment by the CONTRACTOR.

3.6 SAFETY AND HEALTH COMPLIANCE

A. The CONTRACTOR shall comply with all laws, ordinances, rules and regulations of Federal, State, regional and local authorities regarding demolition, handling, storing, transporting and disposing of asbestos and asbestos containing materials. He shall also comply with the applicable requirements of the current issues of 29 CFR 1910.1001, 29 CFR 1926.1101, and 40 CFR 61 Subparts A and M. Asbestos removal is also required to comply with the provisions of the State of Alaska, Solid Waste Management Codes, title 18 of the Alaska Administrative Code, and the State of Alaska OSHA Standards.

B. Some materials on this project are both lead and asbestos hazards. See Section 02090 of this specification for compliance information regarding lead-containing materials.

3.7 ASBESTOS WORK PROCEDURES

A. The WORK specified in these contract documents shall be carried out in accordance with all applicable local, state, and federal regulations, and the following special requirements:

1. OSHA Class I asbestos WORK: Class I WORK shall comply with the appropriate sections of OSHA 1926.1101(g)(4) “Class I Requirements” and OSHA 1926.1101(g)(5). Certified asbestos abatement workers are a requirement for Class I asbestos WORK.

2. OSHA Class II asbestos WORK: GWB removal and other Class II WORK shall comply with the appropriate sections of OSHA 1926.1101(g)(7) “Work Practices and Engineering Controls for Class II WORK” and OSHA 1926.1101(g)(8). Certified asbestos abatement workers are a requirement for Class II asbestos WORK.

3. Asbestos Handling Procedures: The CONTRACTOR shall sufficiently wet ACM with a fine spray of amended water during removal, cutting or other handling to reduce the emission of airborne fibers. All removed and waste materials shall be placed in plastic disposal bags or other approved containers. Under no circumstances shall asbestos waste or debris be allowed to accumulate in the WORK area.

4. Disposal of Asbestos: Procedures for hauling and disposal shall comply with 40 CFR 61, Subpart M, 40 CFR 241 and 257, and state, regional, and local standards. Abated material and associated debris shall be packaged in accordance with applicable regulations and disposed of at an approved facility. All ACM shall be transported in an enclosed vehicle.
5. Mastic on concrete decks shall be removed using methods recommended by the approved Mastic Remover manufacturer.
6. Final cleaning of concrete deck shall be in accordance with the recommendations of the approved Final Wash Cleaner manufacturer.
7. No lock-down encapsulant shall be applied to cleaned concrete deck.

3.8 MONITORING

A. The abatement Subcontractor shall provide third-party on-site air monitoring for the duration of the Project in accordance with the approved Pre-WORK Submittal.

B. At a minimum the CONTRACTOR shall provide “Area Monitoring”, “Environmental Monitoring”, “Baseline (Background) Monitoring”, “Initial Exposure Assessment Monitoring”, “Personal Monitoring” and “Clearance Monitoring” all as specified in Paragraph 1.5 “DEFINITIONS”, above.

C. The CONTRACTING OFFICER reserves the right to perform confirmation air monitoring including all elements summarized in Asbestos Air Monitoring in DEFINITIONS, above.

D. Clearance Procedures for each abatement area

1. After abatement activities are complete but prior to the application of lockdown sealant and the performance of clearance monitoring, the CONTRACTOR and the OWNER representative shall perform a detailed visual inspection of the WORK area for any visible asbestos residual. If any is found, a complete re-cleaning of the area shall be performed, and the area reinspected. Once the visual inspection is satisfactorily completed the lockdown shall be applied.

2. The CONTRACTOR shall be responsible for all OWNER costs (including costs accrued by the OWNER's representative) relating to all visual inspections after the second failed visual inspection.

3. After the area has passed the visual inspection and has received spray application of lockdown sealant (where applicable) but prior to the removal of the enclosure, clearance monitoring of the WORK area, conducted under non-aggressive conditions, shall be accomplished to confirm the effectiveness of the clean-up operations. Such sampling shall not be performed until all areas and materials within the WORK area are fully dry.

4. Clearance sampling will be done using TEM analysis. Once clearance criteria have been achieved, clearance shall be considered final and removal of any protective enclosure shall be accomplished.

5. The CONTRACTOR shall be responsible for all costs (including costs accrued by the OWNER) relating to all clearance monitoring after the first failed clearance sampling.

END OF SECTION

SECTION 02090 – LEAD ABATEMENT

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplementary Conditions.

B. Contract Drawings, including HAZ0.0, HAZ1.0, HAZ1.2, and HAZ1.3.

1.2 SUMMARY

A. The lead abatement work is in support of renovation of Gastineau Elementary School in Douglas, Alaska.

B. X-ray fluorescence testing has identified the following lead-based paint (LBP) building components in the Haines Elementary School that will impact the overall Project:

1. Ceramic tile on toilet room walls throughout the building;

2. Toilets in some toilet rooms;

3. Sinks in classrooms throughout the building;

4. White dry-erase boards (whiteboards) and bulletin boards in classrooms;

5. Primer on some structural steel (I-beams only) in areas of the building;

6. Paint on metal floor grates in entry areas to the building; and

7. Paint on exterior green or red wood trim and yellow or orange cement asbestos board siding and soffits.

C. The intent of the abatement project is to:

1. Remove and dispose of all ceramic tile on toilet room walls as shown on drawings HAZ1.0 and HAZ1.2;

2. Remove and dispose of toilets in Toilet 22A, Boys' Toilet B4, and Girls' Toilet B5 as shown on HAZ 1.0 and HAZ1.2;

3. Remove and dispose of sinks in classrooms as shown on HAZ1.2 and HAZ1.3;

4. Remove and dispose of whiteboards and bulletin boards as shown on HAZ1.2 and HAZ1.3;

5. Remove and dispose of lead-based paint on I-beams in areas requiring cutting or welding as shown on HAZ1.0, HAZ1.2, and HAZ1.3 and as directed by the general contractor for demolition purposes;

6. Remove and dispose of metal floor grates in entry areas to the building as shown on HAZ1.0, HAZ1.2, and HAZ1.3, and

7. Remove and dispose of exterior green or red wood trim and exterior yellow or orange CAB siding on walls and soffits as shown on HAZ1.0, HAZ1.2, and HAZ1.3.

D. The abatement project includes all material, labor, equipment and other related costs for:

1. mobilization (including moving all equipment and materials onto the site; providing necessary project utilities or improving existing utilities as necessary, arranging for approved storage areas, issuing and posting all notices, and submitting all submittals),

2. installing all necessary critical barriers and engineering controls to establish non-permanent control areas to isolate the various abatement areas and minimize the risk of employee exposure to lead in air during abatement and disposal operations,

3. providing a competent person to oversee abatement operations,

4. completing all project elements as described in Paragraph D. above,

5. cleaning all surfaces and spaces within the confines of the control areas,

6. disposing of hazardous materials and related demolition debris in accordance with these Contract Documents,

7. removing the non-permanent control areas,

8. performing all required monitoring, and

9. performing general cleanup and demobilization.

1.3 COORDINATION AND TIMING OF ABATEMENT ACTIVITIES

A. The building will be unoccupied during the project. The abatement subcontractor shall coordinate with the general contractor for timing of this work.

B. It is the responsibility of the Abatement Subcontractor to coordinate with the General Contractor for scheduling abatement activities, in particular, lead-based paint removal activities on structural steel.

C. The OWNER will provide access to temporary power and to water for direct Project use. The Abatement Subcontractor is responsible for all costs and effort required to develop those utilities for his or her use.

D. Security to the site shall be maintained for the duration of the work.

1.4 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1. Code of Federal Regulations (CFR) Publications:
   40 CFR 241 Guidelines for Land Disposal of Solid Wastes
   40CFR 745.80 Subpart L Lead-Based Paint Activities
   29 CFR 1926.62 Lead Exposures in Construction
   Note: Alaska is a state plan state and the Division of Occupational Safety and Health (AKDOSH) is responsible for the enforcement of OSHA regulations. For projects falling under AKDOSH jurisdiction, 29 CFR 1926.62 takes precedence.

2. Alaska Department of Labor Construction Code:
   Subchapter 15.0101-Hazard Communication
   18 AAC 62 Hazardous Waste Management

1.5 AN EXCERPT FROM 29 CFR 1926.62 (APPLICABLE TO THE WORK IN THIS SECTION)

"Exposure assessment".
1926.62(d)(1)
"General".

1926.62(d)(1)(i)
Each employer who has a workplace or operation covered by this standard shall initially determine if any employee may be exposed to lead at or above the action level.

1926.62(d)(1)(ii)
For the purposes of paragraph (d) of this section, employee exposure is that exposure which would occur if the employee were not using a respirator.

1926.62(d)(1)(iii)
With the exception of monitoring under paragraph (d)(3), where monitoring is required under this section, the employer shall collect personal samples representative of a full shift including at least one sample for each job classification in each work area either for each shift or for the shift with the highest exposure level.

1926.62(d)(1)(iv)

Full shift personal samples shall be representative of the monitored employee's regular, daily exposure to lead.

1926.62(d)(2)
"Protection of employees during assessment of exposure".

1926.62(d)(2)(i)
With respect to the lead related tasks listed in this paragraph (d)(2)(i) of this section, where lead is present, until the employer performs an employee exposure assessment as required in paragraph (d) of this section and documents that the employee performing any of the listed tasks is not exposed above the PEL, the employer shall treat the employee as if the employee were exposed above the PEL, and not in excess of ten (10) times the PEL, and shall implement employee protective measures prescribed in paragraph (d)(2)(v) of this section. The tasks covered by this requirement are:

1926.62(d)(2)(i)(A)
Where lead containing coatings or paint are present: Manual demolition of structures (e.g, dry wall), manual scraping, manual sanding, heat gun applications, and power tool cleaning with dust collection systems;

1926.62(d)(2)(i)(B)
Spray painting with lead paint

1926.62(d)(2)(ii)
In addition, with regard to tasks not listed in paragraph (d)(2)(i), where the employer has any reason to believe that an employee performing the task may be exposed to lead in excess of the PEL, until the employer performs an employee exposure assessment as required by paragraph (d) of this section and documents that the employee's lead exposure is not above the PEL the employer shall treat the employee as if the employee were exposed above the PEL and shall implement employee protective measures as prescribed in paragraph (d)(2)(v) of this section.

1926.62(d)(2)(iii)
With respect to the tasks listed in this paragraph (d)(2)(iii) of this section, where lead is present, until the employer performs an employee exposure assessment as required in paragraph (d) of this section, and documents that the employee performing any of the listed tasks is not exposed in excess of 500 ug/m(3), the employer shall treat the employee as if the employee were exposed to lead in excess of 500 ug/m(3) and shall implement employee protective measures as prescribed in paragraph (d)(2)(v) of this section. Where the employer does establish that the employee is exposed to levels of lead below 500 ug/m(3), the employer may provide the exposed employee with the appropriate respirator prescribed for such use at such lower exposures, in accordance with Table 1 of this section. The tasks covered by this requirement are:

1926.62(d)(2)(iii)(A)
Using lead containing mortar; lead burning

1926.62(d)(2)(iii)(B)
Where lead containing coatings or paint are present: rivet busting; power tool cleaning without dust collection systems; cleanup activities where dry expendable abrasives are used; and abrasive blasting enclosure movement and removal.

1926.62(d)(2)(iv)
With respect to the tasks listed in this paragraph (d)(2)(iv) of this section, where lead is present, until the employer performs an employee exposure assessment as required in paragraph (d) of this section and documents that the employee performing any of the listed tasks is not exposed to lead in excess of 2,500 ug/m(3) (50 x PEL), the employer shall treat the employee as if the employee were exposed to lead in excess of 2,500 ug/m(3) and shall implement employee protective measures as prescribed in paragraph (d)(2)(v) of this section. Where the employer does establish that the employee is exposed to levels of lead below 2,500 ug/m(3), the employer may provide the exposed employee with the appropriate respirator prescribed for use at such lower exposures, in accordance with Table I of this section. Interim protection as described in this paragraph is required where lead containing coatings or paint are present on structures when performing:

1926.62(d)(2)(iv)(A)
Abrasive blasting,

1926.62(d)(2)(iv)(B)
Welding,

1926.62(d)(2)(iv)(C)
Cutting, and

1926.62(d)(2)(iv)(D)
Torch burning.

1926.62(d)(2)(v)
Until the employer performs an employee exposure assessment as required under paragraph (d) of this section and determines actual employee exposure, the employer shall provide to employees performing the tasks described in paragraphs (d)(2)(i), (d)(2)(ii), (d)(2)(iii) and (d)(2)(iv) of this section with interim protection as follows:

1926.62(d)(2)(v)(A)
Appropriate respiratory protection in accordance with paragraph (f) of this section.

1926.62(d)(2)(v)(B)
Appropriate personal protective clothing and equipment in accordance with paragraph (g) of this section.

1926.62(d)(2)(v)(C)
Change areas in accordance with paragraph (i)(2) of this section.

1926.62(d)(2)(v)(D)
Hand washing facilities in accordance with paragraph (i)(5) of this section.

1926.62(d)(2)(v)(E)
Biological monitoring in accordance with paragraph (j)(1)(i) of this section, to consist of blood sampling and analysis for lead and zinc protoporphyrin levels, and

1926.62(d)(2)(v)(F)

Training as required under paragraph (l)(1)(i) of this section regarding 29 CFR 1926.59, Hazard Communication; training as required under paragraph (1)(2)(iii) of this section, regarding use of respirators; and training in accordance with 29 CFR 1926.21, Safety training and education.

1926.62(d)(3)
"Basis of initial determination".

1926.62(d)(3)(i)
Except as provided under paragraphs (d)(3)(iii) and (d)(3)(iv) of this section the employer shall monitor employee exposures and shall base initial determinations on the employee exposure monitoring results and any of the following, relevant considerations:

1926.62(d)(3)(i)(A)
Any information, observations, or calculations which would indicate employee exposure to lead;

1926.62(d)(3)(i)(B)
Any previous measurements of airborne lead; and

1926.62(d)(3)(i)(C)
Any employee complaints of symptoms which may be attributable to exposure to lead.

1926.62(d)(3)(ii)
Monitoring for the initial determination where performed may be limited to a representative sample of the exposed employees who the employer reasonably believes are exposed to the greatest airborne concentrations of lead in the workplace.

1926.62(d)(3)(iii)
Where the employer has previously monitored for lead exposures, and the data were obtained within the past 12 months during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the employer's current operations, the employer may rely on such earlier monitoring results to satisfy the requirements of paragraphs (d)(3)(i) and (d)(6) of this section if the sampling and analytical methods meet the accuracy and confidence levels of paragraph (d)(10) of this section.

1926.62(d)(3)(iv)
Where the employer has objective data, demonstrating that a particular product or material containing lead or a specific process, operation or activity involving lead cannot result in employee exposure to lead at or above the action level during processing, use, or handling, the employer may rely upon such data instead of implementing initial monitoring.

1926.62(d)(3)(iv)(A)
The employer shall establish and maintain an accurate record documenting the nature and relevancy of objective data as specified in paragraph (n)(4) of this section, where used in assessing employee exposure in lieu of exposure monitoring.

1926.62(d)(3)(iv)(B)
Objective data, as described in this paragraph (d)(3)(iv) of this section, is not permitted to be used for exposure assessment in connection with paragraph (d)(2) of this section.

1926.62(d)(4)
"Positive initial determination and initial monitoring".

1926.62(d)(4)(i)
Where a determination conducted under paragraphs (d)(1), (2) and (3) of this section shows the possibility of any employee exposure at or above the action level the employer shall conduct monitoring which is representative of the exposure for each employee in the workplace who is exposed to lead.

1926.62(d)(4)(ii)
Where the employer has previously monitored for lead exposure, and the data were obtained within the past 12 months during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the employer's current operations, the employer may rely on such earlier monitoring results to satisfy the requirements of paragraph (d)(4)(i) of this section if the sampling and analytical methods meet the accuracy and confidence levels of paragraph (d)(10) of this section.

1926.62(d)(5)
"Negative initial determination". Where a determination, conducted under paragraphs (d)(1), (2), and (3) of this section is made that no employee is exposed to airborne concentrations of lead at or above the action level the employer shall make a written record of such determination. The record shall include at least the information specified in paragraph (d)(3)(i) of this section and shall also include the date of determination, location within the worksite, and the name and social security number of each employee monitored.

1926.62(d)(6)
"Frequency".

1926.62(d)(6)(i)
If the initial determination reveals employee exposure to be below the action level further exposure determination need not be repeated except as otherwise provided in paragraph (d)(7) of this section.

1926.62(d)(6)(ii)
If the initial determination or subsequent determination reveals employee exposure to be at or above the action level but at or below the PEL the employer shall perform monitoring in accordance with this paragraph at least every 6 months. The employer shall continue monitoring at the required frequency until at least two consecutive measurements, taken at least 7 days apart, are below the action level at which time the employer may discontinue monitoring for that employee except as otherwise provided in paragraph (d)(7) of this section.

1926.62(d)(6)(iii)
If the initial determination reveals that employee exposure is above the PEL the employer shall perform monitoring quarterly. The employer shall continue monitoring at the required frequency until at least two consecutive measurements, taken at least 7 days apart, are at or below the PEL but at or above the action level at which time the employer shall repeat monitoring for that employee at the frequency specified in paragraph (d)(6)(ii) of this section, except as otherwise provided in paragraph (d)(7) of this section. The employer shall continue monitoring at the required frequency until at least two consecutive measurements, taken at least 7 days apart, are below the action level at which time the employer may discontinue monitoring for that employee except as otherwise provided in paragraph (d)(7) of this section.

1926.62(d)(7)

"Additional exposure assessments". Whenever there has been a change of equipment, process, control, personnel or a new task has been initiated that may result in additional employees being exposed to lead at or above the action level or may result in employees already exposed at or above the action level being exposed above the PEL, the employer shall conduct additional monitoring in accordance with this paragraph.

1926.62(d)(8)
"Employee notification".

1926.62(d)(8)(i)
The employer must, as soon as possible but no later than 5 working days after the receipt of the results of any monitoring performed under this section, notify each affected employee of these results either individually in writing or by posting the results in an appropriate location that is accessible to employees.

1926.62(d)(8)(ii)
Whenever the results indicate that the representative employee exposure, without regard to respirators, is at or above the PEL the employer shall include in the written notice a statement that the employees exposure was at or above that level and a description of the corrective action taken or to be taken to reduce exposure to below that level.

1926.62(d)(9)
"Accuracy of measurement". The employer shall use a method of monitoring and analysis which has an accuracy (to a confidence level of 95 percent) of not less than plus or minus 25 percent for airborne concentrations of lead equal to or greater than 30 ug/m(3).

1.6 PRE-WORK SUBMITTALS

A. Six copies of the Pre-WORK Submittal shall be submitted. The following items shall be included and submitted as a complete package in a three ring binder complete with index and divider tabs. If the lead abatement contractor is also performing the lead abatement, a single binder should be developed including both lead and lead submittals. Modify as necessary to obtain approval by the ARCHITECT five working days prior to any work on the project. The Abatement Subcontractor shall perform its WORK in compliance with the approved Pre-WORK Submittal:

1. Hazardous Materials WORK Plan: Prepare a detailed plain language plan covering the WORK procedures to be used during each and all operations involving hazardous materials. Annotated building plans or site plans no larger than 11 inches by 17 inches shall be included to detail locations for control areas, monitoring locations, access and disposal routes, and other activities where needed. The plan shall include as a minimum the following elements:

2. Testing Laboratory: Submit the name, address, telephone number and qualifications of the independent testing laboratory selected to perform the monitoring, testing and reporting of airborne lead

3. Training: Submit certificates signed by each employee and the Industrial Hygienist that each employee has received the training required by 29 CFR 1926.62, and appropriate State of Alaska Regulations and this specification. Include proof that each employee has completed lead awareness training.

4. Protective Equipment and Protective Method Plans: Details of planned personnel protective equipment requirements and protective methods, including respirators as will be required for each specific type of operation or condition. Include supporting justification when alternate (e.g., less than the maximum specified) protection is proposed.

5. Manufacturer's Data: Provide complete manufacturer's information, including maintenance and usage instructions, on all specialized equipment to be used for lead WORK, including, but not limited to:
   a. Vacuum equipment
   b. Respirators

6. Material Safety Data Sheets (MSDS): Provide copies of the MSDS for each chemical, adhesive, sealant, foam, glue, additive for creation of the amended water, and paints to be utilized, as well as any other material requiring this reporting in accordance with Federal Standard 313B. This requirement is in addition to the requirement for submittal of material data sheets specified elsewhere in the specifications.

B. Any changes to procedures, methods, conditions, etc., identified in the approved Pre-WORK Submittal must be submitted in writing for review and approval by the ARCHITECT prior to the inception of the change. Where changes must be implemented immediately for the protection of workers, personnel outside the WORK area, the structure or the environment, and the change established an environment more stringent than that previously existing, the changes may be implemented by the competent person or other individuals with appropriate authority, and the ARCHITECT notified immediately. These changes will then be submitted in writing within 24 hours for final review and approval.

1.7 POST-WORK SUBMITTALS

A. Six copies of a post-WORK submittal shall be submitted. The following items shall be included and approved by the ARCHITECT as complete before final payment is approved:
   a. A copy of all shipping manifests that document disposal of all hazardous materials at an approved solid waste facility.

PART 2- PRODUCTS—NOT USED

PART 3- EXECUTION

3.1 PROTECTION OF ADJACENT AREAS

A. Perform all hazardous materials WORK in such a way as to not contaminate adjacent areas. Such areas or spaces are assumed free of lead dust contamination, and if they are found to be contaminated after abatement activities, they shall be cleaned and/or restored to their original condition as directed by the ARCHITECT at the Abatement Subcontractor's expense.

3.2 NOTIFICATIONS AND PERMITS

A. The Abatement Subcontractor shall notify the ARCHITECT 48 hours prior to commencement of any abatement WORK, and immediately upon completion or termination of the WORK. Where any emergency removal is required, notifications will be made immediately, but WORK schedules will not be contingent on the notification timing specified in the paragraph.

B. The Abatement Subcontractor shall carry out disposal in accordance with state and federal requirements, and shall secure necessary permits in conjunction with lead removal and transport, and provide timely notification of such actions as may be required by Federal, State, regional and local authorities.

3.3 PROJECT INSPECTION

A. While performing lead WORK, the Abatement Subcontractor may be subject to on-site inspection by the OWNER, the ARCHITECT (or designated representative), fire, safety, and health personnel, and Federal and State inspectors. If the WORK is in violation of specification requirements, or applicable Federal or State regulations, the ARCHITECT may issue a stop-WORK order to be in effect immediately, and which will remain in place until the violation(s) are resolved and, if required by the ARCHITECT, a new or amended lead WORK plan is submitted. Restart will not be accomplished without approval of the ARCHITECT. Standby time and expenses required to resolve the violation(s) and provide new or amended submittals shall be at the Abatement Subcontractor's expense.

B. The Project WORK Log (see Paragraph 1.7A.1 above) shall be subject to review by the OWNER and the ARCHITECT on a daily basis and at each Application for Payment by the Abatement Subcontractor.

3.4 SAFETY AND HEALTH COMPLIANCE

A. The Abatement Subcontractor shall comply with all laws, ordinances, rules and regulations of Federal, State, regional and local authorities regarding demolition, handling, storing, transporting and disposing of lead and lead containing materials. He shall also comply with the applicable requirements of the current issues of 29 CFR 1910.1001, 29 CFR 1926.1101, and 40 CFR 61 Subparts A and M. Lead removal is also required to comply with the provisions of the State of Alaska, Solid Waste Management Codes, title 18 of the Alaska Administrative Code, and the State of Alaska OSHA Standards.

3.5 LEAD DUST WORK PROCEDURES

A. In order to ensure worker safety, the following procedures shall be used when removing lead hazards:

1. Ensure that abatement employees have completed lead awareness training, and appropriate training under the EPA Renovation, Repair, and Painting (RRP) Rule.

2. Install appropriate engineering controls to minimize the risk of employee exposure to lead in air during demolition, cleaning, and disposal operations,

3. Respirators shall be worn by all workers at all times,

4. and A mass balance of the waste stream and the TCLP results show that all demolition debris from this project may be disposed of as regular demolition debris.

3.6 MONITORING

A. At a minimum the Abatement Subcontractor shall provide “Area Monitoring”, “Environmental Monitoring”, “Baseline (Background) Monitoring”, “Initial Exposure Assessment Monitoring”, “Personal Monitoring” and “Clearance Monitoring” all as specified in Paragraph 1.5 “DEFINITIONS”, above.

3.7 CLEARANCE PROCEDURES FOR EACH ABATEMENT AREA

A. After abatement activities are complete and the performance of clearance monitoring, the Abatement Subcontractor and the OWNER representative shall perform a detailed visual inspection of the WORK area for any visible lead dust residual. If any is found, a complete recleaning of the area shall be performed, and the area reinspected. Once the visual inspection is satisfactorily completed, a wipe test will be performed in accordance with the EPA Lead RRP Rule. Once the wipe test has been passed, lockdown sealant shall be applied.

B. The Abatement Subcontractor shall be responsible for all costs relating to all visual inspections (including costs accrued by the OWNER’s representative) after the second failed visual inspection.

C. After the area has passed the visual inspection but prior to the removal of the enclosure, clearance monitoring of the WORK area shall be accomplished to confirm the effectiveness of the clean-up operations.

D. The Abatement Subcontractor shall be responsible for all costs relating to all clearance monitoring (including costs accrued by the OWNER’s representative) after the first failed clearance sampling.

END OF SECTION

SECTION 02230 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Removing existing vegetation.
2. Clearing and grubbing.
3. Removing above and below-grade site improvements.
4. Disconnecting, capping or sealing, and removing site utilities and/or abandoning site utilities in place.
5. Temporary erosion- and sedimentation-control measures.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or videotape.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at location determined by Owner.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify Call Before You Dig at the following for area where Project is located before site clearing at 586-1333.

C. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 02300 "Earthwork."

1. Obtain approved borrow soil material from an off-site source when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify vegetation to remain.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures including a Stormwater Pollution Prevention Plan (SWPPP) to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's permission.

E. Excavate for and remove underground utilities indicated to be removed.

F. Removal of underground utilities is included in Division 2 Sections.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots, obstructions, and debris to a suitable depth below exposed subgrade.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 12 inches.

3.5 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property at an approved waste disposal site.

END OF SECTION 02230

SECTION 02231 - TREE PROTECTION AND TRIMMING

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. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.
2. Division 2 Section “Planting Soil” for manufacturing of planting soils.
3. Division 2 Section “Exterior Plants” for planting trees, shrubs and other plants.

1.3 DEFINITIONS

A. Arborist: Personnel certified as an Arborist in good standing and meeting the requirements as set forth by the International Society of Arboriculture (ISA).

B. Finish Grade: Elevation of finished surface of planting soil.

C. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

D. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

E. Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, as indicated on Drawings or as defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line if not indicated on Drawings.

1.4 SUBMITTALS

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

B. Samples: For each type of protection-zone fencing.

C. Tree Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

D. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

E. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

F. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1.5 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA, licensed arborist in jurisdiction where Project is located, current member of ASCA, or registered Consulting Arborist as designated by ASCA.

1.6 PROJECT CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic (except along existing path).
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements.

1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch maximum opening in pattern and supported by tubular or T-shape galvanized-steel posts spaced not more than 8 feet apart. High-visibility orange color, nonfading.
2. Height of Fencing: 4 feet

B. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes pre-punched and reinforced; legibly printed with nonfading lettering.

1. Sign to be printed with the following or approved equal: “Tree Protection Area. No equipment or materials to be stored or deposited in this area.”

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3.2 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones in a manner that will prevent people from easily entering protected area.

1. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Landscape Architect.

B. Protection-Zone Signage: Install protection-zone signage to fencing in visibly prominent locations in a manner approved by Landscape Architect.

C. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Landscape Architect.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Landscape Architect and remove when construction operations are complete and equipment has been removed from the site.

3.3 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Division 2 Section "Earthwork."

B. Do not allow exposed roots to dry out before placing permanent backfill.

3.4 ROOT PRUNING

A. Prune roots that are affected by temporary and permanent construction. Prune roots as follows:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.

2. Temporarily support and protect roots from damage until they are permanently covered with soil.
3. Cover exposed roots with burlap and water regularly.
4. Backfill as soon as possible according to requirements in Division 2 Section "Earthwork."

B. Root Pruning at Edge of Protection Zone: Prune roots by cleanly cutting all roots to the depth of the required excavation.

3.5 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

C. Minor Fill within Protection Zone: Where existing grade is 2 inches or less below elevation of finish grade, fill with topsoil. Place planting soil in a single uncompacted layer and hand grade to required finish elevations.

3.6 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.7 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Landscape Architect.

1. Have arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
2. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
3. Perform repairs within 24 hours.
4. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by Architect.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 02231

SECTION 02300 - EARTHWORK

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. Section Includes:

1. Preparing subgrades for walks, pavements, turf, and grasses and plants.
2. Excavating and backfilling for buildings and structures.
3. Structural fill for concrete walks and pavements.
4. Structural fill and base course for asphalt paving.
5. Subsurface drainage backfill for walls and trenches.
6. Excavating and backfilling trenches for utilities and pits for buried utility structures.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe. Backfill placed during the initial lift of structural backfill beside and around foundations or structural footings and walls.
2. Final Backfill: Backfill placed over initial backfill to fill a trench. Backfill placed over Initial Backfill to fill an excavation for a foundation or structural footing or wall.

B. Base Course: Aggregate layer placed above structural fill and/or as indicated on plans.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe immediately above laid pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Structural Fill: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk. Structural fill also includes aggregate layer placed at and around structures as noted on plan drawings.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

L. Native Material and Backfill: Existing soil material that is determined suitable for use as shown on plan drawings.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled low-strength material, including design mixture.
3. Warning tapes.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each borrow material source proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 1557.

C. Blasting plan by approved agency.

D. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

A. Blasting: No blasting is permitted.

B. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

C. Pre-excavation Conference: Conduct conference at an Owner determined location.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

A. Utility Locator Service: Notify Call Before You Dig at the following for area where Project is located before site clearing:

1. All above-ground and underground utilities: 907-586-1333.

B. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures including SWPPP, are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Imported Backfill: Pororous shot rock back fill material consisting of crushed or naturally occurring granular material containing not more than 1% clay lumps or other readily decomposed material meeting the following grading requirement:

1. 100% passing the 3" sieve;

2. 20-70% passing the No.4 sieve;

3. Not more than 6% passing the No. 200 sieve.

E. Base Course: Aggregate base course shall consist of crushed gravel or crushed stone, conforming to the quality requirements of AASHTO M 147. The aggregate shall be free from lumps, balls of clay, or other objectionable matter, and shall be durable and sound.

Base course shall be sampled according to "WAQTC FOP for AASHTO T2 – Sampling Aggregates" as described in the *Alaska Test Methods Manual*, published by the Alaska Department of Transportation and Public Facilities.

Coarse aggregate (that material retained on the No. 4 sieve) shall be crushed stone and shall consist of sound, tough, durable rock of uniform quality. Rock shall be free of schist that cleaves along preferred foliation planes. Rock shall be free of platy mineral grains. Metamorphosed rock shall be free of slaty cleavage. All material shall be free from clay balls, vegetable matter or other deleterious matters. Coarse aggregate shall not be coated with dirt or other finely divided mineral matter. All aggregates shall be free of roots and wood. In addition, coarse aggregate shall meet the following requirements:

Property	**Value**	**Test Method**
L.A. Wear, %	25 max.	AASHTO T 96
Degradation Value	45 min.	ATM 313
Fracture, %	70 min.	WAQTC FOP for AASHTO TP 61
Sodium Sulfate Loss, %	9 max.	AASHTO T 104

Aggregate shall not exceed eight (8) percent thin -elongated pieces as determined by ATM 306. Fine Aggregate: Fine aggregate (passing the No. 4 sieve) shall meet the quality requirements of AASHTO M 29.

Base course material shall conform to the following gradation as specified:

1. 100% passing the 1" sieve;

2. 70-100% passing the 3/4" sieve;

3. 50-80% passing the 3/8" sieve;

4. 35-80% passing the No.4 sieve;

5. 8-20% passing the No. 40 sieve;

6. 0-6% passing the No. 200 sieve.

F. Bedding Course: Bedding, Class A, shall be aggregate conforming to the following gradation:

1. 100% passing the 1-1/2” sieve;

2. 0-35% passing the No.4 sieve;

3. Not more than 6% passing the No. 200 sieve.

Bedding material shall be non-frost susceptible material.

G. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

H. Sand: ASTM C 33; fine aggregate.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 90 lbf; ASTM D 4632.
3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
4. Tear Strength: 25 lbf; ASTM D 4533.
5. Puncture Strength: 25 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 70 sieve, minimum; ASTM D 4751.
7. Permittivity: 0.5 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, flowable concrete material produced from the following:

1. Portland Cement: ASTM C 150, Type I or Type II.
2. Normal-Weight Aggregate: ASTM C 33, 3/4-inch nominal maximum aggregate size.
3. Water: ASTM C 94/C 94M.
4. Air-Entraining Admixture: ASTM C 260.

B. Produce conventional-weight, controlled low-strength material with 1500-psi compressive strength when tested according to ASTM C 495.

2.4 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. In all areas, excavation is to be carried down, as necessary, until suitable subgrade material is encountered as determined by the Engineer.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Where required to prevent caving of the trench, or by any safety law or regulation such as OSHA, the CONTRACTOR shall furnish and install bracing and/or sheeting to protect the excavation. This bracing and/or sheeting shall be removed as trench backfill progresses.

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: As indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 6 inches deeper than bottom of pipe and conduit elevations to allow for bedding course.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.7 SUBGRADE INSPECTION

A. Notify Engineer when excavations have reached required subgrade.

B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements and sloped benches with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Engineer.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 STRUCTURAL FILL AND BACKFILL

A. Place and compact in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place on subgrades free of mud, frost, snow, or ice.

C. Imported backfill and fill shall be compacted to 95% of optimum density as determined by AASHTO T180-D.

3.11 BEDDING

A. Bedding shall be placed in conformance with the lines and grades shown on the Drawings. Before placing any bedding material, the bottom of the trench shall be prepared as described above. The specified bedding material shall then be placed in layer(s) the full width of the trench, each layer not exceeding eight inches in thickness loose measure, and compacted to 95% of maximum density as determined by AASHTO T 180 D, until the elevation of the plan grade is attained.

3.12 TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with controlled low-strength materials to elevation of bottom of footings.

D. Backfill voids with satisfactory soil while removing shoring and bracing.

E. Place and compact initial backfill of bedding material, to a height of 12 inches over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

F. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

G. Place and compact final backfill of satisfactory soil to final subgrade elevation. Fill shall be compacted to 95% of optimum density as determined by AASHTO T180-D

H. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

I. Install warning tape directly above utilities and indicated on Drawings.

3.13 FILL AND BACKFILL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact Structural Fill to a minimum density of 95% as determined by AASHTO T180-D. Additional passes may be ordered to finalize the level of compactive effort required, at no additional cost to the Owner, based upon the performance of the Contractor's equipment.

D. Compact base course to not less than the following level of effort:

1. Under structures, building slabs, steps, retaining walls, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material. Compact to a minimum density of 95% as determined by AASHTO T180-D.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material. Compact to a minimum density of 95% as determined by AASHTO T180-D.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material. Use a level of effort of a minimum of eight complete coverage passes, back and forth, provided by a minimum 15 ton vibratory steel drum roller suited for base course compaction.
4. For utility trenches, compact each layer of initial and final backfill soil material Compact to a minimum density of 95% as determined by AASHTO T180-D.

3.15 GRADING

A. General: Uniformly grade areas to plan elevations to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.16 STRUCTURAL FILL AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place structural fill and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place structural fill and base course under pavements and walks as follows:

1. Place base course material over structural fill under concrete pavement and sidewalks.
2. Shape structural and base course to required crown elevations and cross-slope grades.
3. Place base course 6 inches or less in compacted thickness in a single layer.
4. Place structural and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 18 inches for subbase and 12 inches for base course.
5. Compact structural fill and base course at optimum moisture content to a minimum density of 95% as determined by AASHTO T180-D. In places not accessible to rolling equipment, material shall be compacted with hand-tamping equipment.
6. Blading, rolling, and tamping shall continue until the surface is smooth and free from waves and irregularities. If at any time the mixture is excessively moistened, it shall be serrated by means of blade graders, harrows, or other approved equipment, until the moisture content is such that the surface can be recompacted and finished as above.

3.17 FIELD QUALITY CONTROL

A. Special Inspections: Owner may engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 1000 cy or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 100 feet or less of trench length, but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property to approved disposal site.

END OF SECTION 02300

SECTION 02510 - WATER DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for water service provided by the City & Borough of Juneau.

1.3 DEFINITIONS

A. DI: Ductile Iron.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

B. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

D. NSF Compliance:

1. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify Owner no fewer than 72 hours in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without Owner's written permission.

1.9 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated. Class 52 Pipe shall be used for all pipe.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile-standard pattern or AWWA C153, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Gaskets: AWWA C111, rubber.

2.2 JOINING MATERIALS

A. All joints shall conform to the requirements of ANSI/AWWA C600

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

2.3 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
      1) Mueller, Clow, Kennedy or M&H or comparable as approved by the City and Borough of Juneau.

   2. Nonrising-Stem, Resilient-Seated Gate Valves:

      a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.

         1) Standard: AWWA C509.
         2) Minimum Pressure Rating: 200 psig.
         3) End Connections: Mechanical joint.
         4) Interior Coating: Complying with AWWA C550.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Underground water-service piping NPS 4 to NPS 8 shall be the following:

   1. Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.

3.3 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts

B. The following requirements apply:

   1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, metal-seated gate valves with valve box.

3.4 PIPING INSTALLATION

A. Make connections larger than NPS 2 with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to MSS SP-60.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

B. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

1. Install PE corrosion-protection encasement according to ASTM A 674 or AWWA C105.

C. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:

1. Under Driveways: With at least 36 inches cover over top.
2. In Loose Gravelly Soil and Rock: With at least 12 inches additional cover.

D. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

E. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

F. See Division 15 Section "Domestic Water Piping" for potable-water piping inside the building.

3.5 JOINT CONSTRUCTION

A. Make pipe joints according to the following:

1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.

3.6 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.
3. Set-screw mechanical retainer glands.
4. Bolted flanged joints.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.7 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

C. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

D. Pressure-Reducing Valves: Install in vault or aboveground between shutoff valves. Install full-size valved bypass.

3.8 CONNECTIONS

A. Piping installation requirements are specified in other Division 2 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. See Division 2 Section "Piped Utilities - Basic Materials and Methods" for piping connections to valves and equipment.

C. Connect water-distribution piping to service stub-out. Connect with Gate Valve at stub out.

D. Ground equipment according to Division 16 Section "Grounding and Bonding."

E. Connect wiring according to Division 16 Section "Conductors and Cables."

3.9 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water. Prior to any tests performed, all newly installed water facilities shall be tested by the Contractor in the following sequence:

1. Open-bore flushing
2. Hydrostatic testing
3. Disinfection

B. Open-Bore Flushing: To remove any foreign matter.

1. The Contractor shall furnish, install and remove all fittings and pipe necessary to perform the flushing, at no additional cost to the City or Owner. Under no circumstances will open-bore flushing through hydrants or reduced outlets be permitted. All flushing water shall be controlled as to not damage neighboring property.

2. It will be the Contractor's responsibility to notify the Architect and the CBJ Water Department at least forty-eight (48) hours in advance of any flushing operations. The CBJ and Owner will not be responsible for any cost incurred by the Contractor for flushing.

C. Hydrostatic Tests: Test in accordance with the requirements of ANSI/AWWA C600 .

1. The Contractor shall furnish all necessary assistance, equipment, labor, materials, and supplies necessary to complete the test to the satisfaction of the Owner and Architect.

2. The Contractor shall suitably valve-off or plug the outlet to the existing or previously-tested water main at his expense, prior to making the required hydrostatic test. Prior to testing, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall, at his expense, install coporation cocks at such points so that air can be expelled as the line is slowly filled with water.

3. All hydrostatic testing will be performed through test copper. Use of fire hydrant and service connections for testing will not be allowed.

4. The hydrostatic pressure shall be one hundred pounds per square inch (100 psi) greater than static line pressure but not less than one hundred fifty pounds per square inch (150 psi) any place within the system being tested. The duration of each hydrostatic pressure test shall be two (2) hours. After the required test pressure has been reached, the pumping will be terminated. If the pressure does not drop more than 5 pounds per square inch, that section of line will not be subject to any future hydrostatic testing.

5. Cracked or defective pipe, gaskets, mechanical joints, fittings, valves, or hydrants discovered as a consequence of the hydrostatic tests shall be removed and replaced with sound material at the Contractor's expense. The test shall then be repeated until the results are satisfactory.

6. The contractor shall notify the Architect forty-eight (48) hours, two (2) working days, prior to any testing and shall notify them two (2) hours in advance of the scheduled time if the test is to be cancelled. In the event the Owner and Architect have not been notified of cancellation and the Contractor is not prepared for the test as scheduled, the Contractor shall reimburse the Architect for all expenses incurred.

D. Dinfection: Shall be done in accordance with ANSI/AWWA C657.

1. Chlorine shall be used for disinfection. Chlorine shall be applied with a calcium hypochlorite and water mixture. Calcium hypcholorite shall be comparable to commercial products known as HTH, Perchloren, or Machoclor.

2. The chlorinating agent shall be applied at the beginning of the section adjacent to the feeder connecting, insuring treatment of the entire line. Water shall be fed slowly into the new line with chlorine applied in amounts to produce a dosage of forty (40) ppm to fifty (50) ppm. Application of the chlorine solution shall continue until the required dosage is evident at all extremities of the newly laid line.

3. Calcium hypochloride shall be injected or pumped into the water main. During chlorination, all intermediate valves, service lines, fire hydrants, fire lines and accessories shall be operated. Valves shall be manipulated so that the 40-50 ppm chlorine solution in the line being treated will not flow back into the line supplying water. The superchlorinated solution shall remain int he system of 24-hours, minimum. Hydrostatic testing of a water line containing chlorine mixture will not be allowed.

4. A residual of not less than twenty-five (25) ppm chlorine shall remain in all parts of the water main at the end of the twenty-four (24) hour period, after which the residual shall be flushed from the line and neutralized at its extremities until the replacement water tests are equal chemically to those of the permanent source of supply. After another twenty-four (24) hours, bacteriaological samples shall be taken per the CBJ Water Department Standards.

5. After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with pipe. In order to prevent damage to the pipe lining or corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main until chlorine measurements who that the concentration in the water leaving the main is no higher that that generally prevailing in the distribution system or is acceptable for domestic use.

3.10 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 2 Section "Earthwork."

B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel.

C. Prepare reports of purging and disinfecting activities.

END OF SECTION 02510

SECTION 02530 - SANITARY SEWERAGE

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. Section Includes:

1. Pipe and fittings.
2. Nonpressure and pressure couplings.
3. Cleanouts.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Expansion joints and deflection fittings.
2. Backwater valves.

B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

B. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.

C. Field quality-control reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's permission.

PART 2 - PRODUCTS

2.1 DUCTILE-IRON, GRAVITY SEWER PIPE AND FITTINGS

A. Pipe: ASTM A 746, for push-on joints.

B. Standard Fittings: AWWA C-104, ductile or gray iron, for push-on joints.

C. Compact Fittings: AWWA C153, ductile iron, for push-on joints.

D. Gaskets: AWWA C111, rubber.

E. Joints: ASTM C-14 AND ASTM C-443, “O” Ring type

2.2 NONPRESSURE-TYPE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Ductile-Iron Soil Pipes: ASTM C 564, rubber.

C. Nonpressure-Type, Rigid Couplings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. ANACO-Husky.
b. US Pipe.
c. Everett Johnson Prescott, Inc.

2. Description: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling, molded from A 536 Ductile Iron, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.3 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Josam Company.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.
d. Tyler Pipe.
e. Watts Water Technologies, Inc.
f. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover.
3. Top-Loading Classification(s): Medium Duty.
4. Sewer Pipe Fitting and Riser to Cleanout: AWWA C-151, for Class 50 ductile iron pipe and AWWA C104/ANSI A21.4 fittings.

2.4 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed steel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install proper couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. Install gravity-flow, nonpressure, drainage piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of 0.5 percent unless otherwise indicated.
2. Install piping with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
3. Install ductile-iron, gravity sewer piping according to ASTM A 746.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:

1. Join ductile-iron, gravity sewer piping according to ASTM C-14 AND ASTM C-443 for push-on joints.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.

a. Shielded flexible or rigid couplings for pipes of same or slightly different OD.

3.4 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.5 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts, and use cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.

1. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.

B. Set cleanout frames and covers in earth in cast-in-place-concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.6 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's sanitary building drains specified in Division 15 Section "Sanitary Waste and Vent Piping."

B. Make connections to existing piping.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch overlap with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.7 IDENTIFICATION

A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.8 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:

a. Fill sewer piping with water. Test with pressure of at least 10-foot head of water, and maintain such pressure without leakage for at least 15 minutes.
b. Close openings in system and fill with water.
c. Purge air and refill with water.
d. Disconnect water supply.
e. Test and inspect joints for leaks.

6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

a. Option: City & Borough of Sitka, Exfiltration Test for Mains and Services as follows:

The contractor shall furnish all facilities and personnel for conducting the test under the observation of the Architect. The equipment and personnel shall subject to the approval of the Architect.

The Contractor may desire to make an air test prior to back filling for his own purpose. However, the acceptance air test shall be made after backfilling has been completed and compacted.

Immediately following the pipe cleaning, the pipe installation shall be tested with low pressure air. Air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches 4.0 psi greater than the average back pressure of any ground water that may submerge the pipe. At least (2) minutes shall be allowed for temperature stabilization before proceeding.

The pipline shall be considered acceptable when tested at an average pressure of 4.0 psi greater than the average back pressure of any ground water that may submerge the pipe, if:

The total rate of air loss from any section tested in its entirety between manholes or between manholes and cleanout structures does not exceed 2.0 cubic feet per minute.

Pressure gauges shall be incremented in not more than 1/2 pound increments for accurate tests.

If the pipe installation fails to meet test requirements, the Contractor shall determine at his own expense the source or sources of leakage and he shall repair or replace all defective materials or Workmanship. The completed pipe installation shall meet the requirements of this test.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials.

3.9 CLEANING

A. Clean dirt and superfluous material from interior of piping. Flush with potable water.

END OF SECTION 02530

SECTION 02630 - STORM UTILITY DRAINAGE PIPING

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. Section Includes:

1. Pipe and fittings.
2. Nonpressure transition couplings.
3. Catch basins.
4. Manholes
5. Ornamental Grate

1.3 SUBMITTALS

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

B. Shop Drawings:

1. Catch basins. Include plans, elevations, sections, details, frames, covers, and grates.
2. Manholes. Include plans, elevations, sections, details, frames, covers and grates

C. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet and vertical scale of not less than 1 inch equals 5 feet. Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

D. Product Certificates: For each type of polyethelyne pipe and fitting, from manufacturer.

E. Field quality-control reports.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Owner no fewer than five days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PE PIPE AND FITTINGS

A. Corrugated PE Pipe and Fittings NPS 3 to NPS 10: AASHTO M 252M, Type S, with smooth waterway for coupling joints.

1. Soiltight Couplings: AASHTO M 252M, corrugated, matching pipe and fittings.

2.2 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:

1. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.

C. Unshielded, Flexible Couplings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Dallas Specialty & Mfg. Co.
b. Fernco Inc.
c. Logan Clay Pipe.
d. Mission Rubber Company; a division of MCP Industries, Inc.
e. NDS Inc.
f. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

2. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

2.3 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, ACI 350/350R, and the following:

1. Cement: ASTM C 150, Type II.

2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.4 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 6-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
6. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.

B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for HS-20, loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: 17 by 20 inches minimum unless otherwise indicated.
2. Grate Free Area: Must be of a type that will not create a hazard for bicycle traffic.

C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for HS-20, structural loading. Include 24-inch ID by 6-inch riser with 4-inch minimum width flange, and 26-inch-diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Must be of a type that will not create a hazard for bicycle traffic.

2.5 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section.
4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.

5. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
6. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
7. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
8. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12-inch intervals.
9. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
10. Grade Rings: Reinforced-concrete rings to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

2.6 ORNAMENTAL GRATE

A. Bronze Ornamental Grate

1. Description: Silicone Bronze Grate with baked on oil finish by Iron Age Designs; Product ID ME25.
2. Diameter: 25 inches or per manufacturer.
3. Edge Thickness: 1.5 inches or per manufacturer.
4. Manufacturer: Iron Age Designs
   2104 SW 152nd Street, #4
   Burien, WA 98166
   Phone: 206-276-0925
   Fax: 206-257-0318

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in 02300 Section "Earthwork."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves,

and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
2. Install PE corrugated piping according to ASTM D 2321.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join corrugated PE piping according to ASTM D 3212 for push-on joints.

3.4 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.5 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.6 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

a. Alignment: Less than full diameter of inside of pipe is visible between structures.
b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
c. Damage: Crushed, broken, cracked, or otherwise damaged piping.

d. Infiltration: Water leakage into piping.
e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Re-inspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

a. Exception: Piping with soil-tight joints unless required by authorities having jurisdiction.
b. Option: Test plastic piping according to ASTM F 1417.

C. Leaks constitute defects that must be repaired.

D. Replace leaking piping using new materials.

3.7 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 02630

SECTION 02741 - ASPHALT CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. This WORK consists of the furnishing and mixing of aggregate, asphalt cement, and additives at a mixing plant and the hauling, spreading, and compaction of the asphalt concrete mixture on a previously prepared surface, all as specified in the contract and in conformance with the lines, grades and thicknesses shown on the Plans.

B. Asphaltic concrete mix for this project shall be Type II, Class B.

C. The WORK under this Section includes providing all labor, materials, tools and equipment necessary to apply a Fog Seal Coat to all asphalt surfaces. This Fog Seal Coat shall be composed of a slow setting asphalt emulsion and diluted with water. Blotting the Fog Seal Coat with sand after the emulsion breaks is required.

PART 2 - PRODUCTS

2.1 COMPOSITION OF ASPHALT CONCRETE MIXTURES - JOB MIX DESIGN

A. Asphalt concrete mixtures shall be composed of aggregate, asphalt cement, and required additives combined within the limits for the type and class specified in the Contract.

B. It is the CONTRACTOR's responsibility to insure that, in addition to the aggregate gradation requirements, the aggregate material meets all the requirements of this Section and asphalt concrete mixture meets the applicable design parameters, when tested according to ATM T17.

C. At least 15 days prior to the production of asphalt concrete pavement the CONTRACTOR shall submit a current mix design. The mix design shall be performed within six (6) months of the construction season. The following related items shall be submitted with the mix design:

1. Notification that aggregate proposed for the asphalt concrete mixture is available for sampling.
2. A letter stating the proposed gradation for the Trial Job Mix Design, gradations for individual stockpiles, and blend ratio for each aggregate stockpile.
3. A minimum of three 1-gallon samples of the asphalt cement proposed for use in the mixture, including name of product, manufacturer, test results as required, manufacturer's certificate of compliance, and a temperature viscosity curve for the asphalt cement.
4. A 1/2 pint sample of the anti-strip additive proposed, including name of product, manufacturer, and manufacturer's data sheet, and current Materials Safety Data Sheet (MSDS).
5. The CONTRACTOR shall accompany the ENGINEER during sampling, and shall furnish assistance to assure that the ENGINEER obtains representative samples.

D. The ENGINEER will evaluate the gradation for the Trial Job Mix Design and suitability of the materials submitted. If the asphalt concrete mixture conforms to the design parameters specified in Table 02801-1 when tested according to ATM T-17, the ENGINEER will approve the Trial Job Mix Design and specify a target value for the asphalt cement content, mixing temperature and additives.

E. If the Trial Job Mix Design does not conform to the design parameters specified in Table 02801-1, when tested by the ENGINEER, the CONTRACTOR shall submit in writing to the ENGINEER another proposed gradation for a second Trial Job Mix Design. Samples of aggregate and additional asphalt cement shall be obtained in the same manner as for the original Trial Job Mix Design. The ENGINEER shall evaluate and test the second Trial Job Mix Design and either approve or disapprove the design based on the Contract Requirements. The above procedure shall be repeated until the Trial Job Mix Design is approved.

F. If the CONTRACTOR proposes a change in source of aggregate material, source of asphalt cement, or a change in the gradation target values after production has started, the CONTRACTOR shall submit in writing the proposed gradation target values to the ENGINEER and request a new Trial Job Mix Design be evaluated for approval. The CONTRACTOR shall accompany the ENGINEER during sampling and shall furnish all the assistance needed to assure that the ENGINEER obtains representative samples. Approval of the new Trial Job Mix Design and/or aggregate material will require testing and evaluation. Trial Job Mix Design test results will be available within 15 calendar days of submittal. If the asphalt concrete mixture conforms to the design parameters specified in Table 02801-1, when tested in accordance with ATM T-17, the ENGINEER will develop a new target value for the asphalt cement content, mixing temperature and additives. The new target values for gradation and asphalt cement content will only be in effect on asphalt concrete mixture produced after the CONTRACTOR submittal of the new gradation target values for the Trial Job Mix Design.

G. The location and type of the mixing plant shall be included with the Trial Job Mix Design data. Asphalt concrete mixtures produced from different plants shall not be mixed.

H. All trial job mix designs as required will be assessed and paid for by the CONTRACTOR.

TABLE 02801-1

ASPHALTIC CONCRETE MIX REQUIREMENTS		
DESIGN PARAMETERS	CLASS A	CLASS B
Stability, lbs.	1,800	1,800
Flow, 0.01 inch (0.25 mm)	8-14	8-16
Voids in total mix, percent	2-5	3-5
Compactions, number of blows ea side of test specimen	75	50
Dust-asphalt ratio (1)	0.6-1.2	0.6-1.2
Percent oil content	5.5-7	5.9-7
Voids in the mineral aggregate (VMA) Type I Type II Type III	 13.0 14.0 15.0	 12.0 13.0 14.0

(1) Dust-asphalt ratio is defined as the percent of material passing the U.S. No. 200 sieve divided by the percent of asphalt (calculated by weight of mix).

2.2 ASPHALT AGGREGATES

A. Aggregate for Plant Mix Asphalt Pavement:

1. Coarse Aggregate: Coarse aggregate (material retained on the No. 4 sieve) shall be crushed stone or crushed gravel and shall consist of sound, tough, durable rock of uniform quality. All material shall be free from clay balls, vegetative or other deleterious matters. Coarse aggregate shall not be coated with dirt or other finely divided mineral matter. Coarse aggregate shall also meet the following requirements:

Percent of Wear	AASHTO T-96	30 max.
Degradation Value	ATM T-13	30 min.
Percent Sodium Sulfate Loss	AASHTO T-104	9 max.
Percent Fracture	ATM T-4	80 min. single face/ 70 min. double face

2. Asphalt concrete aggregate shall not exceed 8 percent thin - elongated pieces as determined by ATM T-9.
3. Fine Aggregate: Fine aggregate (passing the No. 4 sieve) shall meet the quality requirements of AASHTO M-29.
4. The several aggregate fractions for the mixture shall be sized, graded, and combined in such proportions that the resulting composite blend conforms to the grading requirements of Table 02801-2. Aggregates gradations shall be determined by ATM T-7, except when the sample is obtained by extraction.
5. Asphalt aggregate may be a blend but shall be 80% mechanically crushed with no more than 20% natural sand.

TABLE 02801-2

ASPHALT CONCRETE AGGREGATE Percent Passing by Weight			
Sieve Design	Type I	Type II	Type III
1 inch	100	–	–
¾ inch	80-95	100	–
½ inch	60-88	80-95	100
3/8 inch	48-77	60-87	80-95
No. 4	28-63	36-72	44-81
No. 8	14-55	19-62	26-70

No. 16	9-46	10-52	16-59
No. 30	6-39	7-45	9-49
No. 50	5-29	5-34	6-36
No. 100	4-18	4-21	4-22
No. 200	3-5	3-5	3-5

2.3 ASPHALT MATERIALS

A. The grade of asphalt cement material will be PG 58-22. The asphalt cement material shall conform to the applicable requirements of this Section and will be conditionally accepted at the source. If the material is to be conditionally accepted at the source, the CONTRACTOR shall provide a manufacture's certificate of compliance in accordance with this section and test results of the applicable quality requirements of this section before the material is shipped. If there is a change in the source of the asphalt cement or if the kinematic viscosity (viscosity at 275 degrees Fahrenheit) of the asphalt supplied for the Trial Job Mix Design by a factor of 2 (doubles or halves) or more, then operations shall be suspended while a new Trial Job Mix Design proposal is submitted for approval.

B. ASPHALT CEMENT

1. Asphalt cement shall be designated PG58-22 and conform to the requirements below:

TEST FOR	SPECIFICATIONS	AASHTO METHOD	SPEC.
Penetration	(4ºC [39.2ºF], 200g, 60s), dmm RTFO Aged Residue Note 1	T-49	15+
Ductility	(7.2ºC [45ºF], 1 cm/min), cm RTFO Aged Residue	T-51	10+
Absolute Viscosity	60ºC [140ºF]), P Original Binders RTFO Aged Residue	T202 T202	1,100+ 1,500-6,000
Kinematic Viscosity	(135ºC [275ºF]), RTFO Viscosity/Orig. Viscosity	T-201	275+
Absolute Viscosity Ratio	(60ºC [140ºF]), RTFO Viscosity/Orig. Viscosity		4.0-
Flash Point, Cleveland Open Cup	C(F) Original Binder 232°+(450°+)	T-48f	232º+(450º+)
Solubility in Trichloroethylene	%, Original Binder	T-44	99.0+
Ductility	(25ºC [77ºF], 5 cm/min), cm RTFO Aged Residue	T-51	75+

Note 1 "RTFO Aged Residue" means the asphaltic residue obtained using the rolling thin film oven test (RTFO Test), AASHTO T-240.

C. CUT-BACK ASPHALTS

1. Cut-back asphalts shall conform to the requirements of AASHTO M-81 and M-82 except as follows:

   a. In Table 1 of M-82, reduce the minimum absolute viscosity on residue from distillation at 60C to 100, in the MC-30 and MC-250 columns, and revise the maximum distillate percentage by volume of total distillate at 225ºC for MC-30 to read: 35%.

D. EMULSIFIED ASPHALTS

1. STE-1 cationic emulsified asphalts shall comply with the requirements listed below:

TABLE 02801-3

TESTS ON EMULSION	
Viscosity @ 77ºF., SSF	30 max.
Storage Stability, 1 day, %	1 max.
Demulsibility 35 ml. 0.8% SDS, %	25 min.
Particle Charge	Positive*
Sieve, % retained	0.10 max.
Distillation Oil by Vol. of Emulsion, %	5 max.
Distillation Residue by Wt. of Emulsion, %	45 min.
TESTS ON RESIDUE	
Penetration @ 77ºF.	100-200
Ductility @ 77ºF., 5cm/min., cm	40 min.
Solubility in TCE, %	97.5 min.

* If particle charge test is inconclusive, material having a max. Ph value of 6.7 will be acceptable.

2. CSS-1 Cationic Emulsified Asphalt shall conform to the requirements of AASHTO M208.

E. STORAGE AND APPLICATION TEMPERATURES

1. Asphalt materials required by the Specifications shall be stored and applied within the temperatures ranges indicated in Table 02801-4.

TABLE 02801-4
STORAGE AND APPLICATION TEMPERATURES

Type and Grade of Material	Spray ºF	Mix ºF	Storage EF
MC-30	85+		140 Max
MC-250	165+	165-220	240 Max
RC-800	200+		200 Max
CRS-2	125-175		100-175
CMS-2	125-175	120-160*	100-175
CSS-1	90-120	90-160*	50-125
AC-2.5	270+	235-280**	325 Max
AC-5	280+	250-295**	325 Max
AC-10	280+	250-315**	325 Max
STE-1	70-140	70-150	50-125

PBA-2		350 Max	275-325 ºF

* Temperature of the emulsified asphalt in the pugmill mixture.

** As required to achieve Kinematic viscosity of 150-300 centistokes.

2.4 ANTI-STRIP ADDITIVES

A. Anti-strip agents shall be used in the proportions determined by ATM T-14 and shall be included in the approved Trial Job Mix Design. At least 70% of the aggregate shall remain coated when tested in accordance with ATM T-14.

2.5 PROCESS QUALITY CONTROL

A. The PND Engineers, Inc. has the exclusive right and responsibility for determining the acceptability of all materials incorporated into the Project. It is expressly understood, however, that the CONTRACTOR is solely responsible for the sampling and testing of material for process control of the asphalt concrete mixture including screening, crushing, blending, stockpiling of the aggregate, production of the asphalt concrete mixture and monitoring compaction of the asphalt concrete mixture.

B. The results of the acceptance testing performed by the ENGINEER may not be available to the CONTRACTOR until a period of at least seven (7) working days has elapsed from the date of sampling.

2.6 MATERIALS

A. The type of asphalt material used for the Fog Seal Coat shall be CSS-1 cationic emulsified asphalt.

B. The asphalt material shall conform to the applicable requirements of Section 02801 - Asphalt Concrete Pavement and will be conditionally accepted at the source.

C. The blotter material shall be suitable clean sand.

PART 3 - EXECUTION

3.1 WEATHER LIMITATIONS

A. The asphalt concrete mixture shall not be placed on a surface with standing water, on an unstable roadbed when the base material is frozen, or when weather conditions prevent the proper handling or finishing of the mixture. No asphalt concrete, Type II mixture shall be placed unless the surface temperature is 40^0 F or warmer.

3.2 EQUIPMENT

A. All equipment shall be in good working order and free of asphalt concrete mix buildup. All equipment shall be available for inspection and demonstration 72 hours prior to placement of asphalt concrete.

B. Bituminous Mixing Plants:

1. Mixing plants shall conform to AASHTO M-156.
2. Proportioning (batch) scales shall not be used for weighing material for payment. Weigh scales used in conjunction with a storage silo may be used to weigh the final product for payment, provided the scales are certified.

C. Hauling Equipment:

1. Trucks used for hauling asphalt mixtures shall have tight, clean, smooth metal beds which have been thinly coated with a minimum amount of either paraffin oil, lime water solution, or other manufactured material included approved by the ENGINEER. Diesel or fuel oil shall not be used.
2. Each truck shall have a watertight canvas cover of such size as to extend at least one foot over the sides and end of the truck bed and be adequately secured to protect the asphalt concrete mixture. The use of the canvas cover shall be at the ENGINEER's direction.

D. Asphalt Pavers:

1. Asphalt pavers shall be self-propelled units, provided with a heated vibratory screed. Grade and cross slope shall be controlled through the use of automatic grade and slope control devices. The paver screed control system shall be automatically actuated by the use of a string line, or minimum 30-foot long ski. The length of the string line shall be adjusted to produce the required surface smoothness.
2. The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed.
3. The screed assembly shall produce a finished surface of the required smoothness, thickness, and texture without tearing, shoving, or displacing the asphalt concrete mixture. Screed extensions used for paving a constant width shall be heated and vibrated. Auger extensions shall be the same length as the rigid screed extensions.
4. The use of a pickup machine to transfer the asphalt mixture from a windrow to the paver hopper will be permitted, provided the pickup machine is capable of collection of the windrowed material without damage to the underlying course. The ENGINEER will not allow the continued use of the pickup machine if segregation, excessive temperature loss, or any detrimental effects are observed.
5. Paver hopper wings shall either be left in the top or down position throughout the paving operation. If the CONTRACTOR wishes to dump the wings during paving, the material on the wings and in the hopper shall not be incorporated into the finish mat or included in the quantity for payment.
6. The screed assembly shall have a joint compaction device and a joint edge restrainer.

E. Rollers:

1. The CONTRACTOR shall supply a sufficient number and weight of rollers to compact the mixture to the required density while maintaining the pace of the paving operations. Rollers shall be of the static steel wheel, vibratory steel wheel, and pneumatic tire type, self propelled and capable of reversing without backlash. They shall be specifically designated to compact hot asphalt concrete mixtures. The use of equipment, which results in crushing of the aggregate, will not be permitted. Pneumatic tire rollers shall be fully skirted; shall be at least 6 feet wide; and shall be configured such that the rear group of tires align to cover the spaces between the front group of tires. The roller shall have an operating weight per tire of at least 3,000 pounds. Tires shall be of equal size, a minimum of 20 inches in diameter, shall be inflated to at least 80 p.s.i. and maintained so that tire pressures do not vary more than 5 p.s.i. between any two tires.

3.3 PREPARATION OF EXISTING SURFACE

A. The existing surface shall be prepared in conformance with the plans and Specifications. Existing paved surfaces shall be cleaned of loose material by sweeping with a power broom, supplemented by hand sweeping, if necessary.

B. Contact surfaces of curbing, gutters, manholes, and other structures shall be coated with a thin, uniform coating of tack coat prior to the asphalt mixture being placed.

C. Surfaces, which have received a prime coat, shall be allowed to cure such that the prime coat is not picked up by the haul vehicles. Surfaces, which have received an emulsion tack coat, shall be allowed to break prior to placement of asphalt concrete mixture.

D. The grading, shaping, and strengthening where applicable, of the road surface shall be as specified in Section 02204 – Base Course.

E. A string line installed by the CONTRACTOR at the direction of the ENGINEER will be the edges of paving.

F. Prior to paving over any existing pavement, the surface shall be thoroughly cleaned and an application of tack coat applied that will provide a strong bond between the two layers.

3.4 PREPARATION OF ASPHALT

A. A continuous supply of the asphalt cement shall be supplied to the mixer at a uniform temperature, within 25 degrees F of the Job Mix Design mixing temperature.

3.5 PREPARATION OF AGGREGATES

A. The aggregate for the asphalt concrete mixture shall be heated and dried to a temperature compatible with the mix requirements specified. Flames used for drying and heating shall be properly adjusted to avoid damage to the aggregate and to avoid the presence of unburned fuel on the aggregate. Any asphalt concrete mixture in which soot or fuel is present shall be wasted and no payment made.

B. Drying operations shall reduce the aggregate moisture content to the extent that the moisture content of the asphalt concrete mixture, sampled at the point of acceptance for asphalt cement content, shall be no more than 0.5% (by total weight of mix), as determined by ATM T-25.

3.6 MIXING

A. The aggregate, asphalt cement additives shall be combined in the mixer in the amounts required by the Job Mix Design.

B. The materials shall be mixed such that a complete and uniform coating of the aggregate is obtained. For batch plants, dry aggregate shall be placed in motion immediately prior to the addition of asphalt cement. Wet mixing time shall be adequate to obtain 98% coated particles when tested in accordance with AASHTO T-195.

C. The temperature of the asphalt concrete mixture at the time of the mixing shall be as determined by the Job Mix Design.

3. 7 TEMPORARY STORAGE OF ASPHALT CONCRETE MIXTURE

A. Temporary storing or holding of hot asphalt concrete mixture in silo type storage bins will be permitted.

B. All the asphalt concrete mixture drawn from the silo type storage bins shall conform to all of the requirements for asphalt concrete mixtures as if loaded directly into hauling equipment from the mixing plant. Signs of visible segregation, heat loss, changes from the Job Mix Design, change in the characteristics of asphalt cement, lumpiness or stiffness of the mixture will be cause for rejection.

C. Unsuitable asphalt concrete mixture shall be disposed of by the CONTRACTOR at no cost to the OWNER.

3.8 SPREADING AND PLACING

A. The CONTRACTOR shall submit a Paving Plan for the ENGINEER's review a minimum of five working days prior to initiating the paving operation. The Paving Plan shall consist of, but not be limited to, the following:

1. Paving schedule to include sequence of operations.
2. Paving schedule distributed to Residents within the project boundary.
3. Operational details to include:

    a. Plant operating capacity and target production rate.
    b. Number and capacity of trucks, cycle time, and delivery rate.
    c. The manufacturer and model of the paver and pickup machine, to include information on grade followers, sensors, operating speed and production rate of the pavers.
    d. Number, type, weight, and operating speed of rollers.

e. Location of longitudinal joints and method of constructing transverse joints.
f. Construction plan for paving intersections and driveways.
g. The manufacturers, model number, and the last certified calibration date for the CONTRACTOR's nuclear densometer gauge.

B. The asphalt concrete mixture shall be laid upon a surface approved by the ENGINEER, spread and struck off to the required compacted thickness. Asphalt pavers shall be used to distribute the asphalt concrete mixture in lanes of such widths as to hold to a practical minimum the number of longitudinal joints required, subject to the requirements of this Section.

C. When laying asphalt concrete mixtures, the paver shall be operated at uniform forward speeds consistent with the delivery of asphalt concrete mix to avoid unnecessary stopping and starting of the paver.

D. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the asphalt concrete mixture shall be spread, raked and luted by hand tools. For such areas the asphalt concrete mixture shall be placed to the required compacted thickness.

E. Any asphalt concrete mixture, which is observed to be contaminated or segregated, will be rejected.

F. When the section of roadway being paved is open to traffic, adjacent traffic lanes shall be paved to the same elevation within 24 hours unless prevented by weather or other factors beyond the CONTRACTOR's control.

G. When multiple lifts are specified in the Contract, the final lift shall not be placed until all other lower lift pavement throughout that section, as defined by the Paving Plan, has been placed and accepted. Paving shall not begin until all adjacent curb has been poured and cured for 72 hours or until satisfactory strength is achieved.

3.9 COMPACTION

A. Immediately after the asphalt mixture has been spread, struck-off and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling.

B. The target value for density will be 95% of the maximum specific gravity (MSG) as determined in accordance with AASHTO T-209 for the first sample from each lot of asphalt concrete mixture, as defined in this Section. Acceptance testing for field density will be determined in accordance with ATM T-18 or ASTM D-2950, as directed in writing by the ENGINEER.

C. The asphalt concrete mixture, including the leveling course, shall have a minimum of 3 complete passes with a pneumatic-tired roller prior to cooling to 175 degrees F. A pass is defined as once over each point on the pavement surface.

D. Areas not accessible to the rollers shall be graded with rakes and lutes and compacted with mechanical tampers. For depressed areas a trench roller may be used to achieve the required compaction.

E. Any asphalt concrete mixture that becomes loose and broken, segregated, mixed with dirt, or is any other way defective shall be removed and replaced with fresh hot asphalt concrete mixture, which shall be compacted to conform with the surrounding area. Any area showing an excess or deficiency of asphalt cement shall be removed and replaced.

F. Rollers or other vehicles shall not be parked or left standing on pavement that has not cooled sufficiently to prevent indentation by wheels.

3.10 JOINTS

A. Joints shall be made to ensure a continuous bond between old and new sections of the course. All joints shall present the same texture and smoothness as other sections of the course.

B. When joining old existing pavement and new pavement, the old pavement shall be cut in a neat line, with a power driven saw.

C. Improperly formed joints resulting in surface irregularities shall be removed, full road width, replaced with new material, and thoroughly compacted. Rolling of joints after the material has cooled below 160 degrees F shall not be allowed. All pavement removal shall be precut to a neat line using a power driven saw.

D. A thin tack coat of asphalt cement or asphalt emulsion shall be applied on all cold joints prior to placing any fresh asphalt concrete mixture against the joint. This WORK shall be completed by the CONTRACTOR just prior to paving.

E. Transverse joints shall be formed by cutting back on the previous run to expose the full depth of the course or by using a removable bulkhead.

F. The longitudinal joints in one layer shall offset those in the layer immediately below by at least 6 inches. The joints in the top layer shall be at centerline or lane lines except where pre-formed marking tape striping is required, in which case the longitudinal joint in the top layer shall be offset not more than 1 foot.

G. The density at the joints shall not be more than 2% lower than the density specified in the lanes away from the joint.

H. Rolling at the longitudinal joint should be done from the hot side with a vibratory roller as soon as possible. The hot side should always overlap the cold side by 1" - 1.5" at the joint.

I. The finished asphalt surface along the edge of curb and gutter shall be 1/4" above the top edge of the gutter pan.

3.11 SURFACE TOLERANCE

A. The surface will be tested after final rolling at selected locations using a 10-foot straightedge. The variation of the surface from the testing edge of the straightedge between any two contacts with the surface shall not exceed 3/16 inch. The asphalt concrete mixture in all defective areas shall be

removed and replaced. All costs associated with removal and replacement of asphalt concrete mixture in the defective areas shall be borne by the CONTRACTOR.

3.12 PATCHING DEFECTIVE AREAS

A. Any asphalt concrete mixture that becomes contaminated with foreign material or is in any way defective shall be removed. Defective materials shall be removed for the full thickness of the course. The pavement shall be saw cut so that the sides are perpendicular and parallel to the direction of traffic and so that the edges are vertical. Edges shall be coated with a thin tack coat material. Fresh asphalt concrete mixture shall be placed in sufficient quantity so that the finished surface will conform to grade and smoothness requirements. The asphalt concrete mixture shall be compacted to the density specified. No payment shall be made for material replacing defective material. All costs associated with the patching of defective areas shall be borne by the CONTRACTOR.

3.13 ACCEPTANCE SAMPLING AND TESTING

A. Asphalt concrete pavement will be accepted for payment based on the ENGINEER's approval of: the Job Mix Design; the materials; the placement and compaction of the asphalt concrete pavement to the specified depth, finished surface requirements, tolerances, and densities. Any area of finished surfacing that is visibly segregated, fails to meet surface tolerance requirements or specified thickness or densities, or is in any way defective, shall be removed and replaced with new asphalt concrete pavement. Removal and replacement of defective pavement shall be at no additional cost to the OWNER. The full depth of the new asphalt concrete mixture will be replaced; surface patching will not be allowed.

B. Acceptance sampling and testing shall be performed by the ENGINEER. Acceptance testing will determine whether the materials, installation and compaction efforts used by the CONTRACTOR have met these Specifications. The results of the acceptance testing performed by the ENGINEER may not be available to the CONTRACTOR until a period of at least seven working days has elapsed from the date of sampling.

C. A lot will be the total asphalt placed on the project per season. A sublot will be one day's production on the project. Each sublot shall be randomly sampled and tested in accordance with this Subsection for asphalt cement content, density, and gradation.

D. Samples taken for the determination of asphalt cement content and gradation will be taken from behind the screed prior to initial compaction. Asphalt cement content shall be determined by ATM T-23. The cost of this sampling (one per sublot) will be borne by the ENGINEER. The CONTRACTOR shall pay for additional testing if not in compliance.

E. ASTM D-2950 will be used to measure density. A minimum of six random tests will be taken from each sublot. When using ASTM D-2950, the MSG or laboratory pounds per cubic feet shall be determined by using the Rice Method, AASHTO Designation T 209-93. The Rice Method, for the purposes of nuclear gauge compaction testing, replaces the Marshal Method. Acceptance testing for density will be completed by the ENGINEER in the following sequence:

1. The ENGINEER will randomly sample the in-place asphalt concrete mixture with a nuclear densometer gauge. Frequency of this testing will be determined by the ENGINEER. The

CONTRACTOR may request a re-test of any nuclear densometer sample not within Specification limits. The ENGINEER will select the sample location for the re-test. Only one re-test per sample will be allowed. This acceptance testing will be paid for by the OWNER.

2. If the random density acceptance testing indicates that the density specified has not been met, further sampling and testing will be required by the ENGINEER. At the direction of the ENGINEER, the CONTRACTOR shall cut at least one full depth 6" diameter core sample (per lot) from the finished mat. The samples shall be neatly cut by a core drill at the randomly selected locations. Core holes for sampling shall be backfilled and compacted with hot asphalt concrete mixture within two hours of sampling. The core samples will be tested for compliance with these specifications at a certified laboratory specified by the ENGINEER. Any sampling and testing required beyond the nuclear densometer testing by the ENGINEER, will be paid for by the CONTRACTOR.

F. At the direction of the ENGINEER, samples taken for the determination of aggregate gradation may be obtained from one of the following locations:

1. From the combined aggregate cold feed conveyor via a diversion chute, or from the stopped conveyor belt.
2. For dry batched aggregates, on batch plants, the pugmill shall be cleaned by dry batching at least two dry batches or until no asphalt coating is found on the aggregate. One complete batch will be dropped in a loader bucket and hand mixed thoroughly with a shovel until a sample can be taken. The sample will be used for acceptance, gradation, control, and payment.

G. Additional materials testing will be required whenever a new Trial Job Mix Design is approved. The MSG for each lot will be determined from the first randomly selected sample from the first sublot. Materials testing includes, but is not limited to, gradations, extractions, density testing and core analysis.

H. If field density is determined in accordance with ASTM D-2950, additional core samples will be required whenever a new Trial Job Mix Design is approved or whenever there is a change in the typical section. The MSG for each lot will be determined from the first randomly selected sample from the first sublot. The CONTRACTOR shall reimburse the OWNER for all materials testing beyond the first $2,000.00. Materials testing includes but is not limited to gradations, extractions, density testing and core analysis.

I. All tests necessary to determine conformance with the requirements specified in this Section will be performed by the ENGINEER and paid for by the CONTRACTOR.

J. The frequency of materials testing for asphalt is determined by the CBJ Materials Frequency Guide. For circumstances not covered by the Specifications, the Alaska Department of Transportation and Public Facilities Standard Specifications for Highway Construction, 1998 Edition, shall be used and incorporated by reference herein. The CA/Inspector shall meet with Project Manager prior to paving to determine the appropriate testing frequency.

3.14 GENERAL

A. The CONTRACTOR shall provide equipment for heating and applying the asphalt emulsion and for applying blotter material and removing blotter material. The distributor equipment shall conform to the requirements set forth in Section 02801 - Asphalt Concrete Pavement. In addition, a self-propelled aggregate spreader of approved design, and a rotary paver broom, shall be provided by the CONTRACTOR.

B. The emulsion shall not be applied to wet surfaces, or when the air temperature is below 45° F, or when weather conditions appear to threaten precipitation.

C. The surface shall be clean and free from all loose material.

D. The rate of application shall be between 0.08 and 0.15 gallons per square yard, or as directed by the ENGINEER. Building paper shall be placed over the end of the previous applications and the joining application shall start on the building paper. Building paper shall be permitted on the untreated portion of the roadbed. As soon as the asphalt material has been blotted and will not pick up, traffic may be transferred to the treated portion and the remaining width of the section fogged.

E. After application of the Fog Seal Coat, blotter sand shall be applied by a ten (10) yard capacity truck with a rear-mounted spreader at a rate of three (3) to five (5) pounds per square yard.

F. Blotting sand shall be removed by means of a rotary broom and vacuum truck within ten (10) days after application of the Fog Seal Coat. The road surface shall be less than 65°F when sweeping.

G. The Fog Seal Coat and sand blotters shall commence prior to the addition of base course to the shoulder to assure a fresh, clean asphalt-bonding surface.

H. All existing asphalt to remain and all new asphalt surfaces shall be seal coated prior to installing painted traffic markings.

END OF SECTION 02801

SECTION 02821 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 DESCRIPTION

A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing chain link fencing, as shown on the Drawings.

PART 2- PRODUCTS

2.1 MATERIALS

A. Fencing materials shall conform to AASHTO M 181 including fittings and hardware. Use 9 gauge fabric wire, 2-inch mesh. Sizes of posts, gate frames, rails and braces shall conform to the dimensions and weights shown on the Drawings.

B. Post tops shall consist of ornamental tops. The post tops shall fit over the outside of the posts and shall exclude moisture from the tubular posts.

C. Stretcher bars shall not be less than 1/4" by 3/4", and shall be of lengths one-inch less than the full height of the fabric with which they are to be used. The stretcher bars shall be arranged for attaching the fabric to all terminal posts by threading through the fabric, by bands, or by other positive mechanical means. One stretcher bar shall be provided for each gate, and end post and two for each corner and pull post.

D. Ties or clips of adequate strength shall be provided in sufficient number for attaching the fabric and stretcher bars to all terminal posts at intervals not exceeding 15 inches.

E. Bands or clips of adequate strength shall be provided in sufficient number for attaching the fabric and stretcher bars to all terminal posts at intervals not exceeding 15 inches.

F. Posts. Interior posts shall be of the length required for a footing depth of three feet. End posts shall be of the length required for a footing depth of four feet. All posts shall be tubular.

G. Reinforcing Wires. Top reinforcing wire shall be provided. The reinforcing wires shall be of coiled spring wire not less than seven gauge plus, or minus 0.005-inch in diameter. Ties or clips shall be provided for attaching each wire to the fabric at intervals not exceeding two feet.

H. Portland cement concrete shall conform to Section 03300 – Cast-in-Place Concrete.

I. Mesh and wire size shall be two-inch mesh, 0.148-inch in diameter.

PART 3 - EXECUTION

3.1 GENERAL

A. All trees, brush, and other obstacles that would interfere with the construction of the fence shall be removed and disposed of as directed by the ENGINEER.

B. Prior to installing the fence, the existing ground along the line of the fence location shall be graded to a smooth, uniform surface, to the extent that no abrupt changes in grade exist between adjacent fence posts.

C. The CONTRACTOR shall stake all fences and gates. After staking is complete, the CONTRACTOR shall complete a walk-through with the OWNER and ENGINEER. The OWNER and ENGINEER shall make minor adjustments and changes at no additional cost to the OWNER.

D. All posts shall be set in Portland cement concrete footings. The tops of the footings shall be level with the ground, shall be crowned to provide drainage, and shall be troweled smooth. Concrete footings shall be twelve inch diameter. The footings shall be allowed to cure for a period of at least seven days before any stress is applied.

E. The posts shall be set vertical and shall be of uniform and equal height above the ground, with a maximum horizontal spacing of ten feet, center-to-center. The chain link fabric shall be fastened to the top reinforcing wire, and the lower edge of the fabric shall be fastened to the bottom tension wire.

F. For fabric heights of six feet or more, a 1 1/4" inch top rail shall be provided. Top rails for fabric heights less than six feet, and intermediate brace rails shall be provided, if shown on the Drawings.

G. Grading. The fence shall be constructed to follow a smooth profile. Nowhere, however, throughout the fence length shall be the distance between the ground surface and the bottom tension wire be greater than four inches, nor less than two inches. Where excavation is necessary to meet this requirement, the ground will be graded level not less than one foot on either side of the fence. Grading for all specific conditions shall be such that water will not be allowed to pond in the immediate area of the fence.

H. General Appearance. All runs of fence shall present the same general appearance. The product of one manufacturer only will be accepted, except for items which do not influence the appearance of the completed fence. The fence shall be the product of a manufacturer who has demonstrated by actual installations of a similar nature, that its product is the type required. No used, re-rolled, or open seam steel will be permitted in posts, gate frames, rails or braces.

END OF SECTION 02821

SECTION 02870 – SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 specification sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following site and street furnishings:

1. Benches
2. Trash cans
3. Bike racks

B. Related Sections include the following:

1. Section 03300 – Cast In Place Concrete, for installation of anchor bolts cast in concrete footings.

C. Products furnished, but not installed under this Section, include anchor bolts to be cast in concrete footings.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details for approval.

B. Samples for Initial Selection: For units with factory-applied color finishes.

C. Product Schedule: For site and street furnishings. Use same designations indicated on Drawings.

D. Maintenance Data: For site and street furnishings to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of site and street furnishings through one source from a single manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the following or approved equal:

1. Benches:
   a. Landscapeforms
      431 Lawndale Ave, Kalamazoo, MI 49048
      (800) 521-2546
      www.landscapeforms.com

2. Trash Cans:
   a. BearSaver,
      1390 S. Milliken Ave, Ontario, CA 91761
      (909) 605-1697

3. Bike Racks:
   a. CORA
      (800) 354-8624
      www.cora.com

2.2 MATERIALS

A. Steel: Free from surface blemishes and complying with the following:

1. Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53, or electric-resistance-welded pipe complying with ASTM A 135.
3. Tubing: Cold-formed steel tubing complying with ASTM A 500.
4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 569/A 569M and complying with dimensional tolerances in ASTM A 500; zinc coated internally and externally.
5. Sheet: Commercial steel sheet complying with ASTM A 569/A 569M.

B. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard, noncorrodible materials; commercial quality; concealed, recessed, and capped or plugged. Provide as required for site and street furnishings' assembly, mounting, and secure attachment.

2.3 BENCH

A. Landscapeforms: Petoskey, backless, metal rod bench, or approved equal.

B. Unit Configuration: Single, 62” length.

C. Installation Method: Embedded, anchored below finished grade to concrete footing as indicated by manufacturer.

D. Steel Finish: Powder coated.

E. Finish: As approved, from a full range of standard colors.

2.4 TRASH CANS

A. Bear Saver, Hid-A-Bag, Model Number: HA-P, 32 gallon capacity, or approved equal, with standard supplied can. Unit to be accessible including lid.

B. Installation Method: Anchored to concrete pad as indicated by manufacturer.

C. Steel Finish: Powder coated.

D. Color: Black.

2.5 BIKE RACKS

A. Bike Rack: EXPO "W" series Bicycle Rack, 10 bike capacity

B. Installation Method: Anchored in-ground as indicated by manufacturer.

C. Material: Stainless Steel.

D. Accessories: In-ground grout cover.

2.6 FABRICATION

A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.

B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.

C. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain

cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

D. Steel and Iron Components: Galvanized, galvanized and color coated, or color coated. Bare metal steel or iron components are not permitted.

E. Exposed Surfaces: Polished, sanded, or otherwise finished; smooth all surfaces, free from burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.

F. Factory Assembly: Assemble components in the factory to the greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Landscape Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 STEEL AND GALVANIZED STEEL FINISHES

A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard, baked, polyester-TGIC, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.9 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions, unless more stringent requirements are indicated. Complete field assembly of site and street furnishings, where required.

B. Unless otherwise indicated, install site and street furnishings after landscaping and paving have been completed.

C. Landscape Architect to approve location of furnishings prior to installation. Install site and street furnishings level, plumb, true, and securely anchored at locations indicated on Drawings. Where indicated on drawings, orient furnishings with paving patterns.

3.3 CLEANING

A. After completing site and street furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION 02870

SECTION 02920 - LAWNS AND GRASSES

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. Section Includes:

1. Seeding.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.
2. Division 2 Section “Planting Soil” for manufacturing of planting soils.
3. Division 2 Section “Exterior Plants” for planting trees, shrubs and other plants.
4. Division 2 Section “Landscape Maintenance” for maintenance requirements and techniques for exterior plants, lawns, grasses and meadows.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Manufactured Planting Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

C. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

D. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

E. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

F. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

G. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

H. Native Surface Soil: Whatever soil is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 SUBMITTALS

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

B. Certification of grass seed.

1. Certification of each seed mixture.

C. Product certificates.

1.5 QUALITY ASSURANCE

A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

1.7 MAINTENANCE SERVICE

A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:

1. Seeded Turf: 60 days from date of Substantial Completion.

a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species as follows:

TYPE	VARIETY	%
Kentuck Bluegrass *Poa prantensis*	Merion, Nugget, or Park	45%
Red fescue *Festuca rubra*	Arctared, Boreal, or Pennlawn	45%
Annual Ryegrass *Lolium multiflorum*	-	10%

C. Seed shall have a minimum 85% germination rate and maximum weed seed content shall be 0.5%.

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.

2.3 PLATING SOIL MIX

A. Planting Soil: Create planting soil as directed in Section 02940-Planting Soil with the addition of the following to the planting soil for turf areas.

1. Weight of Lime per 1000 Sq. Ft.: 25 pounds.

2.4 MULCHES

A. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.

PART 3 - EXECUTION

3.1 TURF AREA PREPARATION

A. Prepare turf areas in the same manner as directed under Section 02930 Exterior Plants for Planting Bed Preparation.

B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.2 SEEDING

A. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 5 lb/1000 sq. ft.

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. Do not seed areas to receive turf grass within 3 feet of tree trunks.

E. Protect seeded areas from hot, dry weather or drying winds by applying peat mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch and roll surface smooth.

3.3 TURF MAINTENANCE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

B. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain height appropriate for species without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings.

C. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate

applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

3.4 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

END OF SECTION 02920

SECTION 02930 – EXTERIOR PLANTS

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. Section Includes:

1. Plants
2. Fertilizers.
3. Mulches.
4. Tree Stabilization.
5. Edging.
6. Filter Fabric

B. Related Sections include the following:

1. Division 2 Section "Tree Protection and Trimming" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.
2. Division 2 Section "Earthwork" for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.
3. Division 2 Section "Lawns and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.
4. Division 2 Section “Planting Soil” for manufacturing of planting soils.
5. Division 2 Section “Landscape Maintenance” for maintenance requirements and techniques for exterior plants, lawns, grasses and meadows.

1.3 DEFINITIONS

A. Arborist: Personnel certified as an Arborist in good standing and meeting the requirements as set forth by the International Society of Arboriculture (ISA).

B. Backfill: The earth used to replace or the act of replacing earth in an excavation.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.

D. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when

removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

E. Finish Grade: Elevation of finished surface of planting soil.

F. Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

G. Invasive Species: Plant material as listed within the most recent US Department of Agriculture publication for Region 10 (Alaska) or most recent University of Alaska Fairbanks Cooperative Extension publication, specific for the region of Alaska in which the project is located.

H. Native Topsoil: Existing native organic and mineral soils used to produce planting soil.

I. Herbicide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, and fungicides.

J. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

K. Planting Area: Areas to be planted.

L. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

M. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

N. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

O. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.

P. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

Q. Weeds: Plant material that is not specified in the Drawings or Specifications.

1.4 REFERENCES

A. ANSI Z60.1 (latest edition), American Standard for Nursery Stock, American Nursery and Landscape Association.

1.5 SUBMITTALS

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

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
2. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to the Project.

B. Provide samples of the following in the quantities indicated.

1. Organic Mulch: 1-pint volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
2. Mineral Mulch: 2 lb. of each mineral mulch required, in sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot of material to be delivered and installed on the site; provide an accurate indication of color, texture, and makeup of the material.
3. Tree tie and wire: One tie and 6 inch segment of wire
4. Edging and stakes: Manufacturer's standard size, to verify material and color selected
5. Filter Fabric/Weed Control Barrier: 12 by 12 inches..

C. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

D. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

E. Planting Schedule: Indicating anticipated planting dates for exterior plants.

F. Product data. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and installation details for approval.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified Landscape Installer whose work has resulted in successful establishment of plants.

B. Experience: Five years' experience in landscape installation in addition to requirements in Division 1 Section "Quality Requirements."

C. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

D. Pesticide Applicator: State licensed, commercial.

E. Native Surface Soil and Planting Soil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; deleterious material; pH; and mineral and plant-nutrient content for topsoil and each type of planting soil.

1. Report suitability of soil for plant growth. State-recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

F. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."

G. Tree and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches above ground for trees up to 4-inch caliper size, and 12 inches above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

H. Observation: Landscape Architect may observe all plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Landscape Architect retains right to observe all plant material further for size and condition of balls and root systems, insects, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Landscape Architect may remove a portion of or all growth media from the root system for inspection of the roots and to ensure proper nursery practices. This shall be a maximum of two plants per species, up to 2% of the species if greater. The Landscape Architect reserves the right to observe and remove growing media from additional plants should previous observations indicate defects in the root system or nursery practices. It will be the responsibility of the Contractor to immediately plant or repot in original container, if approval of material is granted.

1. Notify Landscape Architect of arrival of planting materials for inspection 7 days prior to installation.

I. Approval: Plant material shall not be planted by the Contractor until observed and approved by the Landscape Architect. All rejected material shall be immediately removed from the Project site. All rejected material shall be replaced with observed and approved material of the required species and size at no additional cost. The Landscape Architect reserves the right to reject individual plants, or the entire shipment of any species or multiple species not meeting the specifications.

J. Trees shall meet the following specifications for quality:

1. As typical for the species/cultivar, trees shall be healthy and vigorous, as indicated by an inspection for the following:

    a. foliar crown density
    b. length of shoot growth (throughout crown)
    c. size, color and appearance of leaves

d. uniform distribution of roots in the container media
e. appearance of roots
f. absence of twig and/or branch dieback
g. relative freedom from insects and diseases

2. There shall be no roots greater than 1/10 diameter of the trunk circling more than one-third the way around in the top half of the root ball. Roots larger than this may be cut provided they are smaller than one-third the trunk diameter. There shall be no kinked roots (90 degrees or more) greater than 1/5 the trunk diameter. Roots larger than this can be cut provided they are less than one-third the trunk diameter.
3. Trunk flare on trees must be visible above the surface of the root ball. Major roots must be found at 2 inches or less below surface of root ball.
4. Trees should be rooted into the root ball so that soil or media remains intact and trunk and root ball move as one when lifted. The trunk should bend when gently pushed, not pivot at or below soil line.
5. The point where the top-most root in the root ball emerges from the trunk shall be visible at the soil surface.
6. The relationship between caliper, height and root ball size shall meet the ANSI Z60.1 standard.
7. There should be one dominant leader more-or-less straight to the top of the tree with the largest branches spaced at least 6 inches apart. There can be a double leader in the top 10% of the tree when typical of the species or cultivar. All coniferous plant material shall have only one leader.
8. The tree canopy should be symmetrical, free of large voids greater than twelve inches, and typical of the species or cultivar. Live crown ratio (distance from bottom of canopy to tree top/tree height) should be at least 65%.
9. One-half or more of the foliage shall be on branches originating on the lower two-thirds structure of the canopy, and one-half or less shall occur on the upper one-third of the canopy structure.
10. Branches should be less than 2/3 the trunk diameter when measured one inch above the branch, free of bark inclusions, and more-or-less radially distributed around the trunk and vertically along trunk, without crossed branching.
11. Trees shall stand erect without a supporting stake.
12. The trunk shall decrease in taper with increasing height.
13. The trunk and main branches shall be free of wounds (except for properly-made pruning wounds), damaged areas, conks, bleeding, and signs of insects or disease. Open wounds or visible damage on the trunk shall not exceed 2 inches in length or be more than 5% of the total circumference of the trunk. Pruning wounds do not have to be closed over but shall have been made properly and just outside the collar.
14. There shall be live buds or foliage along the length and to the ends of all twigs.
15. At time of inspection and delivery, the rootball shall be moist throughout, and the tree crown shall show no signs of moisture stress, as indicated by wilt, shriveled, dead leaves, or branch dieback. Roots shall show no signs of being subjected to excess soil moisture conditions, as indicated by root discoloration, distortion, death, or foul odor.
16. Trees shall not have nursery tape, labels, wire, twine, or other materials within live tissue of the trunk, branches, major roots, or other portions of the tree that may compromise the health or structural integrity of the tree.
17. If any of the above conditions are not met, trees may be rejected.

K. Shrubs shall meet the same requirements for quality as for trees with the exception of trunk and branching requirements. The Landscape Architect may reject shrubs not meeting these requirements.

L. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."

M. Preinstallation Conference: Conduct conference on site prior to beginning work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Bulk Materials: Do not deliver or place backfill, soils and soil amendments in frozen, wet, or muddy conditions.

1. Do not dump or store bulk materials near structures, utilities, sidewalks, pavements, and other facilities, or on existing trees, turf areas or plants.

2. Provide protection including tarps, plastic and or matting between all bulk materials and any finished surfaces sufficient to protect the finish material.

B. Provide erosion-control measures to prevent erosion or displacement of bulk materials and discharge of soil-bearing water runoff or airborne dust to adjacent properties, water conveyance systems, and walkways. Provide additional sediment control to retain excavated material, backfill, soil amendments and planting mix within the project limits as needed.

C. Plants transported to the site on open vehicles shall be completely covered with tarpaulins or other suitable covers securely fastened to the vehicle to prevent damage to the plants or wind desiccation. Closed vehicles or shipping containers shall be adequately ventilated to prevent overheating of plants and allow natural respiration. Do not ship plants in the same container with fresh produce (fruit and vegetables) or other products harmful to plant material. Ensure plants are well watered prior to shipping. Immediately open shipping containers upon arrival in port and water plants if necessary. Do not let plants remain in shipping containers more than 48 hours after arrival in port. Plants damaged in transit or due to improper handling shall be cause of rejection.

D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery and handling.

E. Handle planting stock by root ball or container. Do not drop plant material.

F. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.

2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

G. Keep plant tags and labels on all plants until approved.

1.8 PROJECT CONDITIONS

A. Verification of Existing Conditions and Protection of New or Existing Improvements: Before proceeding with work in this section, the Installer shall carefully check and verify all dimensions, quantities, and grade elevations, and inform the Landscape Architect immediately of any discrepancies.

1. Carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging. Verify the location of all aboveground and underground utility lines, infrastructure, other improvements, and existing trees, shrubs, and plants to remain including their root system, and take proper precautions as necessary to avoid damage to such improvements and plants.

2. In the event of conflict between existing and new improvements notify the Landscape Architect in writing and obtain written confirmation of any changes to the work prior to proceeding.

a. When new or previously existing utility lines are encountered during the course of excavation, notify the Landscape Architect in writing and make recommendations as to remedial action. Proceed with work in that area only upon approval of appropriate remedial action. Coordinate all work with the appropriate utility contractors, utility company or responsible public works agency.

B. Protect partially completed installation against damage from other construction traffic when work is in progress, and following completion with highly visible construction tape, fencing, or other means until construction is complete.

1.9 COORDINATION

A. Planting Restrictions: Plant during the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Planting: May 1 to September 15 or as approved by Landscape Architect.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Do not plant during excessive periods of rain or when soils are saturated and can become compacted due to normal planting operations. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

C. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.10 WARRANTY

A. Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period at no cost to the Owner.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
b. Structural failures including plantings falling or blowing over.
c. Faulty performance of tree stabilization and edgings.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods from Date of Substantial Completion:

a. Trees, Shrubs, Vines and Ornamental Grasses: One year.
b. Ground Cover, Biennials, Perennials and Other Plants: One year.

3. Include the following remedial actions as a minimum:

a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements including maintenance.
d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.11 MAINTENANCE SERVICE

A. Special Maintenance Service: See Section 02945 – Landscape Maintenance.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated

when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls. Tree and shrub sizes indicated on Drawings are sizes after pruning.

C. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.

2.2 FERTILIZER

A. Planting Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

1. Size: 10-gram tablets.
2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.3 PLANTING SOIL MIX

A. Planting Soil: See Section 02940 – Planting Soil.

B. Planting Soil Mix: As indicated on Drawings and specified in 02940.

2.4 MULCHES

A. Organic Mulch: Free from deleterious materials, growth-inhibiting or germination-inhibiting ingredients, and suitable as a top dressing of trees and shrubs, consisting of the following:

1. Type: Ground or shredded bark.
   a. Wood chips are not acceptable.
   b. Naturally biodegradable.
   c. May contain up to 50% shredded wood material aged for a minimum of one year prior to installation.
2. Size Range: Maximum length of any individual component 2 inches and a minimum of 75% of the mulch shall pass through a one inch screen. Shall be of size and structure to remain in place during rain and wind events.
3. Color: Natural.

B. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:

1. Type: Rounded riverbed gravel or smooth-faced stone.
2. Size Range: 1-1/2 inches maximum, 3/4 inch minimum.
3. Color: Uniform color range acceptable to Landscape Architect.

2.5 WEED-CONTROL BARRIERS

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally-encountered chemicals, alkalis, and acids.

B. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./sq. yd.

2.6 TREE STABILIZATION MATERIALS

A. Tree Stakes:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, redwood, or pressure-preservative-treated softwood, free of knots, holes, cross grain, and other defects, size and length as indicated, pointed at one end.
2. Guys and Tie Wires: ASTM A 641A/M, Class 1 galvanized-steel wire, 2 strand, twisted, 0.05 inch in diameter.
3. Tree Webbing: 1 inch wide, UV-resistant polypropylene webbing, 18 inches long with a brass grummet on each end. Do not use hose and wire.

2.7 LANDSCAPE EDGING

A. Aluminum Edging: Standard-profile extruded-aluminum edging, ASTM B 221 Alloy 6063-T6, fabricated in standard lengths with interlocking sections with loops stamped from face of sections to receive stakes.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Curv-Rite, Inc.
    b. Permaloc Corporation.
    c. Russell, J. D. Company (The).
    d. Sure-Loc Edging Corporation.

2. Edging Size: 3/16 inch wide by 5-1/2 inches deep
3. Stakes: Aluminum, ASTM B 221 Alloy 6061-T6, approximately 1-1/2 inches wide by 12 inches long.
4. Finish: Mill (natural aluminum).
5. Color: Black

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Landscape Architect and replace with new planting soil.

D. Examine planting areas and surrounding areas for defects that will adversely affect the work and for deviations beyond allowable tolerances.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting operations.

B. Obtain utility locates for all underground utilities and structures in planting areas. Notify the Landscape Architect of any conflicts prior to beginning excavation.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

D. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

E. Lay out planting beds and trenches for exterior plantings. Stake locations, outline areas, adjust locations when requested and obtain Landscape Architect acceptance of layout before starting planting bed excavation work and planting. Make minor adjustments as required.

F. Excavate beds to the depth required to accept the depth of planting soils as indicated on Drawings. Loosen subgrade of planting areas to a minimum depth of 4 inches. Remove stones

larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

G. If drain tile is shown on Drawings or required under planting areas, excavate to top of porous backfill over tile.

H. Fill all excavations completely with water and allow to naturally percolate from excavations. Notify Landscape Architect of any beds which fail to percolate within 24 hours and make good excavations through drilling, spiking, scarifying, reducing compaction, and other methods to a minimum depth of 12 inches to get adequate percolation as indicated. Repeat water percolation test as needed.

1. Where compaction is a result of operation of heavy equipment or natural subgrade is other than AASHTO classification A6 or A7 such remediation shall be considered incidental, without additional cost to Owner.
2. Where compaction is a result of construction materials (concrete, mortar and other related materials) and subsoil is other than AASHTO classification A6 or A7 such remediation shall be considered incidental, without additional cost to Owner.
3. Where compaction is a result of the subsoil being AASHTO classification A6 or A7 and has a moisture content greater than 30 percent then installation of a sub-drainage system or other means acceptable to the Landscape Architect shall be used. Where conditions have not been previously known costs shall be the responsibility of the Owner and work performed when approved by Owner.

I. Obstructions: Notify Landscape Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

J. Secure open excavations when not under direct supervision.

K. Scarify the sides and bottom of all beds to a minimum depth of 4 inches after percolation test to reduce compaction as a result of testing.

3.3 PLANTING BED ESTABLISHMENT

A. Homogeneously blend planting soil mix off-site before spreading or mix planting soil in beds and homogeneously blend planting soil mix to the full depth to a uniform texture. Do not add planting soil until all water has percolated out of excavation. Do not use planting soil that is subgrade is frozen, muddy, or excessively wet.

B. Spread planting soil to the depth indicated on Drawings. Install in lifts that do not exceed 8 inches. Compact using irrigation or a water filled roller. Do not use mechanical compaction. Compact soil to 80-85% of maximum dry density. Check the soil compaction with a penetrometer or densiometer. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

C. If the planting soil becomes overly compacted, remove the soil and reinstall.

D. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Protect areas from vehicle and pedestrian traffic and other forms of compaction.

E. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

F. Lay out individual tree and shrub locations and areas for multiple exterior plantings. Stake locations, outline areas, adjust locations when requested, and obtain Landscape Architect acceptance of layout before planting. Make minor adjustments as required.

G. Plant trees and shrubs after finish grades are established and before planting lawns. Do not plant in soils immediately after performing irrigation compaction of planting soils. Allow soils to dry before planting.

3.4 TREES AND SHRUB PLANTING

A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Excavation of Pits and Trenches in Planting Beds: Excavate pits to a depth and width to accommodate roots and result in the uppermost lateral root being no more than 2 inches below finish grade but below finish grade. Avoid mixing of soil layers during excavation. Scarify sides of plant pit smeared or smoothed during excavation. Limit compaction of planting soils as a result of planting operations. Loosen planting soils, by hand, that have been compacted during planting operations.

D. Set balled and burlapped, and container grown stock plumb and in center of pit or trench with uppermost lateral root no more than 2 inches below finish grades.

1. Remove burlap and wire baskets from root balls without breaking root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
2. Make adjustments to ensure proper planting depth is obtained. Verify that root flare is visible at top of root ball according to ANSI Z60.1.
3. Plumb before backfilling, and maintain plumb while working backfill around roots.
4. Place planting soil in lifts that do not exceed 6 inches. Compact using irrigation or a water filled roller. Do not use mechanical compaction. Compact soil to 80-85% of maximum dry density. Check the soil compaction with a penetrometer or densiometer. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
5. Backfill around root ball with planting soil in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
6. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
7. Continue backfilling process in layers to maintain soil layers established prior to excavating plant pits. Water again after placing and tamping final layer of soil.

E. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.5 TREE AND SHRUB PRUNING

A. Prune only when directed by Landscape Architect. Pruning to be executed by or under direct supervision of a certified Arborist, or experienced nurseryman with pruning experience.

B. All pruning cuts shall comply with ANSI A-300 standards. Do not cut tree leaders; remove only injured or dead branches from trees. Do not prune branches unless damaged or to retain natural character. Prune trees and shrubs according to standard horticultural practice with sharp, clean tools.

C. Tree sizes indicated are sizes after pruning. Prune shrubs to retain natural character. Shrub sizes indicated are sizes after pruning.

D. Do not apply pruning paint to wounds.

3.6 TREE STABILIZATION

A. Upright Staking and Tying: Stake all trees indicated.

1. Use stakes of length required as indicated on drawings and to extend to height indicated above grade.
2. Set vertical stakes and space to avoid penetrating root balls or root masses.
3. Support trees with two strands of tie wire and webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3.7 GROUND COVERS, PERENNIALS, BI-ANNUALS AND ANNUALS

A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated in Drawings even rows with triangular spacing.

B. Use approved planting soil for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.

E. Work soil around roots to eliminate air pockets.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.8 EDGING INSTALLATION

A. Layout edging as shown on Drawings. Layout of curves shall be smooth and curvilinear without deformations or kinks or bends. Straight runs shall be linear with a deviation of less than ¼ inch in any 8 foot length. Connections shall be visually seamless with no overlap. Top elevation of edging shall be uniform.

B. Aluminum Edging: Install aluminum edging where indicated according to manufacturer's written instructions. Anchor with aluminum stakes spaced approximately 36 inches apart, driven below top elevation of edging.

3.9 MULCHING

A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 9 inches and secure seams with galvanized pins.

B. Mulch all planting beds and other areas indicated on Drawings. Ensure even coverage.

1. Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.
2. Trees in Turf Areas: Apply organic mulch in a ring of 36-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
3. Mineral Mulch in Planting Areas: Apply 4-inch average thickness of mineral mulch over whole surface of planting area as shown on Drawings, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

3.10 PLANT MAINTENANCE

A. Plant Maintenance: See Section 02945, Plant Maintenance.

3.11 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.

B. Protect plants and planting areas from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

C. Remove all nursery ties, tape, nursery stakes, ribbons, twine, and wire from branches and trunk. Remove all nursery plant identification labels and tags when approved and directed by Landscape Architect.

D. Remove all debris from plant material, planting areas, and Project site.

3.12 DISPOSAL

A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 02930

SECTION 02940 – PLANTING SOIL

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. Section includes:

1. Manufacturing of planting soil

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.
2. Division 2 Section "Lawns and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.
3. Division 2 Section “Exterior Plants” for planting trees, shrubs and other plants.

1.3 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation. Backfill may be planting soil, if designated in specifications.

B. Duff Layer: The surface layer of native soil that is composed of mostly decayed leaves, twigs, and detritus.

C. Finish Grade: Elevation of finished surface of planting soil.

D. Invasive Species: Plant material as listed within the most recent US Department of Agriculture publication for Region 10 (Alaska) or most recent University of Alaska Fairbanks Cooperative Extension publication, specific for the region of Alaska in which the project is located.

E. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce planting soil. Manufactured soil may also be called manufactured/imported topsoil by some commercial retailers.

F. Native Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

G. Planting Soil: Standardized approved topsoil, existing/native approved surface topsoil, existing/in-place approved surface soil, approved imported topsoil, or manufactured soil that is

modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. Any of the above must meet the requirements of the specifications for planting soil.

H. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

I. Subsoil: All soil beneath the top organic layer of the soil profile, and typified by the lack of organic matter and soil organisms.

J. Weeds: Plant material that is not specified in the Drawings or Specifications.

1.4 SUBMITTALS

A. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

B. Material Test Reports: For each unamended soil type and the planting soil, furnish soil analysis and a written report by a qualified soil-testing laboratory.

1. Soil Analysis: Furnish soil analysis stating:

a. Percentages of organic matter.
b. Gradation of sand, silt, and clay content.
c. Cation exchange capacity.
d. Deleterious material (greater than #4 screen).
e. pH.
f. Mineral and plant-nutrient content of soil (nitrogen, phosphorous and potassium at a minimum).

C. Report suitability of planting soil for plant growth. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.

D. The Contractor shall notify the Landscape Architect of the source of imported/manufactured soil and/or planting soil at least 30 days prior to delivery.

1.5 QUALITY ASSURANCE

A. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

B. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.

C. Planting Soil Manufacturer Qualifications: A qualified landscape/soil manufacturer who has produced planting soil that supports the healthy growth of plant material.

1. Experience: Five years' experience in planting soil production in addition to requirements in Division 1 Section "Quality Requirements."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

C. Planting Soil: Protect planting soils and materials to produce planting soil from excessive moisture than will lead to erosion or saturation levels that will negatively affect the texture and structure of soil or its placement on site.

D. Weather Limitations: Proceed with producing planting soil only when existing and forecasted weather conditions permit. Do not screen or produce planting soils during periods of prolonged rain, heavy rain, freezing conditions or other conditions that do not allow optimum results to be obtained.

PART 2 - PRODUCTS

2.1 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.
2. Provide lime in form of ground dolomitic limestone.

B. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

2.2 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, sterile, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or granular texture, with a pH range of 3.4 to 4.8.

C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.

2.3 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.4 NATIVE SURFACE SOIL

A. Native Surface Soil: Fertile, friable, surface soil containing natural loam (approximately 45% sand, 40% silt and 15% clay) and complying with ASTM D 5268, pH range of 5.5 to 7, an average of 10 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth. Soil to be free of vegetative plant parts or seed capable of propagating. Soil shall be free of volcanic ash and shall not have a deleterious material mass percentage of greater than 5% not passing through a #4 screen. Obtain soil from naturally well-drained sites where soil occurs at least 4” deep; do not obtain from public or protects bogs or marshes.

1. Soil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce planting soil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

    a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient or native surface soils do not meet requirements.

2.5 MANUFACTURED SOILS

A. Manufactured Soils: Shall meet the requirements of Native Surface Soil.

2.6 PLANTING SOILS

A. Planting Soil: Manufacture planting soil from a variety of sources. Obtain native organic surface soil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from public land or protected bogs, or marshes. Soil shall not have a deleterious material mass percentage of greater than 5% not passing a #4 screen.

1. Additional Properties of Planting Soil: Screened and free of stones ¾ inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants not infested with nematodes; grubs; or other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration.
2. Mix native or manufactured soil with the following soil amendments and fertilizers in the following quantities to produce planting soil. Percentages are ratios (volumes):

    a. Ratio of Native or Manufactured Soil by Volume: 55%.
    b. Ratio of Sand by Volume: 40%.
    c. Ratio of Loose Organics by Volume: 5-8%.
    d. Total Organic Content: 9-11%.
    e. Weight of Slow Release Fertilizers: As recommended by testing agency.
    f. Weight of Lime: As recommended by testing agency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not mix or place soils and soil amendments when frozen, wet, or muddy conditions.

B. Suspend soil mixing operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

C. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
D. Proceed with mixing only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, and lawns and existing exterior plants from damage caused by planting soil operations.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust.

3.3 PLANTING SOIL BLENDING

A. Blend planting soil off-site unless approved by Owner.

B. Thoroughly blend planting soil to create planting soil that is homogeneously blending to a uniform texture. Planting soil shall be friable, free draining, with a structure and texture that will support healthy plant growth.

1. Planting soil shall allow 95 percent pass through a #4 screen with no soil clods greater than 1 inch.
2. Planting soil shall have a continuous, air-filled pore space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.

C. Remove stones larger than ¾" inch in any dimension and all sticks, roots, rubbish, and other extraneous matter and legally dispose of them.

D. Do not blend soils or soil components that are saturated or will not produce an acceptable final product. Compacted or saturated soils are not acceptable.

E. Delay mixing fertilizers with planting soil if installation of planting soil is greater than 72 hours.

1. When planting soil is greater than 72 hours surface apply fertilizers on site and incorporate into upper 6 inches of soil.

F. Mix lime with dry soil on site and incorporate into upper 1 inch of soil.

END OF SECTION 02940

SECTION 02945 – LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.1 RELATED WORK

A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Maintenance period and warranty
   2. Maintenance of Exterior Plants
   3. Maintenance of Lawns and Grasses
   4. Clean-up
   5. Inspection

B. Related Sections include the following:
   1. Division 2 Section "Lawns and Grasses" for turf (lawn) and meadow planting, hydro-seeding, and erosion-control materials.
   2. Division 2 Section “Exterior Plants” for planting trees, shrubs and other plants.
   3. Division 2 Section “Planting Soil” for manufacturing of planting soils.

1.3 DEFINITIONS

A. Acceptance Inspection: Final inspection of landscape where upon approval, the maintenance and warranty period commences.

B. Arborist: Personnel certified as an Arborist in good standing and meeting the requirements as set forth by the International Society of Arboriculture (ISA).

C. Invasive Species: Plant material as listed within the most recent US Department of Agriculture publication for Region 10 (Alaska) or most recent University of Alaska Fairbanks Cooperative Extension publication, specific for the region of Alaska in which the project is located.

D. Herbicide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, and fungicides.

E. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

F. Planting Area: Areas to be planted.

G. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

H. Warranty Inspection: Performed at Project Substantial Completion.

I. Weeds: Plant material that is not specified in the Drawings or Specifications.

1.4 REGULATORY REQUIREMENTS

A. Comply with all requirements of the State of Alaska Department of Environmental Conservation concerning application of herbicides, pesticides, and insecticides.

B. All materials used shall conform with all local, state, or federal regulations controlling the use of chemicals, sprays, or other toxic materials. Required permits or certifications for use of "restricted" materials shall be obtained by the Contractor. Proof of Certification shall be proven to the Owner's Representative.

1.5 MAINTENANCE PERIOD AND WARRANTY

A. Commencement of the maintenance and warranty period shall begin upon completion of the acceptance inspection. The maintenance and warranty period for Exterior Plants shall be one year. For Lawns and Grasses, the maintenance and warranty period shall be one growing season (minimum of sixty days). If the period between the time of planting of Lawns and Grasses and winter freeze-up is less than 60 days, the warranty and maintenance period will carry over into the following growing season. Date of acceptance is that date upon which final inspection occurs.

B. Owner’s Representative will provide the Contractor with written notice of any deficiencies with performance during the maintenance period. If the Contractor fails to address those concerns within thirty (30) days, the Owner’s Representative shall terminate the Contractor’s maintenance period and hire an alternative contractor to complete the remainder of the warranty period. The cost of the alternative contractor shall be at the original contractor’s expense.

1.6 SUBMITTALS

A. The Contractor shall submit a maintenance schedule for Owner’s Representative approval (30) days prior to the acceptance inspection.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
3. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to the Project.

1.7 QUALITY ASSURANCE AND SAFETY

A. The Contractor shall be experienced in landscape maintenance, preferably with an education in Ornamental Horticulture, with the work crew to be experienced and familiar with maintaining plant materials in sub-arctic conditions.

B. The Contractor shall furnish all labor, materials, equipment, supervision, traffic control, and transportation and shall secure all necessary permits and licenses required to maintain and keep the landscape in an attractive, healthy and vigorous growing condition for one year.

C. The Contractor shall have a certified arborist on staff. Submit arborist's International Society of Arborist's (ISA) certification for verification.

PART 2 - EXECUTION

2.1 GENERAL

A. Diseases and Pests: An approved pesticide shall be applied as necessary to maintain plant materials in a healthy and vigorous growing condition. The Contractor shall apply for and receive a "permit to apply pesticide" from the State of Alaska, Department of Environmental Conservation, or shall engage the services of a qualified, licensed pest control service familiar with plants, pests and appropriate pesticides.

B. Weed Control: All planting and seeding areas shall be kept free of weeds by chemical control, hand weeding, or other approved methods.

2.2 EXTERIOR PLANTS

A. Watering: The Contractor shall deepwater all trees and shrubs providing water penetration to the depth of planting pits and extent of the root zone. Deep watering shall be done in accordance with the following schedule:

1. Summer of Installation: Deepwater all trees and shrubs each week (during periods of extended dry weather, watering shall occur twice weekly) continuing through the first hard frost, or October 15, which ever occurs first.

B. Staking and Guying: Tree collars, stakes, and guys are to be inspected and adjusted as necessary a minimum of twice per year. Tree collars, staking and guys shall be removed at the end of the warranty period. Tree girdling, rubbing, or other deficiencies caused by improper staking conditions or materials will be immediately repaired, and adjustments made as necessary to avoid additional issues.

C. Fertilization: Fertilization of all trees and shrubs shall be as follows:

1. Summer of Installation: One week after the installation of plant material, an initial application of fertilizer will be applied. Only this initial application of fertilizer during planting is necessary.

2. Following summer(s) of warranty period: Fertilization shall occur twice per year. The first shall be applied no later than May 1 with 8-32-16 fertilizer, and the second shall be applied on or about June 30 with 8-32-16 fertilizer. Application rate shall be per manufacturer's specifications.

D. Pruning: The Contractor shall maintain a certified arborist on staff. Pruning shall be done by them, or under their direct supervision. Plant material shall be pruned as necessary to promote healthy growth and shape of all trees and shrubs.

E. Plant Damage: In the event of damages to trees or shrubs from a third party, including vandalism, the Owner may direct the Contractor to replace them at unit cost amounts. Such replacements to be made only upon written notice form the Owner's Representative.

2.3 LAWNS AND GRASSES

A. Watering: All areas shall be watered at least once a week during the one-year maintenance period, excluding the period from the first hard frost or October 15, whichever comes first to May 15, to maintain soil moisture throughout the root zone and shall be conducted regardless of natural rain fall unless approved in writing by the Owner's Representative.

1. Three-fourths of an inch (3/4") of water is required weekly and shall be applied at rates to promote maximum penetration to root zone with minimal run-off.
2. New areas to be kept moist at all times for the first six (6) weeks after seeding.

B. Mowing:

1. Manicured lawn areas shall be mowed each week, once established, during the specified maintenance period.
2. Mow grass at regular intervals to maintain at a maximum height of 3 inches. Do not cut more than 1/3 of grass blade at any one mowing.
3. Immediately remove clippings after mowing and trimming.

C. Edging: Trimming of all curbs, walks, bed edges, tree wells, and mow strips to be done every other mowing.

D. Fertilization: Apply one and one-half (1 1/2) pounds of actual nitrogen per 1,000 square feet, a minimum of three (3) times per year. Suggested applications are every four (4) to six (6) weeks between May 1 and August 1.

E. Limestone: Apply dolomitic limestone at rates to bring pH to 6.0 plus or minus 0.5 at the beginning of the growing season. An additional application may also be necessary to keep the pH level at 6.0 plus or minus 0.5.

F. Repair: Repair and replacement of all damaged or dead turf of seeded areas shall occur upon request to the Owner's Representative regardless of cause.

2.4 MULCH

A. Ensure even coverage of mulch all planting beds and other areas indicated on Drawings.

1. Maintain a 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

2.5 CLEAN-UP

A. The Contractor shall keep the project site clean and free of excess materials, and rubbish incidental to his work at all times. Clean-up will be one of the conditions to be met prior to all phases of planting acceptance.

2.6 INSPECTION

A. Condition of Plant Material: Prior to final inspection, the Contractor shall be responsible for repairing third-party damage, watering and protecting planted areas, resetting any plants to an upright position, to proper grade or to proper position, and for removal and replacement of any dead plant material. The Contractor shall also re-stake trees and prune plants if necessary.

B. At the conclusion of the maintenance period, a final inspection shall be conducted by the Owner's Representative. The Contractor shall notify the Owner's Representative in writing seven (7) days in advance of the requested final inspection date.

2.7 WARRANTY INSPECTION

A. At the end of the warranty period, all trees, shrubs, plants, and turf areas shall be inspected and shall meet all required specified conditions. Acceptance shall be contingent upon the following:
1. Trees and shrubs shall be in healthy condition, free of damage, and of the specified quantities and size, as outlined within Drawings and Specifications.
2. Lawns and Grasses shall be as per 02920 – 3.6A Satisfactory Lawns

END OF SECTION 02945

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.
4. Building walls.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.3 SUBMITTALS

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

B. LEED Submittals:

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

E. Joint Layout: Indicate proposed joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

2. Location of control and isolation joints is subject to the approval of the Architect.

F. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Curing compounds.
7. Bonding agents.
8. Adhesives.
9. Vapor retarders.
10. Repair materials.

G. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

H. Minutes of preinstallation conference.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

E. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.
e. Special inspector.
f. Special concrete finish subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

C. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I, Type II or Type I/II, gray.

B. Normal-Weight Aggregates: ASTM C 33, Class 4M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 FIBER REINFORCEMENT

A. Synthetic Micro-Fiber: Monofilament or fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Monofilament Micro-Fibers:

1) Axim Italcementi Group, Inc.; Fibrasol II P.
2) Euclid Chemical Company (The), an RPM company; Fiberstrand 150.
3) FORTA Corporation; FORTA Econo-Mono.
4) Grace Construction Products, W. R. Grace & Co.; Grace MicroFiber.
5) Metalcrete Industries; Polystrand 1000.
6) Nycon, Inc.; ProConM.
7) Propex Concrete Systems Corp.; Fibermesh 150.
8) Sika Corporation; Sika Fiber PPM.

b. Fibrillated Micro-Fibers:

1) Axim Italcementi Group, Inc.; Fibrasol F.
2) Euclid Chemical Company (The), an RPM company; Fiberstrand F.
3) FORTA Corporation; FORTA Econo-Net or Ultra-Net.
4) Grace Construction Products, W. R. Grace & Co.; Grace Fibers.
5) Nycon, Inc.; ProConF.
6) Propex Concrete Systems Corp.; Fibermesh 300.
7) Sika Corporation; Sika Fiber PPF.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.8 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ChemMasters; Chemisil Plus.
    b. ChemTec Int'l; ChemTec One.
    c. Conspec by Dayton Superior; Intraseal.
    d. Curecrete Distribution Inc.; Ashford Formula.
    e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
    f. Edoco by Dayton Superior; Titan Hard.
    g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
    h. Kaufman Products, Inc.; SureHard.
    i. L&M Construction Chemicals, Inc.; Seal Hard.
    j. Meadows, W. R., Inc.; LIQUI-HARD.
    k. Metalcrete Industries; Floorsaver.
    l. Nox-Crete Products Group; Duro-Nox.
    m. Symons by Dayton Superior; Buff Hard.
    n. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
    o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.

2.9 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
    b. BASF Construction Chemicals - Building Systems; Confilm.
    c. ChemMasters; SprayFilm.
    d. Conspec by Dayton Superior; Aquafilm.
    e. Dayton Superior Corporation; Sure Film (J-74).
    f. Edoco by Dayton Superior; BurkeFilm.
    g. Euclid Chemical Company (The), an RPM company; Eucobar.
    h. Kaufman Products, Inc.; Vapor-Aid.
    i. Lambert Corporation; LAMBCO Skin.
    j. L&M Construction Chemicals, Inc.; E-CON.
    k. Meadows, W. R., Inc.; EVAPRE.
    l. Metalcrete Industries; Waterhold.
    m. Nox-Crete Products Group; MONOFILM.
    n. Sika Corporation; SikaFilm.
    o. SpecChem, LLC; Spec Film.
    p. Symons by Dayton Superior; Finishing Aid.
    q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
    r. Unitex; PRO-FILM.
    s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.45.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. All Concrete except slabs on grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 4 inches or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch or 3/4-inch nominal maximum aggregate size.

B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Minimum Cementitious Materials Content: 520 lb/cu. yd..
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch or 3/4-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

6. Synthetic Micro-Fiber (at exterior slabs only): Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd..

2.14 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete as indicated.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

5. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or not more than 1 inch below finished concrete surface.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time

necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply one of the following to smooth-formed finished as-cast concrete where indicated:

1. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match

adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

2. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces indicated, to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated, to receive trowel finish, and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated, exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated, where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.

b. Continuous water-fog spray.
c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: At all exterior concrete slabs, stairs and sidewalks prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than that specified by manufacturer.
   3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.
2. Headed bolts and studs.
3. Verification of use of required design mixture.
4. Concrete placement, including conveying and depositing.
5. Curing procedures and maintenance of curing temperature.
6. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.

   a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

   a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness within 24 hours of finishing.

END OF SECTION 03300

SECTION 03932 - CONCRETE REPAIR

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Preparation of existing concrete and concrete masonry, and application of repair materials.

B. Repair of concrete and concrete masonry surfaces in preparation for finish.

1.2 REFERENCE STANDARDS

A. ASTM C 33 - Standard Specification for Concrete Aggregates; 2008.

B. ASTM C 150 - Standard Specification for Portland Cement; 2007.

C. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout; 2007.

D. ASTM C 882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear; 2005.

1.3 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cementitious Mortars:

1. BASF Construction Chemicals-Building Systems; Product SD2 Repair Mortar: www.chemrex.com.

2. Substitutions: See Section 01600 - Materials and Equipment

B. Bonding Agents:

1. BASF Construction Chemicals-Building Systems: www.chemrex.com.

2. Substitutions: See Section 01600 - Materials and Equipment

2.2 PATCHING MATERIALS

A. Bonding Agent: Polyvinyl acetate emulsion, dispersed in water while mixing, non-coagulant in mix, water resistant when cured.

B. Portland Cement: ASTM C 150, Type I, grey.

C. Sand: ASTM C 33 or ASTM C 404; uniformly graded, clean.

D. Water: Clean and potable.

E. Cleaning Agent: Commercial muriatic acid.

2.3 MIXING CEMENTITIOUS MATERIALS

A. Mix cementitious mortar and grout in accordance with manufacturer's instructions for purpose intended.

B. Include bonding agent as additive to mix.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

A. Clean concrete surfaces of dirt, laitance, corrosion, organic material, or other contamination; wire brush using water; rinse surface and allow to dry.

B. Flush out cracks and voids with cleaning agent to remove laitance and dirt. Chemically neutralize by rinsing with water.

C. Provide temporary entry ports spaced to accomplish movement of fluids between ports; no deeper than the depth of the crack to be filled or port size diameter no greater than the thickness of the crack. Provide temporary seal at concrete surface to prevent leakage of adhesive.

D. Blast clean the exposed reinforcement steel surfaces. Mechanically cut away damaged portions of bar.

3.3 REPAIR WORK

A. Repair exposed rock pockets, structural, shrinkage, and settlement cracks of concrete by the bonding agent and cementitious paste method.

B. Repair spalling. Fill voids flush with surface. Apply surface finish.

3.4 APPLICATION - CEMENTITIOUS MORTAR

A. Apply spray coating of bonding agent to dry concrete surfaces. Provide full surface coverage.

B. Apply cementitious mortar by steel trowel to thickness thickness no less than that required to create a smooth, flat surface. Tamp into place filling voids at spalled areas. Work mix into honeycomb.

C. Damp cure cementitious mortar for four days. Allow full cure prior to coating.

END OF SECTION 03932

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

1.2 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.3 SUBMITTALS

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

B. LEED Submittal:

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

C. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. Identify demand critical welds.

D. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).

2. Electrode manufacturer and trade name, for demand critical welds.

E. Qualification Data: For qualified fabricator.

F. Welding certificates.

G. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

H. Mill test reports for structural steel, including chemical and physical properties.

I. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength bolt-nut-washer assemblies.
4. Shear stud connectors.
5. Shop primers.
6. Nonshrink grout.

J. Source quality-control reports.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

C. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 341 and AISC 341s1.
3. AISC 360.
4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.6 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. W-Shapes: ASTM A 992/A 992M.

C. Channels, Angles-Shapes: ASTM A 36/A 36M.

D. Plate and Bar: ASTM A 36/A 36M.

E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

F. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

G. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.

H. Steel Forgings: ASTM A 668/A 668M.

I. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip.

C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Mechanically deposited zinc coating.

D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

E. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

F. Threaded Rods: ASTM A 36/A 36M.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened carbon steel.
3. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

G. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

H. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

I. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.3 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
2. Mark and match-mark materials for field assembly.
3. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Pretensioned.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner may engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base Bearing and Leveling Plates: Clean concrete-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Slip critical.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780, with method listed in Annex A1: Repair using zinc based alloys.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 05120

SECTION 05210 - STEEL JOISTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. Joist accessories.

1.2 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Laboratory Test Reports for Credit EQ 4: For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
3. Indicate locations and details of bearing plates to be embedded in other construction.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Manufacturer certificates.

C. Mill Certificates: For each type of bolt.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.7 SEQUENCING

A. Deliver steel bearing plates to be built into cast-in-place concrete construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.

1. Use ASD; data are given at service-load level.
2. Design special joists to withstand design loads with live-load deflections no greater than the following:

a. Roof Joists: Vertical deflection of 1/360 of the span.

2.2 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

1. Joist Type: K-series steel joists.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

F. Camber joists according to SJI's "Specifications.".

G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.3 PRIMERS

A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.4 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Fabricate steel bearing plates from ASTM A 36/A 36M steel with integral anchorages of sizes and thicknesses indicated. Shop prime paint.

C. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.

D. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Plain, uncoated.

E. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish: Plain.

F. Welding Electrodes: Comply with AWS standards.

G. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.5 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

B. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

C. Bolt joists to supporting steel framework using carbon-steel bolts.

D. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.

B. Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, as applicable:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709.
c. Ultrasonic Testing: ASTM E 164.
d. Radiographic Testing: ASTM E 94.

C. Visually inspect bolted connections.

D. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

E. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.4 PROTECTION

A. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.

1. Clean and prepare surfaces by power-tool cleaning according to SSPC-SP 3.
2. Apply a compatible primer of same type as primer used on adjacent surfaces.

B. Touchup Painting: Cleaning and touchup painting are specified in Division 9 painting Sections.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05210

SECTION 05310 - STEEL DECK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.
2. Composite floor deck.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Laboratory Test Reports for Credit EQ 4: For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Powder or power-actuated mechanical fasteners.

D. Evaluation Reports: For steel deck.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.; Metal Dek Group.
5. Cordeck.
6. DACS, Inc.
7. Epic Metals Corporation.
8. Marlyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.
10. Nucor Corp.; Vulcraft Group.
11. Roof Deck, Inc.
12. Valley Joist; Subsidiary of EBSCO Industries, Inc.

13. Verco Manufacturing Co.
14. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G90 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
5. Span Condition: As indicated.
6. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 COMPOSITE FLOOR DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.; Metal Dek Group.
5. Cordeck.
6. DACS, Inc.
7. Epic Metals Corporation.
8. Marlyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.
10. Nucor Corp.; Vulcraft Group.
11. Roof Deck, Inc.
12. Verco Manufacturing Co.
13. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: As indicated.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

E. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile indicated recommended by SDI Publication No. 31 for overhang and slab depth.

F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

G. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

H. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

I. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and level recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

J. Galvanizing Repair Paint: ASTM A 780.

K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Locate deck bundles to prevent overloading of supporting members.

C. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

D. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

E. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

F. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

G. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members as indicated on S0.4.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches, and as follows:

1. As indicated on S0.4

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches apart with at least one weld or fastener at each corner.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members as indicated on S0.4.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches, and as follows:

1. As indicated on S0.4

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped or butted at Contractor's option.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

F. Install piercing hanger tabs at 14 inches apart in both directions, within 9 inches of walls at ends, and not more than 12 inches from walls at sides unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Division 9 Section.

C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05310

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Exterior load-bearing wall framing.
2. Interior load-bearing wall framing.
3. Exterior non-load-bearing wall framing.
4. Roof rafter framing.
5. Ceiling joist framing.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height.
b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft..
c. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/240 of the wall height.
d. Roof Rafter Framing: Horizontal deflection of 1/360 of the horizontally projected span.
e. Ceiling Joist Framing: Vertical deflection of 1/240 of the span.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. LEED Submittal:

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

C. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Welding certificates.

E. Qualification Data: For professional engineer.

F. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

G. Research/Evaluation Reports: For cold-formed metal framing.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. Allied Studco.
2. AllSteel Products, Inc.
3. California Expanded Metal Products Company.
4. Clark Steel Framing.
5. Consolidated Fabricators Corp.; Building Products Division.
6. Craco Metals Manufacturing, LLC.
7. Custom Stud, Inc.

8. Dale/Incor.
9. Design Shapes in Steel.
10. Dietrich Metal Framing; a Worthington Industries Company.
11. Formetal Co. Inc. (The).
12. Innovative Steel Systems.
13. MarinoWare; a division of Ware Industries.
14. Quail Run Building Materials, Inc.
15. SCAFCO Corporation.
16. Southeastern Stud & Components, Inc.
17. Steel Construction Systems.
18. Steeler, Inc.
19. Super Stud Building Products, Inc.
20. United Metal Products, Inc.

2.2 MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60, A60, AZ50, or GF30.

C. Steel Sheet for Vertical Deflection Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G90.

2.3 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dietrich Metal Framing; a Worthington Industries Company.
b. MarinoWare, a division of Ware Industries.
c. SCAFCO Corporation
d. The Steel Network, Inc.

2.5 ROOF-RAFTER FRAMING

A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches, minimum.

2.6 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with enlarged service holes, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-5/8 inches, minimum.

2.7 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.8 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.9 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and

plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.10 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by bolting or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw or bolt, wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by screw fastening. Wire tying of framing members is not permitted.

a. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: As shown on Shop Drawings.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.

2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced as indicated on Shop Drawings. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Connect vertical deflection clips to studs and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, mechanically fastened to webs of punched studs.

2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.6 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: 16 inches.

D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.7 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing agency will report test results promptly and in writing to Contractor and Architect.

C. Remove and replace work where test results indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Exterior load-bearing wall framing.
2. Interior load-bearing wall framing.
3. Exterior non-load-bearing wall framing.
4. Roof rafter framing.
5. Ceiling joist framing.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height.
b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft..
c. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/240 of the wall height.
d. Roof Rafter Framing: Horizontal deflection of 1/360 of the horizontally projected span.
e. Ceiling Joist Framing: Vertical deflection of 1/240 of the span.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. LEED Submittal:

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.

a. Include statement indicating costs for each product having recycled content.

C. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Welding certificates.

E. Qualification Data: For professional engineer.

F. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

G. Research/Evaluation Reports: For cold-formed metal framing.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:

1. Allied Studco.
2. AllSteel Products, Inc.
3. California Expanded Metal Products Company.
4. Clark Steel Framing.
5. Consolidated Fabricators Corp.; Building Products Division.
6. Craco Metals Manufacturing, LLC.
7. Custom Stud, Inc.

8. Dale/Incor.
9. Design Shapes in Steel.
10. Dietrich Metal Framing; a Worthington Industries Company.
11. Formetal Co. Inc. (The).
12. Innovative Steel Systems.
13. MarinoWare; a division of Ware Industries.
14. Quail Run Building Materials, Inc.
15. SCAFCO Corporation.
16. Southeastern Stud & Components, Inc.
17. Steel Construction Systems.
18. Steeler, Inc.
19. Super Stud Building Products, Inc.
20. United Metal Products, Inc.

2.2 MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60, A60, AZ50, or GF30.

C. Steel Sheet for Vertical Deflection Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G90.

2.3 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dietrich Metal Framing; a Worthington Industries Company.
b. MarinoWare, a division of Ware Industries.
c. SCAFCO Corporation
d. The Steel Network, Inc.

2.5 ROOF-RAFTER FRAMING

A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1-5/8 inches, minimum.

2.6 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with enlarged service holes, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch.
2. Flange Width: 1-5/8 inches, minimum.

2.7 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.8 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.9 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and

plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.10 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by bolting or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw or bolt, wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by screw fastening. Wire tying of framing members is not permitted.

a. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install insulation, specified in Division 7 Section "Building Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: As shown on Shop Drawings.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.

2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced as indicated on Shop Drawings. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Connect vertical deflection clips to studs and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, mechanically fastened to webs of punched studs.

2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.6 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: 16 inches.

D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.7 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing agency will report test results promptly and in writing to Contractor and Architect.

C. Remove and replace work where test results indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Shop fabricated steel items and associated fasteners.

1.2 RELATED REQUIREMENTS

A. Section 03300 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 05510 - Metal Stairs.

C. Section 05520 - Handrails and Railings.

D. Section 09900 - Paints and Coatings: Paint finish.

1.3 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2002.

B. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2008.

C. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

D. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2009.

E. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

F. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2003 (Reapproved 2007).

G. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2009a.

H. ASTM A 325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.

I. ASTM A 500/A 500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010.

J. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

K. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).

L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

PART 2 PRODUCTS

2.1 MATERIALS - STEEL

A. Steel Sections: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500, Grade B cold-formed structural tubing.

C. Plates: ASTM A 283.

D. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers. Type 1, galvanized to ASTM A 153/A 153M where connecting galvanized components.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group 1 (A1).

D. Anchor Bolts: ASTM F 1554, Grade 36. Type 1, galvanized to ASTM A 153/A 153M where connecting galvanized components.

E. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load

imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

G. Wood Screws: Flat head, ASME B18.6.1.

H. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).

I. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

2.3 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.4 FABRICATED ITEMS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.

1. Side Rails and stand-offs: 3/8 x 2 inches (9 x 50 mm) members spaced at 20 inches (500 mm).

2. Rungs: one inch (25 mm) diameter solid round bar spaced 12 inches (300 mm) on center.

3. Space rungs 7 inches (175 mm) from projections on wall surface.

B. Bollards: Galvanized Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

C. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of overhead coiling doors; prime paint finish.

D. Door Frames for Overhead Door Openings and Wall Openings: Channel sections; prime paint finish.

2.5 FINISHES - STEEL

A. Prime paint all steel items.

1. Exceptions: Galvanize items to be embedded in concrete or masonry and items specified for galvanized finish.

B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

C. Prime Painting: One coat.

D. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A 123/A 123M requirements.

E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A 123/A 123M requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

END OF SECTION 05500

SECTION 05510 - METAL STAIRS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Prefabricated Alternating Tread Stairs with metal treads and steel pipe handrails.

B. Prefabricated Stairs with metal treads and landing, and steel pipe handrails

C. Structural steel stair framing and supports.

D. Handrails and guards specific to Alternating Tread Stair and Prefabricated Stair.

1.2 RELATED REQUIREMENTS

A. Section 05500 - Metal Fabrications.

1.3 REFERENCE STANDARDS

A. ASTM A 6/A 6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2009.

B. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2008.

C. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

D. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2009a.

E. ASTM A 325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.

F. ASTM A 500/A 500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010.

G. ASTM A 501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.

H. ASTM A 786/A 786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates; 2005 (Reapproved 2009).

I. ASTM E 935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and

Rails for Buildings; 2000 (Reapproved 2006).

J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2007.

K. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

L. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).

M. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates.

1.5 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in Alaska, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.1 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.

1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.

2. Structural Design: Provide complete stair and railing assemblies complying with the applicable local code, but capable of supporting a uniform load no less than 100 lbs/sq.ft. or

a concentrated load of 2000 lbs, whichever produces the greater stress.

3. Dimensions: As indicated on drawings.

4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.

5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.

6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:

1. Service: Exposed joints tight with face surfaces aligned; underside of stair not covered by soffit is not considered exposed to view.
   a. Welded Joints: Welded on back side wherever possible.
   b. Welds Exposed to View: Ground smooth; not required to be flush.
   c. Bolts Exposed to View: Countersunk flat or oval head bolts; no exposed nuts or screw threads.
   d. Metal Surfaces to be Painted: Sanded smooth, suitable for satin or matte finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.2 METAL STAIRS WITH METAL TREADS AND LANDING

A. Jointing and Finish Quality Level: Service, as defined above.

B. Risers: Closed.

C. Treads AND LANDING: Checkered steel plate.

1. Tread Thickness: 1/4 inch (6 mm), minimum.

2. Anchorage to Stringers: Welded or bolted to carrier angles welded or bolted to stringers.

D. Risers: Steel sheet.

1. Riser Thickness: As required by design; 14 gage, 0.075 inch (1.9 mm) minimum.

2. Riser/Nosing Profile: Sloped riser with rounded nosing of minimum radius.

E. Stringers: Rolled steel channels.

1. Stringer Depth: 10 inches (250 mm).

2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Railings: Steel pipe railings.

G. Finish: Shop- or factory-prime painted.

2.3 PREFABRICATED METAL ALTERNATING TREAD STAIR

A. Provide prefabricated metal alternating tread stair where indicated. Fabricate of open-type construction with channel or plate stringers, pipe and tube railings, and formed plate treads, unless otherwise indicated. Provide brackets and fittings for installation.

1. Fabricate alternating tread stair, including treads and railings from steel.

2. Paint alternating tread stair including treads, railings, brackets, and fasteners, with zinc-rich primer.

3. Alternating tread stair design: 56deg., w/ full height handrail and extension above floor, both sides.

4. Available Manufacturers:

a. Lapeyer Stair – (800) 535-7631
b. Vestil Manufactureing Corp. – (800) 348-0868
c. As approved by Owner

2.4 HANDRAILS AND GUARDS

A. Stringer-Mounted Rails: Round pipe or tube rails unless otherwise indicated.

1. Outside Diameter: 1-1/4 inch (32 mm), minimum, to 1-1/2 inches (38 mm), maximum.

B. Guards:

1. Top Rails: Round pipe or tube rails unless otherwise indicated.
   a. Outside Diameter: 1-1/4 inch (31 mm), minimum, to 1-1/2 inches (38 mm), maximum.

2. End and Intermediate Posts: Same material and size as top rails.
   a. Horizontal Spacing: no less than 12”.
   b. Mounting: Welded to top surface of stringer. Where wall mounting is feasible at the prefabricated stair, use manufacturer’s standard welded steel wall mount bracket.

2.5 MATERIALS

A. Steel Sections: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500 or ASTM A 501 structural tubing, round and shapes as indicated.

C. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

D. Checkered Plate: ASTM A 786/A 786M, rolled steel floor plate; pattern no. 2.

E. Steel Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, galvanized to ASTM A 153/A 153M where connecting galvanized components.

F. Welding Materials: AWS D1.1; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.6 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.

1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.

2. Number of Coats: One.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.

3.3 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1.

D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.

E. Obtain approval prior to site cutting or creating adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION 05510

SECTION 05520 - HANDRAILS AND RAILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall mounted handrails at exterior conditions.

B. Stair hand railings at exterior conditions.

C. Free-standing hand railings at steps and ramps.

1.2 RELATED REQUIREMENTS

A. Section 03300 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 05500 - Metal Fabrications: miscellaneous support steel, anchor bolts, fasteners.

1.3 REFERENCE STANDARDS

A. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

B. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2009.

C. ASTM A 500/A 500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010.

D. ASTM E 935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

E. ASTM E 985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate coordination and layout, profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories associated with complete guardrail and handrail assembly for each stair condition.

C. Samples: Submit two, 10" long samples of handrail. Submit two samples of elbow, wall bracket, and end stop.

PART 2 PRODUCTS

2.1 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E 985 and applicable local code.

B. Design railing assembly, wall rails, and attachments to resist lateral force of 150 lbs (666 N) at any point without damage or permanent set.

C. Allow for expansion and contraction of members and building movement without damage to connections or members.

D. Dimensions: See drawings for configurations, profiles and heights.

1. Handrails Rails: 1-1/2 inches (38 mm) outside diameter, round, hot dipped galvanized steel.

2. Balusters: Paired 2 inches (50 mm) x 3/4 inches (19mm) rectangular solid steel bar stock with 1-1/4 inch (32mm) x 3/4 inches (19mm) extensions to railing and grout pocket, as indicated in details and elevations. Spacing as indicated on the drawings.

2.2 Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

A. For anchorage to concrete deck edges and slabs, provide galvanized steel inserts to be cast into concrete, for welded attachment.

B. For anchorage to concrete curbs: Embed galvanized post and balusters in grout pocket constituting of galvanized steel pipe set in site cast concrete as detailed.

C. For anchorage to steel channel stringer and slab edging: Posts and Balusters to be welded to stringer and edge channels at stairs.

2.3 Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.4 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A 500, Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, galvanized finish.

C. Steel Bar and Steel Sections: ASTM A 36/A 36M.

D. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

E. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

F. Straight Splice Connectors: Steel concealed spigots.

G. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M - 08. Provide minimum 2.3 oz/sq ft galvanized coating (grade 100, typical).

2.5 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:

1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.

2. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.2 PREPARATION

A. Clean and strip galvanized and primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

3.5 REPAIRS

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780, using hot-applied zinc-base solders to a thickness to match specified coating thickness.

3.5 SCHEDULE; ASSEMBLY AND FINISH

A. At exterior stairs and ramps: Wall mounted, and free-standing handrails with flat steel bar railing support system: hot dipped galvanized handrail assembly.

END OF SECTION 05520

SECTION 05530 - GRATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Glass-fiber-reinforced plastic gratings.

2. Galvanized steel frames and supports for gratings.

B. Related Sections include the following:

1. Division 5 Section "Structural Steel" for structural-steel framing system components.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Gratings: Provide gratings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Floors: Uniform load of 100 lbf/sq. ft. or concentrated load of 2000 lbf (8.90 kN), whichever produces the greater stress.

2. Limit deflection to L/360 or 1/4 inch (6.4 mm), whichever is less.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Glass-fiber-reinforced plastic gratings.

2. Clips and anchorage devices for gratings.

B. LEED Submittal:

1. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled

content.
a. Include statement indicating costs for each product having recycled content.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Provide templates for anchors and bolts specified for installation under other Sections.

2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating gratings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

A. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. 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. Glass-Fiber-Reinforced Plastic Gratings:
a. Creative Pultrusions, Inc.

b. Enduro Systems Inc.; Composite Products Division.
c. Fibergrate Composite Structures Inc.
d. Fisher & Ludlow.
e. IKG Industries; a Harsco Company.
f. Seasafe, Inc.
g. Strongwell.
h. McNichols

2.2 FERROUS METALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).

D. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

E. Anchors: Provide cast-in-place anchors with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy that is welded.

B. Zinc-Rich Primer: Zinc-rich primer, complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to

40 CFR 59, Subpart D (EPA Method 24).

2. Products: Subject to compliance with requirements, provide one of the following:
   a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
   b. Carboline Company; Carbozinc 621.
   c. ICI Devoe Coatings; Catha-Coat 313.
   d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
   e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
   f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
   g. Tnemec Company, Inc.; Tneme-Zinc 90-97.
   h. <Insert manufacturer's name; product name or designation.>

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION

A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Welding: Comply with AWS recommendations and 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.

F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

2.6 GLASS-FIBER-REINFORCED PLASTIC GRATINGS

A. Pultruded Glass-Fiber-Reinforced Gratings: Bar gratings assembled from components made by simultaneously pulling glass fibers and extruding thermosetting plastic resin through a heated die under pressure to produce a product without voids and with a high glass-fiber content.

1. Configuration: I4015; 1-1/2-inch (38-mm) I-bars spaced 1 inch (25 mm) o.c. (40 percent open) or as required to comply with structural performance and ADA requirements

2. Resin Type: Polyester or Vinylester.
   a. Flame-Spread Index: 25 or less when tested according to ASTM E 84.

3. Color: Gray.

4. Traffic Surface: Applied abrasive finish..

B. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

2.7 GRATING FRAMES AND SUPPORTS

A. Frames and Supports for Glass-Fiber-Reinforced Plastic Gratings: Fabricate from galvanized steel shapes of sizes, shapes, and profiles as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items. Provide welded steel intermediary supports at grating pits as required.

B. Galvanized steel frames and supports in the following locations:

1. Exterior; 5 locations identified on plan.

2.8 STEEL FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish gratings, frames, and supports after assembly.

C. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with ASTM A 123/A 123M.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

D. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Attach toeplates to gratings by welding at locations indicated.

F. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.2 INSTALLING GLASS-FIBER-REINFORCED PLASTIC GRATINGS

A. Comply with manufacturer's written instructions for installing gratings. Use manufacturer's standard stainless-steel anchor clips and hold-down devices for bolted connections.

3.3 ADJUSTING AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05530

SECTION 05700 - ORNAMENTAL METAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Stainless Steel perforated metal vent panels integrated into casework for the purpose of screening heating convectors and fin tube. Also identified as supply air grill.

2. Stainless Steel Plate (miscellaneous components, including formed wall bases).

B. Related Sections include the following:

1. Section 05500- Metal Fabrications: for non-ornamental metal fabrications.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, including finishing materials.

1. Stainless Steel perforated and formed panels, and formed plates.

B. Shop Drawings: For ornamental metal. Include plans, elevations, component details, and attachments to other work. Indicate materials and profiles of each ornamental metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

1. Provide plans, elevations, sections and details, including attachment to other work.

2. Provide templates for anchors and bolts specified for installation under other Sections.

C. Samples for Initial Selection:

1. Perforated stainless steel of gauge and perforation specified, no less than 12 inches x 12 inches with 1" margin.

D. Samples for Verification:

1. No less than two 12 inch long Sections of linear shapes, with one joint cover.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Arrange for installation of ornamental metal specified in this Section by the same firm that fabricated it.

B. Fabricator Qualifications: A firm experienced in producing ornamental metal similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.6, "Structural Welding Code--Stainless Steel."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store ornamental metal inside a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with ornamental metal by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

2. If practical, provide allowance for trimming and fitting at site.

1.6 COORDINATION

A. Coordinate installation of anchorages for ornamental metal items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND FABRICATORS

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. McNichols Co. 1-800-237-382

2. Ametco Manufacturing Corporation. 1-800-321-7042

3. Hendrick 1-800-225-7373

B. Perforated Stainless Steel Sheet, formed, with finished end and edge margins: 16 ga type 304 stainless steel with 1/8" diameter holes on 3/16" centers, yielding 40% open area. Margins defined in details and will be confirmed with shop drawing review. Formed and unperforated joint covers as detailed to match.

C. Stainless Steel Plate; miscellaneous components, including formed 10 ga SS wall bases and cut 3/8" stainless steel site signage.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials and fabrications with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, Anchors at Pipe and Tube Rails and Handrails: Cast or milled of same material and finish as supported rails, unless otherwise indicated.

2.3 STAINLESS STEEL

A. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 304.

2.4 FASTENERS

A. Fastener Materials: Unless otherwise indicated, provide the following:

1. Stainless-Steel Items: Type 304 stainless-steel fasteners.

B. Fasteners for Anchoring to Other Construction: Unless otherwise indicated, select fasteners of type, grade, and class required to produce connections suitable for anchoring indicated items to other types of construction indicated, meeting the design loading requirements of those structures.

C. Provide concealed fasteners for interconnecting components and for attaching ornamental metal items to other work, unless otherwise indicated.

1. Provide tortx flat-head machine screws for exposed fasteners, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.6 FABRICATION, GENERAL

A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

B. Form ornamental metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines..

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form simple and compound curves in bars and extruded shapes by bending members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces.

E. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

F. Mill joints to a tight, hairline fit. Cope or miter corner joints. Weld all around at connections to like metals, including fittings. Fabricate connections that will be exposed to weather in a manner to exclude water.

G. Comply with AWS for recommended practices in shop welding. Weld behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces.

H. Provide castings that are sound and free of warp, cracks, blowholes, or other defects that impair strength or appearance. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.8 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Unless otherwise indicated, grind and polish surfaces to produce uniform finish indicated, free of cross scratches.

1. Run grain of directionally textured finishes with long dimension of each piece.

C. Directional Satin Finish: No. 4 finish. (tubes, plates, sheets, and profiles)

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of ornamental metal.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Provide anchorage devices and fasteners where needed to secure ornamental metal to in-place construction.

B. Perform cutting, drilling, and fitting required to install ornamental metal. Set products accurately in location, alignment, and elevation; measured from established lines and levels. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.

C. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, with uniform reveals and spaces for sealants and joint fillers. Where cutting, welding, and grinding are required for proper shop fitting and jointing of ornamental metal, restore finishes to eliminate evidence of such corrective work.

D. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

3.3 CLEANING

A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.

3.4 PROTECTION

A. Protect finishes of ornamental metal from damage during construction period with temporary protective coverings approved by ornamental metal fabricator. Remove protective covering at

time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05700

SECTION 05810 - EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Expansion and movement joint assemblies for wall, ceiling and soffit surfaces.

1.2 RELATED REQUIREMENTS

A. Section 07900 - Joint Sealers: Expansion and control joint finishing utilizing a sealant and bond breaker.

B. Section 09260 -Gypsum Board Assemblies : Soffit and wall movement device.

1.3 REFERENCE STANDARDS

A. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2008.

B. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2007.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices, available colors and finish.

C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction, anchorage locations.

D. Samples: Submit one samples 12 inch (30 mm) long, illustrating profile, dimension, color, and finish selected.

E. Manufacturer's Installation Instructions: Indicate rough-in sizes; provide templates for cast-in or placed frames or anchors; required tolerances for item placement.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Expansion Joint Cover Assemblies:

1. Architectural Art Mfg., Inc; Product R-series: www.archart.com.

2. Construction Specialties, Inc; Product SF-series: www.c-sgroup.com.

3. MM Systems Corp; Product vertical sealing system (VSS - series): www.mmsystemscorp.com.

4. Substitutions: See Section 01600 - Materials and Equipment.

2.2 MATERIALS

A. Extruded Aluminum: ASTM B 221 (ASTM B 221M), 6063 alloy, T6 temper.

B. Resilient Filler: Neoprene, exhibiting Shore A hardness of 40 to 50 Durometer.

C. Threaded Fasteners: Stainless steel.

2.3 FABRICATION

A. Joint Covers: cover plate, aluminum frame construction, retainers with resilient elastomeric filler strip, designed to permit plus or minus 50 percent joint movement with full recovery, flush mounted.

B. Provide joint components in single length wherever practical. Minimize site splicing.

2.4 FINISHES

A. Walls and Ceilings: match wall or ceiling color.

B. Resilient Filler Exposed to View: white.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joint preparation and dimensions are acceptable and in accordance with

manufacturer's requirements.

3.2 PREPARATION

A. Install anchoring devices in conformance to templates.

3.3 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Rigidly anchor to substrate to prevent misalignment.

END OF SECTION 05810

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with timber.
3. Rooftop equipment bases and support curbs.
4. Wood blocking and nailers.
5. Wood furring.
6. Wood sleepers.
7. Plywood backing panels.

1.2 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Timber: Lumber of 5 inches nominal or greater in least dimension.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NLGA: National Lumber Grades Authority.
2. WCLIB: West Coast Lumber Inspection Bureau.
3. WWPA: Western Wood Products Association.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. LEED Submittals:

1. Certificates for Credit MR 6 and Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
2. Product Data for Credit EQ 4.1: For adhesives, documentation including printed statement of VOC content.
3. Product Data for Credit EQ 4.4: For composite wood products, documentation indicating that product contains no urea formaldehyde.
4. Laboratory Test Reports for Credit EQ 4: For adhesives and composite-wood products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Power-driven fasteners.
3. Powder-actuated fasteners.
4. Metal framing anchors.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1. Dimension lumber framing.
2. Timber.
3. Rim boards.
4. Miscellaneous lumber.

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC4a.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, and similar concealed members in contact with concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. All Lumber: No. 2 grade.

1. Species:

a. Douglas fir-larch; WCLIB or WWPA.
b. Hem-fir; WCLIB, or WWPA.

2.4 TIMBER FRAMING

A. Provide timber framing complying with the following requirements, according to grading rules of grading agency indicated:

1. Species and Grade: Douglas fir-larch, No. 1 grade; WCLIB, or WWPA.
2. Species and Grade: Hem-fir or hem-fir (north); No. 1 grade; WCLIB, or WWPA.
3. Maximum Moisture Content: 20 percent.
4. Additional Restriction: Free of heart centers.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.
7. Utility shelving.

B. For items of dimension lumber size, provide No. 2 grade lumber and the following species:

1. Douglas Fir-Larch; WCLIB or WWPA.
2. Hem-fir; WCLIB or WWPA.

C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

2.8 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cleveland Steel Specialty Co.
2. KC Metals Products, Inc.
3. Phoenix Metal Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

2.9 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locatenailers, blocking,and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

D. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

F. Do not splice structural members between supports unless otherwise indicated.

G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.

3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

I. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

J. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use copper naphthenate for items not continuously protected from liquid water.

K. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

L. Use steel box nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

M. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Use box nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

3.3 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-

bearing partitions and for load-bearing partitions where framing members bearing on partition are located directly over studs. Fasten plates to supporting construction unless otherwise indicated.

B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.

3.4 TIMBER FRAMING INSTALLATION

A. Install timber with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members unless otherwise indicated; tie together over supports as indicated if not continuous.

B. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2-inch air space at sides and ends of wood members.

C. Install wood posts using metal anchors indicated.

D. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

3.5 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06100

SECTION 06150 - WOOD DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-sawn wood roof decking.

1.2 SUBMITTALS

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

B. LEED Submittals:

1. Certificates for Credit MR 7: Chain-of-custody certificates certifying that wood used for decking complies with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

a. Include statement indicating costs for each certified wood product.

2. Product Data for Credit EQ 4.1: For sealants and installation adhesives, including printed statement of VOC content.

1.3 QUALITY ASSURANCE

A. Standard for Solid-Sawn Wood Decking: Comply with AITC 112.

B. Forest Certification: Provide wood decking produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Schedule delivery of wood decking to avoid extended on-site storage and to avoid delaying the Work.

B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings. Stack wood decking with surfaces that are to be exposed in the final Work protected from exposure to sunlight.

PART 2 - PRODUCTS

2.1 WOOD DECKING, GENERAL

A. General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

B. Moisture Content: Provide wood decking with 19 percent maximum moisture content at time of dressing.

2.2 SOLID-SAWN WOOD DECKING

A. Decking Species: Douglas fir-larch or Douglas fir-larch (North).

B. Decking Nominal Size: 3x6.

C. Decking Grade: Commercial Decking or Commercial Dex.

D. Grade Stamps: Factory mark each item with grade stamp of grading agency. Apply grade stamp to surfaces that will not be exposed to view.

E. Face Surface: Smooth.

F. Edge Pattern: Vee grooved.

G. Preservative Treatment: Pressure treat solid-sawn wood decking according to AWPA C31 with inorganic boron (SBX) and redry wood to 19 percent maximum moisture content.

2.3 ACCESSORY MATERIALS

A. Fasteners for Solid-Sawn Decking: Provide fastener size and type complying with decking standard for thickness of deck used.

B. Nails: Common; complying with ASTM F 1667, Type I, Style 10.

C. Spikes: Round; complying with ASTM F 1667, Type III, Style 3.

D. Fastener Material: Hot-dip galvanized steel.

E. Bolts for Anchoring Decking to Walls: Carbon steel; complying with ASTM A 307 with ASTM A 563/A 563M hex nuts and, where indicated, flat washers, all hot-dip zinc coated.

F. Sealant: Latex sealant compatible with substrates or Elastomeric joint sealant complying with requirements in Division 7 Section "Joint Sealants" for Use NT (nontraffic) and for Uses M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

1. Use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Penetrating Sealer: Clear sanding sealer complying with Division 9 Section "Wood Stains and Transparent Finishes" and compatible with topcoats specified for use over it.

2.4 FABRICATION

A. Shop Fabrication: Where preservative-treated decking is indicated, complete cutting, trimming, surfacing, and sanding before treating.

B. Predrill decking for lateral spiking to adjacent units to comply with referenced decking standard.

C. Seal Coat: After fabricating and surfacing decking, apply a saturation coat of penetrating sealer in fabrication shop.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and support framing in areas to receive wood decking for compliance with installation tolerances and other conditions affecting performance of wood decking.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install solid-sawn wood decking to comply with referenced decking standard.

1. Locate end joints for two-span continuous lay-up.

B. Anchor wood roof decking, where supported on walls, with bolts as indicated.

C. Apply joint sealant to seal roof decking at exterior walls at the following locations:

1. Between decking and supports located at exterior walls.
2. Between decking and exterior walls that butt against underside of decking.
3. Between tongues and grooves of decking over exterior walls and supports at exterior walls.

3.3 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged decking if repairs are not approved by Architect.

3.4 PROTECTION

A. Provide temporary waterproof covering as the Work progresses to protect roof decking until roofing is applied.

END OF SECTION 06150

SECTION 06160 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Subflooring.
4. Underlayment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. LEED Submittals:

1. Certificates for Credit MR 6 and Credit MR 7: Chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
2. Product Data for Credit EQ 4.1: For adhesives, documentation including printed statement of VOC content.
3. Product Data for Credit EQ 4.4: For composite wood products, documentation indicating that product contains no urea formaldehyde.
4. Laboratory Test Reports for Credit EQ 4: For adhesives and composite wood products, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For following products, from ICC-ES:

1. Preservative-treated plywood.
2. Foam-plastic sheathing.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

A. Emissions: Products shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1. Plywood.

C. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.

D. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

E. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC4a.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 WALL SHEATHING

A. Plywood Wall Sheathing: Exposure 1 sheathing.

1. Nominal Thickness: Not less than as indicated.

2.4 ROOF SHEATHING

A. Plywood Roof Sheathing: Exposure 1 sheathing.

1. Nominal Thickness: As indicated.

2.5 SUBFLOORING AND UNDERLAYMENT

A. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exterior, C-C Plugged single-floor panels.

1. Nominal Thickness: As indicated.
2. Edge Detail: Square.
3. Surface Finish: Fully sanded face.

B. Plywood Subflooring: Exterior, Structural I single-floor panels or sheathing.

1. Nominal Thickness: Not less than that indicated.

C. Underlayment, General: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 1/4 inch over smooth subfloors and not less than 3/8 inch over board or uneven subfloors.

D. Plywood Underlayment for Resilient Flooring: DOC PS 1, Exterior A-C with fully sanded face.

E. Plywood Underlayment for Carpet: DOC PS 1, Exterior, C-C Plugged.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Use box wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Combination Subfloor-Underlayment:

    a. Glue and nail to wood framing.
    b. Screw to cold-formed metal framing.
    c. Space panels 1/8 inch apart at edges and ends.

2. Subflooring:

    a. Glue and nail to wood framing.
    b. Screw to cold-formed metal framing.
    c. Space panels 1/8 inch apart at edges and ends.

3. Wall and Roof Sheathing:

    a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
    b. Screw to cold-formed metal framing.
    c. Space panels 1/8 inch apart at edges and ends.

4. Underlayment:

    a. Nail to subflooring.
    b. Space panels 1/32 inch apart at edges and ends.
    c. Fill and sand edge joints of underlayment receiving resilient flooring immediately before installing flooring.

END OF SECTION 06160

SECTION 06200 - FINISH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Finish carpentry items.

B. Wood veneer panels (Wainscot panels), also identified as hardwood plywood, and associated trim in interior applications.

C. Linear Wood ceiling and soffits - concealed fasteners. Interior and fire retardant treated exterior conditions.

D. Wood casings and moldings.

E. Hardware and attachment accessories not otherwise included in Section 06410.

G. MDO plywood for painted exterior use.

1.2 RELATED REQUIREMENTS

A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05400 - Cold-Formed Metal Framing: Siding, soffit, and interior finish ceiling and wall panel substrate framing.

C. Section 06100 - Rough Carpentry: Support framing, grounds, and concealed blocking.

D. Section 06410 - Custom Cabinets: Shop fabricated custom cabinet work.

E. Section 08211 - Flush Wood Doors.

F. Section 08800 - Glazing: Glass and glazing of display cases.

G. Section 09111 - Non-Loadbearing Metal Framing

H. Section 09900 - Paints and Coatings: Painting and finishing of finish carpentry items.

1.3 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI A135.4 - American National Standard for Basic Hardboard; 2004.

C. ANSI A208.1 - American National Standard for Particleboard; 1999.

D. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2004.

E. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

F. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.

G. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.9).

H. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; Hardwood Plywood & Veneer Association; 2004.

I. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

J. PS 1 - Structural Plywood; 2007.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.5 SUBMITTALS

A. See Section 01300 - Contractor Submittals for submittal procedures.

B. Product Data:

1. Provide data on fire retardant treatment materials and application instructions.

2. Provide instructions for attachment hardware and finish hardware.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot (1:8).

2. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.

D. Samples: Submit two samples of finish plywood, 12x12 inch (300x300 mm) in size illustrating

wood grain and specified finish.

E. Samples: Submit two samples of wood trim 10" long.

F. LEED Report: Submit for wood products made from sustainably harvested wood, salvaged and reused wood, wood fabricated from recovered timber, and locally-sourced wood, as specified in Section 01355.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.

2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

PART 2 PRODUCTS

2.1 FINISH CARPENTRY ITEMS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI//AWMAC/WI Architectural Woodwork Standards for Custom Grade.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Exterior Woodwork Items include but are not limited to:

1. Enclosing Soffit Spaces and blocking: As detailed.

3. Suspended Linear Wood Ceiling System: Clear Hemlock, "FR-S" treated and clear finished prior to installation.

4. Replacement MDO panels at outdoor covered play area – painted. Extent identified on elevations. Thickness to match existing.

D. Interior Woodwork Items:

1. Moldings, Trim, Corner Guards, Bases, Casings, and Miscellaneous Trim: Clear maple, clear finished.

2. Doors: Clear maple, clear finished. Section 08211

3. Window Sills: Clear Hemlock, painted finish, unless otherwise noted as solid surfaces.

4. Suspended Linear Wood Ceiling System: Clear Hemlock, clear finished prior to installation.

5. Wood Wainscot panes: Hardwood plywood; clear finished maple.

6. AC Plywood wall panels, panted; for repair and matching of existing wall panels in gymnasium. Thickness to match existing.

2.2 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

B. Provide sustainably harvested wood, certified or labeled as specified as per requirements to support LEED certification. Section 01355.

2.3 LUMBER MATERIALS

A. Softwood Lumber for use at interior wood ceilings and exterior soffits: Hemlock species, maximum moisture content of 9 percent; with vertical grain, of quality suitable for transparent finish.

B. Hardwood Lumber: Maple species, maximum moisture content of 6 percent; with clear vertical grain, of quality suitable for transparent finish.

2.4 SHEET MATERIALS

A. Softwood Plywood Not Exposed to View: Any face species, veneer core; PS 1 Grade A-B; with formaldehyde-free glue type as recommended for application.

B. Softwood Plywood Exposed to View: Fir, sanded; Grade AC; with formaldehyde-free glue type as recommended for application. Match adjacent thicknesses and paint.

C. Hardwood Plywood: Face species Maple, plain sawn, book matched, veneer core; HPVA HP-1, Grade AA; with formaldehyde-free glue type as recommended for application.

D. Particleboard: ANSI A208.1; composed of wood chips, sawdust, or flakes of medium density, made with waterproof formaldehyde-free resin binders; of grade to suit application; sanded faces.

E. Hardboard: AHA A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch (6 mm) thick, smooth one side (S1S).

F. Medium Density Overlay Plywood (MDO): Laminated fir veneer exterior plywood with MDF surface. APA Grade B-C, Group 1. Match adjacent thicknesses and paint.

G. See section 06410 for plastic laminate materials selection and installation requirements.

2.5 ADHESIVE

A. Adhesive: Formaldehyde-free type recommended by laminate manufacturer to suit application.

2.6 FASTENINGS

A. Adhesive: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Fasteners: Of size and type to suit application; any finish in concealed locations and nickel finish in exposed locations.

C. Concealed Joint Fasteners: Threaded steel.

2.7 ACCESSORIES

A. Lumber for Shimming, Blocking, and backing: Softwood lumber of any species.

B. Wood Edge Trim: Clear Maple with Clear finish.

E. Glass: Type S-1 as specified in Section 08800.

F. Primer: as specified in Section 09900.

G. Wood Filler: Solvent base, tinted to match surface finish color.

2.8 HARDWARE (not otherwise specified in Section 08710)

A. Hardware: Comply with BHMA A156.9.

B. Shelf Standards: Super Duty single slot style, White finish; 87 series manufactured by Knape & Vogt .

C. Shelf Brackets: Super Duty single slot style, White finish; 187LL series manufactured by Knape & Vogt.

D. Coat Hook; Under-shelf: BATTALION 1RCH2 Under Shelf Hook Material Steel Nickel Finish Length 2 1/2 In Height 2 1/2 In Width 3 In Hook Opening 1 1/2 In Hook Eye Inside H 1 In Hook Eye Inside W 1 9/64 In Eye Inside Dia 1 1/2 In Wire Dia 1/4 In Max Working Load 35 Lb. From Gridline Structure http://www.gridlinesupply.com.

E. Coat Hook wall mount: INDUSTRIAL GRADE 4CRU6 Hook Material 304 Stainless Steel Mirror Finish Height 1 19/64 In Depth 1 17/64 In Load Capacity 44 Lb Includes Screws. From Gridline Structure http://www.gridlinesupply.com.

F. Workstation brackets: 1/8" formed steel, 1000lb load capacity, powder coat black; size per counter top depth. www.supportbrackets.com

G. Bench Bracket: Welded and painted steel as detailed.

H. Perforated Grill at cabinet top: Stainless steel as detailed, and specified in Section 05700.

I. Perforated Grill at toe-kick: Stainless steel as detailed, and specified in Section 05700.

J. Built-in shelf Support Pins: Knape & Vogt 345 Series Steel Support; Nickel finish.

K. Display Case Sliding Door Hardware: Top Hung System Junior 80/GP - Hawa, Duel bypass track, double roller running gear, patch suspension system with S-1 glass. Manufactured by Hafele 1-800-423-3531. Side and locations indicated on the drawings.

L. Display Case Shelf Supports: As detailed: 1/2" diameter aluminum rod with hardwood standard.

M. Grommets: LO3, oval type, by Mockett, 1-800-523-1269

2.10 WOOD TREATMENT

A. Fire Retardant Treatment (FR-S Type): At Lineal Wood Ceiling exterior installation, chemically treated and impregnated; capable of providing flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.

B. Provide identification on non-finish side of fire retardant treated material.

C. Redry wood after pressure treatment to maximum 9 percent moisture content.

2.11 FABRICATION

A. Shop assemble work for delivery to site to the greatest extent possible. Size shop fabricated pieces of the work to permit passage through building openings.

D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

H. Wood Wainscot, Trim, and Corner Guards – Clear Finished:

1. ½ inch thick Maple veneer faced hardwood plywood, shop apply first coats of finish and fit on site. Adhere to substrate and mechanically fasten. Adhere and mechanically fasten maple base, chair rail, and batten strips as detailed, filling all fastener holes prior to applying final coat of finish. Panel to install flat on substrate, with no cupping or perceivable

movement with contact.

2. Install shop finished trim and corner guards as the sequence of installation of wall panels permits. Fill all fastener holes prior to applying final coat of finish.

G. Linear Wood Ceiling and Soffits:

1. Interior condition: 1x4 nominal clear finished clear vertical grain hemlock, fastened to 7/8 inch deep painted galvanized steel hat channels with two evenly spaced stainless steel square drive trim-head screws, predrilled and countersink heads 1/8" into finish surface of wood. Fasteners to align from board to board. Hat channels to be spaced equally for a given panel span, not more than 36 inches on center or less than 24 inches on center. All channels and suspension framing and associated hardware to be painted flat black prior to installation. Sprinkler heads to be placed such that head penetrations align with centerline of joint between wood pieces.

2. Exterior Condition: 1x4 nominal clear vertical grain hemlock, fire retardant treated and clear finished, fastened to 7/8 inch deep painted galvanized steel hat channels with two evenly spaced stainless steel square drive trim-head screws, predrilled and countersink heads 1/8" into finish surface of wood. Fasteners to align from board to board. Hat channels to be spaced equally for a given panel span, not more than 36 inches on center or less than 24 inches on center, with attachment at span ends as per details. Install black air barrier fabric over supporting channels, full width of installation prior to installing wood strips to afford black-out between wood strips and to prevent entry of insects and dust. All exposed channels and suspension framing and associated hardware to be painted flat black prior to installation.

2.12 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Ease all exposed hardwood and softwood edges; 3/32" radius.

C. Apply wood filler in exposed nail and screw indentations.

D. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

E. Coordinate finish with Section 09930 - Staining and Transparent finishing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and

ready to receive this work.

3.2 INSTALLATION

A. Applications defined in drawings and details. Install work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (1 mm), unless otherwise noted. Do not use additional overlay trim to conceal larger gaps.

D. Biscuit Joint all butt joints and materials set in same plane.

E. Install components with wall adhesive by gun application, and nails or cabinet head screws at 12 inch centers. Set and apply wood filler at all exposed nail and screw holes.

F. Install prefinished panelswith full bed contact adhesive applied to substrate.

G. Install hardware in accordance with manufacturer's instructions.

3.3 SITE APPLIED WOOD TREATMENT

A. Apply preservative and fire treatment in accordance with manufacturer's instructions.

B. Brush apply one coats of preservative treatment on wood in contact with cementitious materials. Treat site-sawn cuts. Allow preservative to dry prior to erecting members.

3.4 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Ease all exposed hardwood and softwood edges; 3/32” radius. Sand work smooth.

B. Site Finishing: See Section 09900.

C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.5 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.5 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.7 mm).

END OF SECTION 06200

SECTION 06410 - CUSTOM CABINETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fabricated cabinet units.

B. Countertops.

C. Factory finishing.

D. Preparation for installing utilities.

E. Plastic Laminate Materials

1.2 RELATED REQUIREMENTS

A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 06100 - Rough Carpentry: Support framing, grounds, and concealed blocking.

C. Section 06200 - Finish Carpentry: Cabinet Hardware, material and preparation.

D. Section 08310 - Access Doors and Panels: for access doors installed in cabinetry.

E. Section 08800 - Glazing: Glass for casework.

F. Section 09900 - Paints and Coatings: Site and shop finishing of shelf and cabinet exterior edge banding.

G. Section 15762 - Terminal Heat Transfer Units: for valve access locations in back of cabinets

1.3 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard; 2004.

B. ANSI A208.1 - American National Standard for Particleboard; 1999.

C. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.

E. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.9).

F. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; Hardwood Plywood & Veneer Association; 2004 (ANSI/HPVA HP-1).

G. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

H. NHLA G-101 - Rules for the Measurement & Inspection of Hardwood & Cypress; National Hardwood Lumber Association; 2007.

I. PS 1 - Structural Plywood; 2007.

J. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 2005.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. See Section 01300 - Contractor Submittals, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot (1:8).

2. Provide the information required by AWI/AWMAC/WI Architectural Woodwork Standards.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit Samples of laminate and of solid surfaces for color selection from the manufacturers full line of colors. Anticipate up to 6 different laminate colors and one solid surfaces material color will be chosen and

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches (300 mm) square, illustrating proposed cabinet and shelf unit substrate and finish.

E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, specified in Section 06200 and 08710, demonstrating hardware design, quality, and finish.

F. LEED Report: Submit for wood products made from sustainably harvested wood, salvaged and reused wood, wood fabricated from recovered timber, and locally-sourced wood, as specified in

Section 01355.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.

B. Perform work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Custom quality, unless other quality is indicated for specific items.

C. Manufacturer Qualifications: Member in good standing of the Architectural Woodwork Institute (AWI) or the Architectural Woodwork Manufacturers Association of Canada (AWMAC) and familiar with the AWI/AWMAC QSI.

1.7 MOCK-UP

A. Provide mock-up of typical base cabinet and wall cabinet, including hardware, and finishes.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.9 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 - PRODUCTS

2.1 CABINETS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI//AWMAC/WI Architectural Woodwork Standards for Custom Grade.

B. Plastic Laminate Faced Cabinets: Custom grade.

C. Cabinets:

1. Finish - Exposed Exterior Surfaces: Decorative laminate.

2. Finish - Exposed Interior Surfaces: Decorative laminate.

3. Finish - Concealed Surfaces: Laminate backing sheet at panels with laminaTe faces.

4. Door and Drawer Front Edge Profiles: Square edge with thick applied wood edgeband.

5. Door and Drawer Front Retention Profiles: Fixed panel.

6. Casework Construction Type: Type A - Frameless.

7. Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.

8. Cabinet Design Series: As indicated on the Drawings.

9. Adjustable Shelf Loading: 50 lbs. per sq. ft..
   a. Deflection: L/144.

10. Cabinet Style: Flush overlay.

11. Cabinet Doors and Drawer Fronts: Flush style.

12. Drawer Side Construction: Manufacturer's option.

13. Drawer Construction Technique: As recommended by fabricator.

2.2 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

B. Provide sustainably harvested wood, certified or labeled as specified in Section 01600.

C. Hardwood Edgebanding: Use solid clear vertical grain maple edgebanding.

2.3 LUMBER MATERIALS

A. Softwood Lumber: NIST PS 20; Graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Grade II/Custom; average moisture content of 5-10 percent; species as recommended by manufacturer.

B. Hardwood Lumber: NHLA; Graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Grade II/Custom; average moisture content of 5-10 percent; species as follows:

1. Exposed Surfaces: Species Maple.

2. Semi-Exposed Surfaces: Species Maple.

2.4 PANEL MATERIALS

A. Particleboard: ANSI A208.1; medium density industrial type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, composed of wood chips bonded with formaldehyde-free adhesive under heat and pressure; sanded faces; thickness as required; use for all components not indicated as another material.

1. Provide product with no less than 50% recycled wood or post consumer wood waste content.

B. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated; composed of wood fibers pressure bonded with moisture resistant formaldehyde-free adhesive to suit application; sanded faces; thickness as required.

1. Use for painted components and concealed components.

2. Provide product with pre-consumer recycled wood or post consumer wood waste content.

C. Plywood for Non-Decorative Purposes: NIST PS 1, Interior rated formaldehyde-free adhesives, core of wood plies from listed species unless otherwise indicated, thickness as indicated or as required by application.

D. Hardboard: AHA A135.4; Pressed wood fiber with formaldehyde-free resin binder, Class 1 - Tempered, 1/4 inch (6 mm) thick, smooth two sides (S2S); use for drawer bottoms, dust panels, and other components indicated on drawings.

2.5 PLASTIC LAMINATE MATERIALS

A. Manufacturers:

1. Formica Corporation: www.formica.com.

2. Panolam Industries International, Inc\Nevamar: www.nevamar.com.

3. Wilsonart International, Inc: www.wilsonart.com.

4. Substitutions: See 01600 - Materials and Equipment.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Laminate Adhesive: Type recommended by laminate manufacturer to suit application; not containing formaldehyde or other volatile organic compounds.

D. Provide specific types as scheduled.

1. Horizontal Surfaces: HGS, 0.048 inch (1.22 mm) nominal thickness, through color, color as selected, finish as scheduled.

2. Vertical Surfaces: VGS, 0.028 inch (0.71 mm) nominal thickness, through color, color as selected, finish as scheduled.

3. Cabinet Liner: CLS, 0.020 inch (0.51 mm) nominal thickness, through color, color as selected, satin finish.

4. Laminate Backer: BKL, 0.020 inch (0.51 mm) nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

E. Cap plastic laminate finish panel with laminate or hardwood edge trim as indicated.

1. Exposed shelves , fixed and adjustable, and cabinet box edges shall have 3/8” thick hardwood edge trim.

2. Concealed shelves, box edges, concealed edges of adjustable shelves shall have laminate edge trim.

3. Cabinet doors and drawers shall have 3/8” thick hardwood edge trim.

2.6 COUNTERTOPS

A. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISSFA-2 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.

1. Surface Burning Characteristics: Flame spread 25, maximum; smoke developed 450, maximum; when tested in accordance with ASTM E 84.

2. NSF approved for food contact.

3. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.

4. Color and Pattern: As selected by ARCHITECT from manufacturer's full line of products meeting the design criteria.

5. Manufacturers:
   a. Dupont: www.corian.com.
   b. Formica Corporation: www.formica.com.
   c. Avonite Surfaces: www.avonitesurfaces.com.
   d. Wilsonart International, Inc: www.wilsonart.com.
   e. Substitutions: See Section 01600 - Materials and Equipment

6. Provide product with recycled content.

7. Other Components Thickness: 1/2 inch (12 mm), minimum.

8. Exposed Edge Treatment: Built up to minimum 1-1/4 inch (32 mm) thick; edge profile as indicated on drawings; use marine edge at sinks.

9. Back and End Splashes: Same sheet material, square top; minimum 4 inches (102 mm) high.

10. Skirts: As indicated on drawings.

2.7 ACCESSORIES

A. Adhesive: Formaldehyde-free type recommended by AWI/AWMAC to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel, or chrome-plated finish in exposed locations.

E. Concealed Joint Fasteners: Threaded steel.

2.8 HARDWARE

A. See Section 06200 - Finish Carpentry for cabinet hardware no specified here.

B. Pulls: EC-Series style, Satin Stainless Steel finish; EC-180/M manufactured by Sugatsune 1-800-562-5267.

C. Door Locks: Best Access Systems Keyed cylinder, two keys per lock. Cabinet latch function , steel with satin finish.

D. Drawer Slides:

1. Type: Full extension.

2. Static Load Capacity: Heavy Duty grade.

3. Mounting: Side mounted.

4. Stops: Integral type.

5. Features: Provide self closing/stay closed type.

6. Manufacturers:
   a. Accuride International, Inc: www.accuride.com.

b. Grass America Inc: www.grassusa.com.
c. Knape & Vogt Manufacturing Company: www.knapeandvogt.com.
d. Substitutions: See Section 01600 - Materials and Equipment

E. Hinges: European style concealed self-closing type, BHMA No. A156.9, B01602, steel with polished finish.100 degrees open, mimum.

1. Manufacturers:
a. Grass America Inc: www.grassusa.com.
b. Hardware Resources: www.hardwareresources.com.
c. Julius Blum, Inc: www.blum.com.
d. Substitutions: See Section 01600 - Materials and Equipment

2.9 SITE FINISHING MATERIALS

A. Finishing: Site finished as specified in Section 09900.

2.10 FABRICATION

A. Cabinet grade: Custom

B. Cabinet Style: Flush overlay.

C. Cabinet Doors and Drawer Fronts: Flush style.

D. Drawer Construction Technique: As recommended by fabricator to meet requirements of Custom fabrication.

E. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

F. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

G. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.

1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

H. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.11 FACTORY FINISHING

A. Sand work smooth and set exposed nails and screws.

B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.

C. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.

D. Finish work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Section 1500, Nitrocellulose Lacquer, transparent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.2 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (1 mm). Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

G. Site glaze glass materials using the Interior Dry method specified in Section 08800.

H. Coordinate access locations for mechanical, plumbing and electrical items, providing penetration and access door panels identified in Section 08310.

3.3 ADJUSTING

A. Adjust moving or operating parts to function smoothly and correctly.

3.4 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION 06410

SECTION 06640 - PLASTIC PANELING

PART 1 RELATED DOCUMENTS

1.1 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. Section includes glass-fiber reinforced plastic (FRP) wall paneling and trim accessories.

B. Related Sections:

1. Division 6 Section "Rough Carpentry" for wood furring for installing plastic paneling.

1.3 SUBMITTALS

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

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content and chemical components.

C. Samples for Initial Selection: For plastic paneling and trim accessories.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

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. Class: Class C (for enclosed spaces in Group E, Sprinklered building).

2. Flame-Spread Index: 200 or less.

3. Smoke-Developed Index: 450 or less.

4. Testing Agency: UL.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 PRODUCTS

2.1 PLASTIC SHEET PANELING

A. General: Gelcoat-finished, glass-fiber reinforced plastic panels complying with ASTM D 5319.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Kemlite Company Inc.
   b. Marlite.
   c. Nudo Products, Inc.

2. Nominal Thickness: Not less than 0.09 inch.

3. Surface Finish: Molded pebble texture.

4. Color: White.

2.2 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.

1. Color: White.

B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.

C. Adhesive: As recommended by plastic paneling manufacturer.

1. VOC Content: 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Sealant: Single-component, mildew-resistant, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Division 7 Section "Joint Sealants."

1. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.

B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.

D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.

1. Mark plumb lines on substrate at panel joint locations for accurate installation.

2. Locate trim accessories to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install panels with fasteners. Layout fastener locations and mark on face of panels so that fasteners are accurately aligned.

1. Drill oversized fastener holes in panels and center fasteners in holes.

2. Apply sealant to fastener holes before installing fasteners.

D. Install factory-laminated panels using concealed mounting splines in panel joints.

E. Install trim accessories with adhesive and nails or staples. Do not fasten through panels.

F. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.

G. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

H. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.

I. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 06640

SECTION 07115 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Bituminous dampproofing.

1.2 RELATED REQUIREMENTS

A. Section 03300 – cast in place concrete; for coordination of dam-proofing of exterior foundation walls.

1.3 REFERENCE STANDARDS

A. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 2005.

B. ASTM D 2822 - Standard Specification for Asphalt Roof Cement, Asbestos-Containing; 2005.

C. ASTM D 3747 - Standard Specification for Emulsified Asphalt Adhesive for Adhering Roof Insulation; 1979 (Reapproved 2007).

D. NRCA ML104 - The NRCA Roofing and Waterproofing; National Roofing Contractors Association; Fifth Edition, with interim updates.

1.4 SUBMITTALS

A. See Section 01300 - Contractor Submittals, for submittal procedures.

B. Product Data: Provide properties of primer, bitumen, and mastics.

1.5 QUALITY ASSURANCE

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

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application until dampproofing has cured.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Karnak Chemical Corp: www.karnakcorp.com.

2. Mar-Flex Systems, Inc: www.mar-flex.com.

3. W.R. Meadows, Inc: www.wrmeadows.com.

4. Substitutions: See Section 01600 - Materials and Equipment.

2.2 COLD ASPHALTIC MATERIALS

A. Bitumen: Asphalt emulsion, ASTM D 3747.

B. Asphalt Primer: ASTM D 41, compatible with substrate.

C. Sealing Mastic: Asphalt roof cement, ASTM D 2822, Type I.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect adjacent surfaces not designated to receive dampproofing.

B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.

C. Do not apply dampproofing to surfaces unacceptable to manufacturer.

D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

3.2 APPLICATION

A. Foundation Walls: Apply two coats of asphalt dampproofing. Carefully identify and scribe finish grades on foundation wall and do not extend dampproofing above this line. Apply at exterior face of all foundations not to recieve waterproofing (concrete with fill both sides, typical).

B. Prime surfaces in accordance with manufacturer's instructions.

C. Apply bitumen as recomended by manufacturer.

D. Apply from 2 inches (50 mm) below finish grade elevation down to top of footings.

E. Seal items projecting through dampproofing surface with mastic. Seal watertight.

F. Immediately backfill against dampproofing to protect from damage.

END OF SECTION 07115

SECTION 07212 - BOARD AND BATT INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Board insulation at cavity wall construction, perimeter foundation wall, underside of floor slabs, exterior wall behind gypsum board and plywood wall finish, and between structural sheathing siding at areas of new framed construction as indicated.

B. Batt insulation in exterior wall construction and between spaces requiring acoustic isolation as indicated in wall type.

C. Foam insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

D. Foam insulation for use as geotechnical fill under interior concrete slabs.

1.2 RELATED REQUIREMENTS

A. Section 01355 - LEED Certification Procedures; Identification of material recycled content.

B. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

C. Section 05400 - Cold Formed Metal Framing: Supporting construction for board and batt insulation.

D. Section 06100 - Rough Carpentry: Curb blocking at roof and siding assemblies.

E. Section 07260 - Weather Barriers: Air barrier and vapor retarder materials.

F. Section 07410-Metal Wall Panels: for attachment of insulation and vapor retarder materials.

G. Section 07530 - Elastomeric Membrane Roofing: Insulation specified as part of roofing system.

H. Section 07840 - Firestopping.

I. Section 09260 - Gypsum Board Assemblies: Acoustic insulation.

1.3 REFERENCE STANDARDS

A. ASTM C 552 - Standard Specification for Cellular Glass Thermal Insulation; 2007.

B. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2009.

C. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2006.

D. ASTM D 2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2006.

E. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

F. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2009b.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations. With regards to LEED, provide data identifying recycled content.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 - PRODUCTS

2.1 APPLICATIONS

A. Insulation Under Concrete Slabs: Extruded polystyrene board with vapor retarder type C.

B. Insulation at Perimeter of Foundation: Extruded polystyrene board.

C. Acoustic Insulation in interior Metal and Wood Framed Walls: Fiberglass or mineral wool batt insulation with no vapor retarder.

D. Insulation outboard of Metal Framed Walls and applied to inboard side of exterior concrete and wood framed walls: Polyisocyanurate board with vapor retarder type A.

E. Insulation of metal framed exterior walls not otherwise identified with exterior insulation: Fiberglass or mineral wool batt insulation with vapor retarder type B.

2.2 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation: ASTM C 578, Type X; Extruded polystyrene board with either natural skin or cut cell surfaces; with the following characteristics:

1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E 84.

2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E 84.

3. Board Thickness: 2 inches (50 mm).

4. Board Edges: Square.

5. Thermal Conductivity (k factor) at 25 degrees F (-3.9 degrees C): 0.18

6. Compressive Resistance: 15 psi (104 kPa).

7. Board Density: 1.3 lb/cu ft (21 kg/cu m).

8. Water Absorption, maximum: 0.3 percent, volume.

9. Provide material with manufacturers maximum post-consumer and post-industrial recycled content.

10. Manufacturers:
    a. Dow Chemical Co: www.dow.com.
    b. Owens Corning Corp: www.owenscorning.com.
    c. Pactiv Building Products: greenguard.pactiv.com.
    d. Dow Chemical Company.

11. Substitutions: See Section 01600 - Materials and Equipment

B. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C 1289; Type I, Class 1, Grade 1.

1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E 84.

2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E 84.

3. Thermal Conductivity (k factor) at 25 degrees F (-3.9 degrees C): 0.16 (aged)

4. Compressive Strength: 16 psi (110 kPa)

5. Board Size: 48 x 96 inch (1220 x 2440 mm).

6. Board Thickness: 2 inch (50 mm).

7. Provide material with manufacturers maximum post-consumer and post-industrial recycled

content.

7. Manufacturers:
   a. Atlas Roofing Corporation: www.atlasroofing.com.
   b. Dow Chemical Co: www.dow.com.
   c. GAF Materials Corporation: www.gaf.com.

8. Substitutions: see Section 01600 - Materials and Equipment

2.3 BATT INSULATION MATERIALS

A. Batt Insulation: ASTM C 665; preformed batt; friction fit, conforming to the following:

1. Material: Glass or mineral fiber.

2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E 84.

3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E 84.

4. Combustibility: Non-combustible, when tested in accordance with ASTM E 136, except for facing, if any.

5. Formaldehyde Content: Zero.

6. Thermal Resistance: Minimum R of 3.25/inch. Insulate full depth of stud wall assembly.

7. Facing: None.

8. Provide material with manufacturers maximum post-consumer and post-industrial recycled content.

9. Manufacturers:
   a. CertainTeed Corporation: www.certainteed.com.
   b. Johns Manville Corporation: www.jm.com.
   c. Knauf Insulation GmbH: www.knaufinsulation.us.
   d. Owens Corning Corp: www.owenscorning.com.

10. Substitutions: See Section 01600 - Materials and Equipment.

2.4 ACCESSORIES

A. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch (50 mm) wide.

B. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

C. Field applied spray foam for filling joints and gaps around window and door frames.

1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E 84.

2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E 84.

D. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Apply adhesive to back of boards:

1. Three continuous beads per board length.

B. Install boards horizontally on foundation perimeter, inside face of concrete as illustrated in sections and details.

1. Install in running bond pattern.

2. Butt edges and ends tightly to adjacent boards and to protrusions.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.3 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install boards horizontally on walls.

1. Place boards to maximize adhesive contact.

2. Install in running bond pattern.

3. Butt edges and ends tightly to adjacent boards and to protrusions.

B. Extend boards over expansion joints, unbonded to wall on one side of joint.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

D. At new openings in existing wall assemblies, place 6 inch (150 mm) wide band of new polyethylene sheet at perimeter of wall openings, sealed to existing vapor retarder, and extending into the opening assembly. Seal in place to ensure continuity of vapor retarder and air seal.

3.4 BOARD INSTALLATION AT CAVITY WALLS

A. Install boards to fit snugly between wall ties.

B. Install boards horizontally on walls.

1. Install in running bond pattern, stagger joints in coursing.

2. Butt edges and ends tightly to adjacent boards and to protrusions.

C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.5 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade and vapor retarder after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing slab.

3.6 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation unless noted so at accoustic partitions.

C. At interior acoustic partitions, install full height and width of wall cavities without gaps or voids. Compress where noted in the wall type schedule to meet STC requirements.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Retain insulation batts in place with wire mesh secured to framing members.

F. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches (150 mm) on center. Lap and seal sheet retarder joints over member face.

G. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.

H. Tape seal tears or cuts in vapor retarder.

I. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

J. Coordinate work of this section with requirements for vapor retarder specified in Section 07260.

K. Coordinate work of this section with construction of air barrier seal specified in Section 07260.

3.7 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 07212

SECTION 07260 - WEATHER BARRIERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.

B. Vapor Retarders: Materials to make exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls water vapor-resistant and air tight.

C. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.2 RELATED REQUIREMENTS

A. Section 07212 - Board and Batt Insulation: Insulation installed in conjunction with vapor retarders and air barriers.

B. Section 07530 - Elastomeric Membrane Roofing: Roof assembly installed in conjunction with vapor retarder.

C. Section 07620 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

D. Section 07900 - Joint Sealers: Sealant materials and installation techniques.

1.3 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.

1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture-resistant, to

the degree specified, intended to be installed to shed water without sealed seams.

1.4 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test; 2008.

C. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2006.

D. ASTM D 1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2009.

E. ASTM D 4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications; 2009.

F. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

G. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

H. ASTM E 2178 - Standard Test Method for Air Permeance of Building Materials; 2003.

1.5 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics.

1.6 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.1 WEATHER BARRIER ASSEMBLIES

A. Air Barrier:

1. On outside surface of sheathing of exterior walls, at cold side of insulated assemblies, use air

barrier sheet, mechanically fastened type.

C. Interior Vapor Retarder:

1. On inside face of studs of exterior walls, under cladding, use mechanically fastened vapor retarder sheet at batt insulated walls, adhered vapor retarder sheet at rigid insulation insulated walls.

D. Exterior Vapor Retarder:

1. On outside surface of sheathing, on warm (interior) side of insulation, use vapor retarder sheet, self-adhesive type.

2.2 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier Sheet, Mechanically Fastened or self adhering.

1. Air Permeance: 0.095 cubic feet per square foot (0.02 liters per second per square meter), maximum, when tested in accordance with ASTM E 2178.

2. Water Vapor Permeance: 50 perms minimum, when tested in accordance with ASTM E96/E 96M Procedure B (wet cup).

3. Water Penetration Resistance: Withstand a water head of 21 inches (55 cm), minimum, for minimum of 5 hours, when tested in accordance with AATCC 127.

4. Ultraviolet and Weathering Resistance: Approved in writing by manufacturer for minimum of 9 months weather exposure.

5. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 50 or less, when tested in accordance with ASTM E 84.

6. Basis of design: VaproShiels WrapShield.

a. Color: Any color at typical wall assemblies. Black with no exterior print where used in soffit assembly (front entry canopy).

2.3 VAPOR RETARDER MATERIALS

A. Vapor Retarder Type A: Rubberized asphalt bonded to sheet polyethylene, self-adhesive, complying with ASTM D 1970.

1. Thickness: 45 mil (1.2 mm), nominal.

2. Water Vapor Permeance: 0.1 perm (5.7 ng/(Pa s sq m)), maximum, when tested in accordance with ASTM E 96/E 96M.

3. Install on exterior side of wall sheathing where rigid insulation is to be installed outboard of stud wall and sheathing assembly.

4. Install on exterior side of roofing assembly substrate, plywood sheathing or gypsum sheathing, as applicable, below insulation and roofing assembly.

B. Vapor Retarder Type B: ASTM D 4397 polyethylene film, clear, for in-wall application. 10 mil (0.25 mm) thick, 0.1 perm (5.7 ng/(Pa s sq m)), maximum,

1. Install on warm side of stud wall assemblies insulated with fiberglass batt in stud cavity.: As required by referenced standard for thickness specified.

C. Vapor Retarder Type C: ASTM E 1745 Sheet Vapor Retarder: Clear, Black or Yellow polyethylene film for below grade application, 10 mil (0.25 mm) thick, 0.1 perm (5.7 ng/(Pa s sq m)), maximum, when tested in accordance with ASTM E 154, Section 7.

1. Install below all new interior concrete slabs.

C. Vapor Retarder Tape: Bright aluminum self adhering type, mesh reinforced, 2 inches (50 mm) wide, compatible with sheet material.

2.4 SEALANTS

A. Butyl Sealant: Type 2 as specified in Section 07900.

B. Primers, Cleaners, and Other Sealant Materials: As recommended by sealant manufacturer, appropriate to application, and compatible with adjacent materials.

2.5 ADHESIVES

A. Non-Curing Adhesive: Compatible with sheet seal and substrate, permanently non-curing.

2.6 ACCESSORIES

A. Self-Adhesive Sheet Flashing: ASTM D 1970.

B. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.2 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Air Barriers: Install continuous air tight barrier over surfaces, with sealed seams and with sealed joints to adjacent surfaces.

D. Vapor Retarders: Install continuous air tight barrier over surfaces, with sealed seams and with sealed joints to adjacent surfaces.

E. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.

F. Mechanically Fastened Sheets - On Exterior:

1. Install sheets shingle-fashion to shed water, with seams generally horizontal.

2. Overlap seams as recommended by manufacturer but at least 6 inches.

3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches (305 mm).

4. Attach to framed construction with fasteners extending through sheathing into framing. Space fasteners at 12 to 18 inches (305 to 460 mm) on center along each framing member supporting sheathing.

5. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.

6. Install air barrier over jamb flashings.

8. Install head flashings under air barrier, and under vapor barrier where outside insulation is applied..

9. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.

G. Mechanically Fastened Sheets - Vapor Retarder on Interior:

1. When insulation is to be installed in assembly, install vapor retarder over insulation.

2. Seal seams, laps, perimeter edges, penetrations, tears, and cuts with self-adhesive tape, making air tight seal.

3. Locate laps at a framing member; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet.

4. Seal entire perimeter to structure, window and door frames, and other penetrations.

5. Where conduit, pipes, wires, ducts, outlet boxes, and other items are installed in insulation cavity, pass vapor retarder sheet behind item but over insulation and maintain air tight seal.

H. Self-Adhesive Sheets:

1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.

2. Lap sheets shingle-fashion to shed water and seal laps air tight.

3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that all laps are firmly adhered with no gaps or fishmouths.

4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.

5. At wide joints, provide extra flexible membrane allowing joint movement.

I. Openings and Penetrations in Exterior Weather Barriers:

1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto weather barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.

2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches (100 mm) wide; do not seal sill flange.

3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches (230 mm) wide, covering entire depth of framing.

4. At head of openings, install flashing under weather barrier extending at least 2 inches (50 mm) beyond face of jambs; seal weather barrier to flashing.

5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.

6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.4 FIELD QUALITY CONTROL

A. Do not cover installed weather barriers until required inspections have been completed.

3.5 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION 07260

SECTION 07410 - METAL WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured metal panels for walls, with related flashings, and accessory components.

1.2 RELATED REQUIREMENTS

A. Section 05400 - Cold-Formed Metal Framing: Wall panel substrate.

B. Section 06100 - Rough Carpentry: Wall panel substrate.

C. Section 07212 - Board and Batt Insulation.

D. Section 07260 - Weather Barriers: Weather barrier under wall panels.

E. Section 07900 - Joint Sealers.

1.3 REFERENCE STANDARDS

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.

B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

1.4 DESIGN REQUIREMENTS

A. Maximum Allowable Deflection of Panel: 1/90 of span.

B. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.

C. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.

D. Products: Provide continuity of thermal barrier at building enclosure elements.

E. Provide continuity of air barrier and vapor retarder seal at building enclosure elements in

conjunction with materials specified in Section 07260.

1.5 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage.

C. Samples: Submit two samples of wall panel, 12 inch (300 mm) by 24 inch (600 mm) in size illustrating finish color, sheen, and texture.

1.6 QUALITY ASSURANCE

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

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

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.8 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

C. Correct defective Work within a five year period after Substantial Completion, including defects in water tightness and integrity of seals.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. Centria: www.centria.com.

2. MBCI: www.mbci.com.

3. Fabral: www.fabral.com.

4. Substitutions: See Section 01600 - Materials and Equipment

2.2 MANUFACTURED METAL PANELS

A. Exterior Panel Type A:

1. Minimum 22 gage (0.8 mm) thick precoated steel sheet.

2. Preformed consealed fastener lineal vertical wall panel; 12 inch wide, 1-1/2" thick, with fine courogated face.

3. Basis of design: Fabral Select Series 12W

4. Interlocking edges, fitted with continuous gaskets.

5. Color: As selected by ARCHITECT from manufacturer's standard line, including Clear Coated Galvanized or Galvalume as an option.

B. Exterior Panel Type B:

1. Minimum 22 gage (0.8 mm) thick precoated steel sheet.

2. Preformed consealed fastener lineal horizontal wall panel; 12” or 16” inch wide, 7/8" thick, with ribs spaced 4" on center. Smooth.

3. Basis of design: Fabral Silhouette HCF Series, HCF 16-4

4. Interlocking edges, fitted with continuous gaskets.

5. Color: As selected by ARCHITECT from manufacturer's standard line, including Clear Coated Galvanized or Galvalume as an option.

C. Subgirts, Furring and Hat Channels:

1. 20 gage (0.9 mm) thick formed galvanized steel sheet in sizes and profiles detailed .

D. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile identified in details; shop cut and factory mitered to required angles.

E. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

F. Anchors: Galvanized steel.

2.3 MATERIALS

A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

B. Exterior Finish Coating: Panel manufacturer's standard polyvinylidene fluoride (PVF) top coat, over manufacturers system primer. Exception at clear-coated galvanized or galvalume.

C. Interior Finish Coating: Panel manufacturer's standard polyester top coat, over recommended primer.

D. Panel Back Coating: Panel manufacturer's standard polyester wash coat.

E. Non-Coated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M, SS Grade 33/230, with G90/Z275 coating.

F. Insulation: Polyisocyanurate type specified in Section 07212.

1. 4 inch (10mm) thick (two layers of 2”, staggered joints).
2. Coordinate with details for attachment of subgert assembly through insulation to substrate structure. Attachment of subgerts to substrate structure is to match attachment of panels to subgerts with regards to fastener shaft material and diameter, and calculated pull out strength value.

2.4 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

B. Sealants: As specified in Section 07900.

C. Fasteners: Manufacturer's standard type to suit application; steel, hot dip galvanized. Fastener cap same color as exterior panel.

D. Field Touch-up Paint: As recommended by panel manufacturer.

E. Bituminous Paint: Asphalt base.

2.5 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest practicable lengths.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify that weather barrier has been installed over substrate completely and correctly.

3.2 PREPARATION

A. Install subgirts perpendicular to panel length, securely fastened to substrates and shimmed and leveled to uniform plane. Space at intervals indicated. fasteners as indicated.

3.3 INSTALLATION

A. Install panels on walls and soffits in accordance with manufacturer's instructions.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports. Lap panel ends minimum 2 inches (50 mm). No joint shall be less than three feet from end of horizontal or vertical run, or less than 6 feet apart.

E. Use concealed fasteners unless otherwise approved by ARCHITECT.

F. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.4 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch (1.6 mm).

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch (6 mm).

3.5 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION 07410

SECTION 07466 - FIBER CEMENT SIDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wood-fiber cement siding.

1.2 RELATED REQUIREMENTS

A. Section 06100 - Rough Carpentry: Siding substrate.

B. Section 07260 - Weather Barriers: Weather barrier under siding.

C. Section 07620 – Sheetmetal Flashing and Trim

D. Section 07900 - Joint Sealers.

E. Section 09900 - Paints and Coatings: Field painting.

1.3 REFERENCE STANDARDS

A. ASTM C 1186 - Standard Specification for Flat Fiber Cement Sheets; 2008.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Manufacturer's requirements for related materials to be installed by others.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods, including nail patterns.

C. Test Report: Applicable model code authority evaluation report (e.g. ICC-ES).

D. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.

E. Warranty: Submit copy of manufacturer’s warranty, made out in City and Borough of Juneau &

Juneau School District's name, showing that it has been registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum 3 years of experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products under waterproof cover and elevated above grade, on a flat surface.

PART 2 PRODUCTS

2.1 SIDING AND SOFFIT

A. Panel Siding and Soffit: Vertically oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C 1186 Type A Grade II; with machined edges, for nail attachment.

1. Length (Height): 96 inches (2400 mm), nominal.

2. Width: 48 inches (1220 mm).

3. Thickness: 5/16 inch (8 mm), nominal.

4. Finish: Unfinished.

5. Warranty: 30 year limited; transferable.

6. Panel Siding Manufacturers:
   a. CertainTeed Corporation: www.certainteed.com.
   b. James Hardie Building Products, Inc: www.jameshardie.com.
   c. Nichiha USA, Inc: www.nichiha.com.
   d. Substitutions: See Section 01600 - Product Requirements.

2.2 ACCESSORIES

A. Furring Strips: Galvanized metal channels.

B. Trim: Same material and texture as siding.

C. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch (32 mm).

D. Joint Sealer: As specified in Section 07900.

PART 3 EXECUTION

3.1 PREPARATION

A. Examine substrate and clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Verify that weather barrier has been installed over substrate completely and correctly.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is the responsibility of another installer, notify ARCHITECT of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Install sheet metal flashing:

1. Above door and window trim and casings.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and recommendations.

1. Read warranty and comply with all terms necessary to maintain warranty coverage.

2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.

3. Use trim details indicated on drawings.

4. Touch up all field cut edges before installing.

5. Pre-drill nail holes if necessary to prevent breakage.

B. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.

C. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.

D. Do not install siding less than 6 inches (150 mm) from surface of ground nor closer than 1 inch (25 mm) to roofs and other surfaces where water may collect.

E. After installation, seal all joints except lap joints of lap siding. Seal around all penetrations. Paint all exposed cut edges.

F. Finish Painting: Specified in Section 09900.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 07466

SECTION 07530 - ELASTOMERIC MEMBRANE ROOFING (EPDM)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Elastomeric roofing membrane, adhered conventional application.

B. Insulation, flat and tapered.

C. Sheathing and Cover Board.

E. Flashings.

F. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.2 RELATED REQUIREMENTS

A. Section 06100 - Rough Carpentry: Wood nailers and curbs.

B. Section 07260 – Weather Barriers: Vapor Retarder.

B. Section 07620 - Sheet Metal Flashing and Trim: Counterflashings, copings, fascias not otherwise included in this section..

C. Section 15146 - Plumbing Specialties: Roof drains.

1.3 REFERENCE STANDARDS

A. ASTM C 79/C 79M - Standard Specification for Treated Core and Nontreated Core Gypsum Sheathing Board; 2001.

B. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2004.

C. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2009.

D. ASTM C 1177/C 1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2008.

E. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2008.

F. ASTM C 1396/C 1396M - Standard Specification for Gypsum Board; 2009a.

G. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension; 2006a.

H. ASTM D 570 - Standard Test Method for Water Absorption of Plastics; 1998 (Reapproved 2005).

I. ASTM D 624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers; 2000 (Reapproved 2007).

J. ASTM D 746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact; 2007.

K. ASTM D 2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2005.

L. ASTM D 4637 - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2008.

M. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

N. ASTM E 1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2001.

O. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

P. FM DS 1-28 - Wind Design; Factory Mutual Research Corporation; 2007.

Q. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; Fifth Edition, with interim updates.

R. UL (RMSD) - Roofing Materials and Systems Directory; Underwriters Laboratories Inc.; current edition.

S. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of associated counterflashings installed under other sections.

B. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers; review preparation and installation procedures and coordination and scheduling necessary for related work.

1.5 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor

retarder, surfacing, and fasteners.

1. LEED Submittal: Include documentation for recycled content of insulation.

C. Shop Drawings: Indicate joint or termination detail conditions and conditions of interface with other materials.

D. Samples for Verification: Submit two samples 12x12 inches (300x300 mm) in size illustrating insulation.

E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in City and Borough of Juneau & Juneau School District's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with NRCA Roofing and Waterproofing Manual and manufacturer's instructions.

1. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years experience and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

B. Store products in weather protected environment, clear of ground and moisture.

C. Protect foam insulation from direct exposure to sunlight.

1.8 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane when ambient temperature is below 40 degrees F (5 degrees C).

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

1.9 WARRANTY

A. See Section 01780 - Contract Closeout , for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. Provide five year manufacturer's material and labor warranty to cover failure to prevent penetration of water.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. EPDM Membrane Materials:

1. Carlisle SynTec: www.carlisle-syntec.com.

2. Firestone Building Products Co: www.firestonebpco.com.

3. GenFlex Roofing Systems: www.genflex.com.

4. Substitutions: See Section 01600 - Product Requirements.

B. Insulation:

1. Atlas Roofing Corporation: www.atlasroofing.com.

2. GAF Materials Corporation: www.gaf.com.

3. Dow Chemical Co: www.dow.com.

4. Owens Corning Corp: www.owenscorning.com.

5. Substitutions: See Section 01600 - Product Requirements.

2.2 ROOFING - UNBALLASTED APPLICATIONS

A. Elastomeric Membrane Roofing: 60 mils reinforced, over insulation and cover board.

B. Roofing Assembly Requirements:

1. Roof Covering External Fire-Resistance Classification: UL Class A.

2. Wind design: Uplift utilizing wind speeds for location and condition; Exposure as required by IBC and speed as required by City and Borough of Juneau (minmum 116 mph 3-second gust).

3. Insulation Thermal Value (R), minimum: R-40 (aged value); provide insulation of thickness required.

C. Acceptable Insulation Types - Constant Thickness Application:

1. Minimum 2 layers of polyisocyanurate board.

D. Acceptable Insulation Types - Tapered Application: Any of the types specified.

1. Uniform thickness composite or polyisocyanurate board covered with tapered extruded polystyrene board.

2.3 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

A. Membrane: Ethylene-propylene-diene-terpolymer (EPDM); externally reinforced with fabric; complying with minimum properties of ASTM D 4637.

1. Thickness: 0.060 mils inch (1.5 mm).

2. Sheet Width: 76 inch (1930 mm), minimum; factory-fabricate into largest sheets possible.

3. Color: Black.

4. Tensile Strength: 1305 psi (9 MPa), measured in accordance with ASTM D 412.

5. Ultimate Elongation: 300 percent, measured in accordance with ASTM D412.

6. Tear Strength: 150 lbf/in (26.3 kN/m), measured in accordance with ASTM D 624.

7. Water Vapor Permeability: 0.10 perms/inch, measured in accordance with ASTM E 96/E 96M.

8. Brittleness Temperature: -49 deg F. (-45 deg C), measured in accordance with ASTM D 746.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Membrane adhesives: As recommended by membrane manufacturer for this application.

D. Vapor Retarder: Type A as identified in section 07260 Weather Barriers.;

E. Flexible Flashing Material: Same material as membrane; conforming to the following:

2.4 COVER BOARD AND SUBSTRATE BOARD

A. Substrate Board (above metal decking and wood decking, and below insulation and vapor retarder, only as required by manufacturers warranted system design): Gypsum sheathing, ASTM C 1396/C 1396M, Type X special fire-resistant type, paper face, 5/8 inch (16 mm) thick.

B. Cover Board: Pre-primed Glass fiberglass mat faced gypsum panels, ASTM C 1177/C 1177M, fire resistant type, 5/8 inch (16 mm) thick.

1. Fasteners: #14 w/ 2" formed metal washer.
2. Fastener pattern and placement: Provide engineered fastener placement pattern for edge and field conditions, calculated using design wind speeds.

2.5 INSULATION

A. Polyisocyanurate Board Insulation: Rigid cellular foam, complying with ASTM C 1289, Type I, aluminum foil both faces; Class 1, non-reinforced foam core and with the following characteristics:

1. Compressive Strength: 16 psi (110 kPa)

2. Board Size: 48 x 96 inch (1220 x 2440 mm).

3. Board Thickness: 2 inch (50 mm).

4. Board Edges: Square.

5. Provide board with highest recycled content in manufacturers line.

6. Manufacturers:
   a. Atlas Roofing Corporation: www.atlasroofing.com.
   b. Dow Chemical Co: www.dow.com.
   c. GAF Materials Corporation: www.gaf.com.
   d. Substitutions: See Section 01600 - Materials and Equipment.

B. Extruded Polystyrene Board Insulation: ASTM C 578, Type X; Extruded expanded polystyrene board with natural skin surfaces; with the following characteristics:

1. Board Size: 48 x 96 inch (1220 x 2440 mm).

2. Tapered Board: Slope as indicated; minimum thickness 1/2 in (13 mm); fabricate of fewest layers possible.

3. Board Edges: Square.

4. Thermal Conductivity (k factor) at 25 degrees F (-3.9 degrees C): 0.18 (0.31) as determined by ASTM C 177.

5. Compressive Resistance: 15 psi (104 kPa).

6. Board Density: 1.3 lb/cu ft (21 kg/cu m).

7. Water Absorption, maximum: 0.3 percent, volume.

8. Provide board with no less than 30% recycled content..

9. Manufacturer: No limitation on those meeting specification requirements.

2.6 ACCESSORIES

A. Prefabricated Roofing Expansion Joint Flashing: Sheet butyl over closed-cell foam backing seamed to galvanized steel flanges.

B. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

C. Edge Strips: Wood fiberboard, compatible with roofing materials; cants formed to 45 degree angle.

D. Roof drains at canopy: Manufacturers standard low-priofile device with coupling to pipe and rain chain as detailed.

E. Roof drains at heated areas: See section 15146 - Plumbing Specialties

F. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.

1. Length as required for thickness of insulation material and penetration of metal or wood deck substrate, with metal washers.

G. Membrane Adhesive: As recommended by membrane manufacturer.

H. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.

I. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.

J. Insulation Adhesive: As recommended by insulation manufacturer.

K. Roofing Nails: Galvanized, hot dipped type, size and configuration as required to suit application.

L. Walkway Pads: Roofing Manufacturers standard, adhered..

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.2 WOOD DECK PREPARATION

A. Verify flatness and tightness of joints of wood decking. Fill knot holes with latex filler.

B. Confirm dry deck by moisture meter with 12 percent moisture maximum.

3.3 METAL DECK PREPARATION

A. Install substrate board on metal deck:

1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.

2. Cut substrate board cleanly and accurately at roof breaks and protrusions to provide smooth surface. Place boards parallel to flutes with edges bearing on deck.

B. Mechanically fasten sheathing to roof deck, in accordance with roofing manufacturer's instructions.

1. Over entire roof area, fasten sheathing using 6 fasteners with washers per sheathing board.

3.4 VAPOR RETARDER, INSULATION, COVER BOARD

A. Apply vapor retarder to deck surface with adhesive in accordance with manufacturer's

instructions.

1. Extend vapor retarder under blocking to deck edge.

B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.

C. Lay layers of insulation with joints staggered minimum 6 inch (150 mm) from joints of preceding layer.

D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.

E. Install coverboard over insulation with joints staggered minimum 6 inch (150 mm) from joints of preceding layer of insulation.

F. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

G. Attachment of Insulation and cover board:

1. Mechanically fasten insulation and cover board to deck in accordance with roofing manufacturer's instructions and design requirements.

H. Tape joints of insulation in accordance with roofing and insulation manufacturers' instructions.

I. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches (450 mm).

J. Do not apply more insulation than can be covered with membrane in same day.

3.5 MEMBRANE APPLICATION

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Apply adhesive to substrate at rate required by manufacturer. Fully embed membrane in adhesive except in areas directly over or within 3 inches (75 mm) of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches (75 mm). Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

E. At intersections with vertical surfaces:

1. Extend membrane over cant strips and up a minimum of 4 inches (100 mm) onto vertical surfaces.

2. Fully adhere flexible flashing over membrane and up to nailing strips.

3. Secure flashing to nailing strips at 4 inches (100 mm) on center.

F. Around roof penetrations, seal flanges and flashings with flexible flashing.

G. Install roofing expansion joints where indicated. Make joints watertight.

1. Install prefabricated joint components in accordance with manufacturer's instructions.

H. Coordinate installation of roof drains and sumps and related flashings.

3.6 FIELD QUALITY CONTROL

A. See Section 01400 - Quality Control, for general requirements for field quality control and inspection.

B. Require site attendance of roofing material manufacturer’s representative once during installation of the Work.

3.7 CLEANING

A. Remove bituminous markings from finished surfaces.

B. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

C. Repair or replace defaced or damaged finishes caused by work of this section.

3.8 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION 07530

SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fabricated sheet metal items, both coated steel and anodized aluminum, including flashings, counterflashings, and other items indicated in Schedule and details.

1.2 RELATED REQUIREMENTS

A. Section 06100 - Rough Carpentry: Wood nailers.

B. Section 06100 - Rough Carpentry: Wood blocking as part of roof and fascia assembly.

C. Section 07410 - Metal Wall Panels: Flashings associated with Metal Wall Panels assembly and associated penetrations.

D. Section 07530-Elastomeric Membrane Roofing: Roofing system.

E. Section 07900 - Joint Sealers.

F. Section 08410 – Metal Framed Storefronts: miscellaneous aluminum profiles.

G. Section 08520 – Aluminum Windows: miscellaneous aluminum profiles.

1.3 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 1998.

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2005.

C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2005.

D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.

E. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

F. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

[Metric]; 2007.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2003.

1.4 SUBMITTALS

A. See Section 01300 - Contractor Submittals, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples, 12x12 inch (300x300 mm) in size illustrating material of typical external corner.

D. Samples: Submit two samples 12x12 inch (300x300 mm) in size illustrating metal finish color.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated in details or notes.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 - PRODUCTS

2.1 SHEET MATERIALS

A. Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 zinc coating; minimum 0.032 inch (0.8 mm) thick base metal.

B. Pre-Finished Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 zinc coating; minimum 0.032 inch (0.8 mm) thick base metal, shop pre-coated with modified silicone coating.

1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA

2605; multiple coat, thermally cured fluoropolymer finish system.

C. Aluminum: ASTM B 209 (ASTM B 209M); 0.032 inch (0.8 mm) thick; anodized finish to match Storefront and Windows finish.

1. Clear Anodized Finish: AAMA 611 AA-M12C22A41 Class I clear anodic coating not less than 0.7 mils (0.018 mm) thick.

2.2 ACCESSORIES

A. Fasteners: Stainless steel, with soft neoprene washers.

B. Slip Sheet: Rosin sized building paper.

C. Primer: Zinc chromate type.

D. Protective Backing Paint: Zinc molybdate alkyd.

E. Sealant: Type specified in Section 07900.

F. Plastic Cement: ASTM D 4586, Type I.

2.3 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed as indicated in the drawings. where not indicated, form outward 1/4 inch (6 mm) and hem to form drip.

G. Where indicated in the drawings, provide continuous interlocking attachment clip with hemmed edges to facilitate installation with no exposed fasteners.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.3 INSTALLATION

A. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

3.4 FIELD QUALITY CONTROL

A. See Section 01400 - Quality Control, for field inspection requirements.

B. Inspection will involve observation of work by owner and architect during installation to ascertain compliance with specified requirements.

3.5 SCHEDULE

A. Fascia and Copings.

B. Opening Head, Jamb, Sill and Ledge Flashings, including transitions between wall materials.

C. Roofing Terminations (over roofing base flashings):

D. Roofing Penetration Flashings, for Pipes, Structural Steel, and Equipment Supports:

END OF SECTION 07620

SECTION 07840 - FIRESTOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire-resistance rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.2 RELATED REQUIREMENTS

A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 09260 - Gypsum Board Assemblies: Gypsum wallboard assemblies

1.3 REFERENCE STANDARDS

A. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2009c.

B. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2009.

C. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

D. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

E. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

F. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. LEED Report: Submit VOC content documentation for all non-preformed materials.

E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

G. Qualification statements for installing mechanics.

1.5 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.

2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.

3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:

1. With minimum 3 years documented experience installing work of this type.

2. Able to show at least 5 satisfactorily completed projects of comparable size and type.

1.6 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.1 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.

1. Fire Ratings: Use any system listed by UL or tested in accordance with ASTM E 814 that

has F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and that meets all other specified requirements.

2.2 MATERIALS

A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

B. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant; conforming to the following:

1. Durability and Longevity: Permanent.

2. Color: Black, dark gray, or red.

3. Manufacturers:
   a. A/D Fire Protection Systems Inc: www.adfire.com.
   b. 3M Fire Protection Products: www.3m.com/firestop.
   c. Hilti, Inc: www.us.hilti.com.
   d. Specified Technologies, Inc: www.stifirestop.com.
   e. Substitutions: See Section 01600 - Materials and Equipment.

C. Fiber Firestopping: Mineral fiber insulation used in conjunction with elastomeric surface sealer forming airtight bond to opening; conforming to the following:

1. Durability and Longevity: Permanent.

2. Manufacturers:
   a. A/D Fire Protection Systems Inc: www.adfire.com.
   b. Pecora Corporation: www.pecora.com.
   c. Thermafiber, Inc: www.thermafiber.com.
   d. Substitutions: See Section 01600 - Materials and Equipment.

D. Intumescent Putty: Compound that expands on exposure to surface heat gain; conforming to the following:

1. Potential Expansion: Minimum 1000 percent.

2. Durability and Longevity: Permanent.

3. Color: Black, dark gray, or red.

4. Manufacturers:
   a. Grace Construction Products: www.na.graceconstruction.com.
   b. 3M Fire Protection Products: www.3m.com/firestop.
   c. Hilti, Inc: www.us.hilti.com.
   d. Specified Technologies, Inc: www.stifirestop.com.
   e. Substitutions: See Section 01600 - Materials and Equipment.
   f. Substitutions: See Section 01600 - Product Requirements.

E. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to arrest liquid material leakage.

3.3 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authority having jurisdiction.

C. Install labelling required by code.

3.4 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.5 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 07840

SECTION 07900 - JOINT SEALERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sealants and joint backing.

B. Precompressed foam sealers, sealant tape.

1.2 RELATED REQUIREMENTS

A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 07840 - Firestopping: Firestopping sealants.

C. Section 07530 - Elastomeric Membrane Roofing : Sealants required in conjunction with roofing.

D. Section 08800 - Glazing: Glazing sealants and accessories.

E. Section 09300 - Tile: Sealant used as tile grout.

1.3 REFERENCE STANDARDS

A. ASTM C 834 - Standard Specification for Latex Sealants; 2010.

B. ASTM C 919 - Standard Practice for Use of Sealants in Acoustical Applications; 2008.

C. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2010.

D. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2009.

E. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with other sections referencing this section.

1.5 SUBMITTALS

A. See Section 01300 - Contractor Submittals, for submittal procedures.

B. Product Data: Provide data indicating sealant chemical characteristics.

C. LEED Report: Submit VOC content documentation for all non-preformed sealants and primers.

D. Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

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

1.7 MOCK-UP

A. Provide mock-up of sealant joints in conjunction with window under provisions of Section 01400.

B. Construct mock-up with specified sealant types and with other components noted.

C. Locate where directed.

D. Mock-up may remain as part of the Work.

1.8 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.9 WARRANTY

A. See Section 01780 - Contract Closeout, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Silicone Sealants:

1. Dow Corning Corp.; Product 790: www.dow corning.com.

2. Momentive Performance Materials, Inc (formerly GE Silicones); Product SilPruf LM SCS2700: www.momentive.com.

3. Tremco; Product Spectrem 1 (Basic): www.tremcosealants.com.

4. Red Devil; 100% Silicone Industrial Grade RTV Sealant: www.reddevil.com.

5. Substitutions: See Section 01600 - Materials and Equipment

B. Polyurethane Sealants:

1. Sika Corp., Inc; Product Sikaflex - 15LM: www.sikaconstruction.com.

2. Tremko; Product DyMonic: www.tremcosealants.com.

3. BASF Construction Chemicals-Building Systems: www.chemrex.com.

4. Tremko; Product 921 www.tremcosealants.com

5. Substitutions: See Section 01600 - Materials and Equipment

C. Latex Joint Sealants:

1. Tremco Global Sealants; Product Tremflex 834: www.tremcosealants.com.

2. Red Devil; Siliconized Acrylic Construction Grade (35 Year) Sealant: www.reddevil.com.

3. Pecora Corporation; Product AC-20+: www.pecora.com.

4. Bostic Findley; Product Chem0Calk 600.www.bostik-us.com

5. Substitutions: See Section 01600 - Materials and Equipment

D. Butyl Sealants:

1. Bostik Inc: www.bostik-us.com.

2. Pecora Corporation: www.pecora.com.

3. Substitutions: See Section 01600 - Materials and Equipment

E. Preformed Compressible Foam Sealers:

1. EMSEAL Joint Systems, Ltd; MST: www.emseal.com.

2. Sandell Manufacturing Company, Inc: www.sandellmfg.com.

3. Dayton Superior Corporation: www.daytonsuperior.com.

4. Substitutions: See Section 01600 - Materials and Equipment

2.2 SEALANTS

A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

B. Type 1 - General Purpose Exterior Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; single component.

1. Color: Standard colors matching finished surfaces.

2. Applications:
   a. Control, expansion, and soft joints in masonry.
   b. Joints between concrete and other materials.
   c. Joints between metal frames and other materials.
   d. Other exterior joints for which no other sealant is indicated.

C. Type 2 - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.

1. Applications:
   a. Concealed sealant bead in sheet metal work.
   b. Concealed sealant bead in flashing overlaps.

D. Type 3 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type OP, Grade NF single component, paintable.

1. Color: Standard colors matching finished surfaces.

2. Applications:
   a. Interior wall and ceiling control joints.
   b. Joints between door and window frames and wall surfaces.
   c. Other interior joints for which no other type of sealant is indicated.

E. Type 4 - Bathtub/Tile Sealant: Clear silicone; ASTM C 920, Uses I, M and A; single component, mildew resistant.

1. Applications: Use for:
   a. Joints between plumbing fixtures and floor and wall surfaces.
   b. Joints between countertops and wall surfaces.

F. Type 5 - Acoustical Sealant: Acrylic latex sealant; ASTM C 920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, non-skinning.

1. Applications: Use for concealed locations only:
   a. In STC-Rated Walls, Between Metal Stud Track/Runner and Adjacent Construction, and Between Outlet Boxes and Gypsum Board.

G. Type 6 – Precompressed Foam Sealer, Sealant Tape; closed cell polyurethane with adhesive backing.

1. Width and thickness as noted, or as required to meet requirements of intended purpose.

2. Movement Capability: Plus and minus 100 percent, ASTM D 3574E.

3. Service Temperature Range: -30 to 180 degrees F

4. Tensile Strength: 22 psi minimum, ASTM D 3574E.

5. Applications: Use for concealed locations only:
   a. Sheetmetal flashing assemblies as indicated.
   b. Glazing installation, interior.

H. Type 7 - Acrylic Sealant: ASTM C 920, Grade NS, Class 12-1/2, Uses NT, M, A, O; single component, solvent curing, non-staining, non-bleeding, non-sagging. Paintable.

1. Color: Standard colors matching finished surfaces.

2. Movement Capability: Plus and minus 12-1/2 percent.

3. Service Temperature Range: -13 to 180 degrees F (-25 to 82 degrees C).

4. Shore A Hardness Range: 25 to 50.

5. Applications:
   a. Paintable movement joints at painted interior wall surfaces.

I. Type 8 - Silicone Sealant: ASTM C 920, Grade NS, Class 25, Uses NT, A, G, M, O; single component, neutral curing, non-sagging, non-staining, fungus resistant, non-bleeding.

1. Color: Standard colors matching finished surfaces.

2. Movement Capability: Plus and minus 25 percent.

3. Service Temperature Range: -65 to 180 degrees F (-54 to 82 degrees C).

4. Shore A Hardness Range: 15 to 35.

5. Applications:
   a. Metal to metal joints with backing rod in metal panel and window systems.

2.3 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.

E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C 1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

3.3 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C 1193.

C. Perform acoustical sealant application work in accordance with ASTM C 919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated. Note: Sealant joints at window systems not to exceed 3/8" in width, per details.

E. Install bond breaker where joint backing is not used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

H. Tool joints concave.

I. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch (3 to 6 mm) below adjoining surface.

3.4 CLEANING

A. Clean adjacent soiled surfaces.

3.5 PROTECTION

A. Protect sealants until cured.

END OF SECTION 07900

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ENGINEERING DEPARTMENT

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Non-fire-rated steel doors and frames.

B. Steel frames for wood doors.

D. Thermally insulated steel doors and frames.

E. Steel glazing frames.

F. Accessories, including glazing and louvers.

1.2 RELATED REQUIREMENTS

A. Section 08710 - Door Hardware.

B. Section 08800 - Glazing: Glass for doors and borrowed lites.

C. Section 09900 - Paints and Coatings: Field painting.

1.3 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.

B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.

C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2004).

D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.

E. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 2005.

F. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.

G. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors

and Frames; The National Association of Architectural Metal Manufacturers; 2007.

H. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2006.

I. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2010.

J. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

K. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01300 - Contractor Submittals, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

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

B. Maintain at the project site a copy of all reference standards dealing with installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with NAAMM HMMA 840.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Steel Doors and Frames:

1. Assa Abloy Ceco, Curries, or Fleming: www.assaabloydss.com.

2. Amweld International: www.amweld.com

3. Pioneer Industries: www.pioneerindustries.com

4. Substitutions: See Section 01600 - Materials and Equipment

2.2 DOORS AND FRAMES

A. Requirements for All Doors and Frames:

1. Accessibility: Comply with ANSI/ICC A117.1.

2. Door Top Closures: Flush with top of faces and edges.

3. Door Edge Profile: Beveled on both edges.

4. Door Texture: Smooth faces.

5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

6. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.

7. Galvanizing; all exterior insulated hollow metal doors and frames: All components hot-dipped zinc-iron alloy-coated (galvannealed), A60/ZF180.

8. Finish: Factory primed, for field finishing.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.3 STEEL DOORS

A. Exterior Doors:

1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.

2. Core: Polyurethane.

3. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in

accordance with ASTM A 653/A 653M, with A60/ZF180 coating.

4. Insulating Value: U-value of 0.50, when tested in accordance with ASTM C 1363.

5. Weatherstripping: Separate, see Section 08710.

B. Interior Doors, Non-Fire-Rated:

1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 1, full flush.

2. Thickness: 1-3/4 inches (44 mm).

2.4 STEEL FRAMES

A. General:

1. Comply with the requirements of grade specified for corresponding door, except:
   a. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 1, 16 gage

2. Finish: Factory primed, for field finishing.

3. Profile: Double-rabbet.

4. Frame depth: 2 inch x depth of wall assembly.

B. Exterior Door Frames: Face welded, seamless with joints filled.

1. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.

2. Thermal Break and insulation fill: Minimum 1/8 inch thermal break with foam insulation frame filler.

2. Weatherstripping: Separate, see Section 08710.

C. Interior Door Frames, Non-Fire-Rated: Face welded type.

F. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.

2.5 ACCESSORY MATERIALS

A. Glazing: As specified in Section 08800, factory installed.

C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

D. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

E. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.6 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. In addition, install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Coordinate hardware templates and reinforcements, and installation of hardware.

E. Coordinate installation of glazing.

F. Coordinate installation of electrical connections to electrical hardware items.

G. Touch up damaged factory finishes, apply field applied finishes.

3.3 TOLERANCES

A. Clearances Between Door and Frame: As specified in ANSI A250.8.

B. Maximum Diagonal Distortion: 1/16 in (1.5 mm) measured with straight edge, corner to corner.

3.4 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.5 SCHEDULE - See Drawings

END OF SECTION 08110

SECTION 08211 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Flush wood doors; flush configuration; fire rated, non-rated, and acoustical.

1.2 RELATED REQUIREMENTS

A. Section 06200 - Finish Carpentry.

B. Section 08110 - Steel Doors and Frames: for hallow metal frames for wood doors.

C. Section 08710 - Door Hardware.

D. Section 08800 - Glazing.

E. Section 09900 - Paints and Coatings: Site finishing of doors.

1.3 REFERENCE STANDARDS

A. ASTM E 413 - Classification for Rating Sound Insulation; 2004.

B. ASTM E 1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems; 1991 (Reapproved 2000).

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.

D. LMA (VPS) - Voluntary Product Standards and Typical Physical Properties of Decorative Overlays; Composite Panel Association; 2004.

E. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

1.4 SUBMITTALS

A. See Section 01300 - Contractor Submittals for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Specimen warranty.

D. Test Reports: Show compliance with specified requirements for the following:

1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

E. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing and louvers.

F. Samples: Submit two samples of door construction, 12x12 inch (300 by 300 mm) in size cut from top corner of door.

G. Samples: Submit two samples of door veneer, 12x12 inch (300 by 300 mm) in size illustrating plastic laminate pattern and color.

H. LEED Report: Submit for wood products made from sustainably harvested wood, salvaged and reused wood, wood fabricated from recovered timber, and locally-sourced wood, as specified in Section 01355.

I. Manufacturer's Installation Instructions: Indicate special installation instructions.

J. Warranty, executed in City and Borough of Juneau & Juneau School District's name.

1.5 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.7 WARRANTY

A. See Section 01780 - Contract Closeout for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for 5 years.

C. Include coverage for delamitation of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Wood Veneer Faced Doors:

1. Graham Wood Doors: www.grahamdoors.com.

2. Eggers Industries: www.eggersindustries.com.

3. Haley Brothers: www.haleybros.com.

4. Marshfield Door Systems, Inc: www.marshfielddoors.com.

5. Substitutions: See Section 01600 - Materials and Equipment

2.2 DOORS

A. All Doors: See drawings for locations and additional requirements.

1. Quality Level: Premium Grade, in accordance with AWI/AWMAC/WI Architectural Woodwork Standards.

2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 2" inches (50 mm) thick unless otherwise indicated; flush construction.

1. Provide solid core doors at all locations indicated in schedule.

2. Sound Retardant Doors: Minimum STC of 50, calculated in accordance with ASTM E 413, tested in accordance with ASTM E 1408.

3. Wood veneer facing for field transparent finish. Factory finish option will be permitted.
   a. Veneer Species: White Maple
   b. Veneer Grade: A

2.3 DOOR AND PANEL CORES

A. Non-Rated Solid Core Doors: Type structural composite lumber core (SCLC), plies and faces as indicated above.

B. Sound Retardant Doors: Equivalent to Type PC construction with core as required to achieve rating specified; plies and faces as indicated above.

2.4 DOOR FACINGS

A. Wood Veneer Facing for Transparent Finish: Species as specified above, veneer grade as specified by quality standard, plain sliced, book veneer match, balance assembly match; unless otherwise indicated.

1. Vertical Edges: Compatible hardwood.

2.5 ACCESSORIES

A. Metal Louvers:

1. Material and Finish: Roll formed steel; pre-painted finish to color as selected.

2. Louver Blade: Inverted V blade sight-proof.

3. Louver Free Area: 50% percent.

B. Glazing Stops: Wood, of same species as door facing, mitered corners; prepared for countersink style screws.

C. Astragals for Non-Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge. mounted on active leaf.

2.6 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:

1. Provide solid blocks at lock edge for hardware reinforcement.

2. Provide solid blocking for other throughbolted hardware.

C. Where supplementary protective edge trim is required, install trim after veneer facing has been applied full-width.

D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

1. Exception: Doors to be field finished.

F. Provide edge clearances in accordance with the quality standard specified.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Field-Finished Doors: Trimming to fit is acceptable.

1. Adjust width of non-rated doors by cutting equally on both jamb edges.

2. Trim maximum of 3/4 inch (19 mm) off bottom edges.

D. Use machine tools to cut or drill for hardware.

E. Coordinate installation of doors with installation of new and existing frames, and new and salvaged hardware.

F. Coordinate installation of glazing.

G. Install door louvers plumb and level.

3.3 TOLERANCES

A. Conform to specified quality standard for fit and clearance tolerances.

B. Conform to specified quality standard for telegraphing, warp, and squarenes.

3.4 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.5 SCHEDULE - See Drawings

END OF SECTION 08211

SECTION 08310 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Access door and frame units, fire-rated, in wall locations.

1.2 RELATED REQUIREMENTS

A. Section 09260 - Gypsum Board Assemblies: Openings in walls and ceilings.

B. Section 09900 - Paints and Coatings: Field paint finish.

C. Section 15010 - General Mechanical: Mechanical components requiring access.

D. Section 15820 - Duct Accessories: Access doors in ductwork.

E. Section 16050 - Basic Electrical Materials and Methods: Electrical components requiring access.

1.3 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

B. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of all access door units.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

E. Project Record Documents: Record actual locations of all access units.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Access Doors:

1. Acudor Products Inc: www.acudor.com.

2. Karp Associates, Inc: www.karpinc.com.

3. Milcor by Commercial Products Group of Hart & Cooley, Inc: www.milcorinc.com.

4. Substitutions: See Section 01600 - Materials and Methods

2.2 ACCESS DOORS AND PANELS

A. All Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.

B. Units in Fire Rated Assemblies: Fire rating equivalent to the fire rated assembly in which they are to be installed.

1. Provide products listed and labeled by UL or ITS (Warnock Hersey) as suitable for the purpose specified and indicated.

2. Provide certificate of compliance from authority having jurisdiction indicating approval of fire rated doors.

2.3 WALL AND CEILING UNITS

A. Door and Frame Units: Formed steel.

1. Frames and flanges: 0.058 inch (1.5 mm) steel.

2. Door panels: 0.070 inch (1.8 mm) single thickness steel sheet.

3. Sizes:
   a. Typical Walls and back of cabinets: 12 x 12 inches (300 x 300 mm).
   b. Typical Ceilings: 12 x 12 inches (300 x 300 mm).
   c. As called out in drawings:
      1) Bathroom plumbing chase: large(12"x 48"), small (14"x14"); verify quantity and location as required for mechanical/plumbing. Not all are shown on the architectural drawings.
      2) All others: size as required. Not all are shown on the architectural drawings.

4. Hardware:
   a. Hinge: 175 degree steel piano hinge with removable pin.
   b. Lock: Prepare for cylinder lock specified in 08710.

5. Galvanized, hot dipped galvanized and primed finish at unconditioned spaces.
   a. Finish: Two coats enamel, color as selected or to match surrounding, finish.

6. Stainless Steel at bathrooms and kitchen areas.
   a. Finish: No. 4 finish.

B. Non-Fire Rated Door and Frame Units in Walls and cabinets:

1. In Gypsum Board on Steel and Wood Studs:
   a. Model NW manufactured by Nystrom; www.nystrom.com .

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.2 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings. Secure rigidly in place.

C. Position units to provide convenient access to the concealed work requiring access.

END OF SECTION 08310

SECTION 08331 - OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Overhead coiling doors and shutters, operating hardware, non-fire-rated, manual operation.

1.2 RELATED REQUIREMENTS

A. Section 09900 - Paints and Coatings: Field paint finish- frame.

1.3 REFERENCE STANDARDS

A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2008.

B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.

C. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide general construction, component connections and details, and installation requirements.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

D. Samples: Submit two slats, 12 inch (300 mm) in length illustrating shape, color and finish texture.

E. Manufacturer's Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.

F. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Overhead Coiling Doors:

1. Alpine Overhead Doors, Inc: www.alpinedoors.com.

2. Cornell Iron Works, Inc: www.cornelliron.com.

3. The Cookson Company: www.cooksondoor.com.

4. Wayne-Dalton Corporation: www.wayne-dalton.com.

5. Substitutions: See Section 01600 - Materials and Equipment

2.2 COILING DOORS

A. Non-Fire-Rated Interior Coiling Doors: Stainless steel slat curtain.

1. Single thickness slats.

2. Nominal Slat Size: 2 inches (50 mm) wide x required length.

3. Finish: No. 4.

4. Guides: Angles; galvanized steel.

5. Hood Enclosure: Manufacturer's standard; aluminum.

6. Manual hand chain lift operation.

7. Mounting: Surface mounted.

8. Interior latch only.

2.3 MATERIALS

A. Curtain Construction: Interlocking slats.

1. Slat Ends: Each slat fitted with end locks to act as wearing surface in guides and to prevent lateral movement.

2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.

B. Stainless Steel Slats: Minimum 20 ga steel conforming to ASTM A 666, Type 304, rollable temper.

C. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.

D. Steel Guides: Formed from galvanized steel sheet, 10 gage (2.6 mm thick); complying with ASTM A 653/A 653M.

E. Hood Enclosure: Internally reinforced to maintain rigidity and shape.

F. Hardware:

1. Latching: Inside mounted, adjustable keeper, spring activated latch bar with feature to keep in locked or retracted position.

G. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb (10 kg) nominal force to operate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.2 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.

F. Install perimeter trim and closures.

3.3 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch (1.5 mm).

C. Maximum Variation From Level: 1/16 inch (1.5 mm).

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft (3 mm per 3 m) straight edge.

3.4 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.5 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION 08331

SECTION 08334 - COILING COUNTER DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-fire-rated coiling counter doors and operating hardware.

1.2 RELATED REQUIREMENTS

A. Section 05400 – Cold Formed Metal Framing: Openings.

B. Section 09260 - Gypsum Board Assemblies: Openings.

C. Section 09900 - Paints and Coatings: Field paint finish of frames.

1.3 REFERENCE STANDARDS

A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2008.

B. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.

C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.

D. Samples: Submit two slats, 4 inches long (100 mm long) illustrating shape, color and finish texture.

E. Manufacturer's Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.

F. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

PART 2 PRODUCTS

2.1 COILING COUNTER DOORS

A. Coiling Counter Doors, Non-Fire-Rated: Stainless steel slat curtain.

1. Mounting: Interior face mounted.

2. Nominal Slat Size: 2 inches (50 mm) wide.

3. Slat Profile: Flat.

4. Finish: No. 4.

5. Guides: Formed track; same material and finish unless otherwise indicated.

6. Hood: Manufacturer's standard; material and finish to match curtain.

7. Operation: Manual push up operation.

2.2 MATERIALS

A. Curtain Construction: Interlocking, single thickness slats.

1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.

2. Curtain Bottom: Fitted with tube to provide reinforcement and positive contact in closed position.

3. Stainless Steel Slats: ASTM A 666, Type 304; minimum thickness 22 gage, 0.03 inch (0.76 mm).

B. Guide Construction: Continuous, of profile to retain door in place, with mounting brackets of same metal.

1. Stainless Steel Guides: ASTM A 666, Type 304, rollable temper.

C. Hood Enclosure: Internally reinforced to maintain rigidity and shape.

D. Latching: Inside mounted, sliding deadbolt.

E. Roller Shaft Counterbalance: Steel pipe and torsion steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb (10 kg) nominal force to operate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.2 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.

F. Install perimeter trim as indicated.

3.3 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb and Level: 1/16 inch (1.5 mm).

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft (3 mm per 3 m) straight edge.

3.4 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.5 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION 08334

SECTION 08410 - METAL-FRAMED STOREFRONTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Aluminum framed storefront system, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

D. Door hardware.

1.2 RELATED REQUIREMENTS

A. Section 05500 - Metal Fabrications: Steel attachment devices.

B. Section 07260 - Weather Barriers: Perimeter air and vapor seal between glazing system and adjacent construction.

C. Section 07620 – Sheet Metal Flashing and Trim

C. Section 07900 - Joint Sealers: Perimeter sealant and back-up materials.

D. Section 08520 - Aluminum Windows: Operable sash within glazing system.

E. Section 08710 - Door Hardware: Hardware items other than specified in this section.

F. Section 08800 - Glazing: Glass and glazing accessories.

1.3 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2004.

B. AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage; American Architectural Manufacturers Association; 2009 (part of AAMA 501).

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 1998.

D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; American Architectural Manufacturers

Association; 2009.

E. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 2005.

F. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2008.

G. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2009.

H. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

I. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2008.

J. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004.

K. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002 (Reapproved 2010).

L. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

M. ASTM E 547 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Differential; 2000 (Reapproved 2009).

N. ASTM E 1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2000 (Reapproved 2008).

O. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

P. SSPC-Paint 25 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II; Society for Protective Coatings; 1997 (Ed. 2004).

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 PERFORMANCE REQUIREMENTS

A. Design and size components to withstand the following load requirements without damage or permanent set, when tested in accordance with ASTM E 330, using loads 1.5 times the design wind loads and 10 second duration of maximum load.

1. Design Wind Loads: Comply with requirements of ASCE 7. Exposure as required by IBC and speed as required by City and Borough of Juneau (minmum 116 mph 3-second gust).

2. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.

B. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

C. Thermal Resistance of Framing: R of 2.5

D. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft (0.3 L/s/sq m) of wall area, measured at a reference differential pressure across assembly of 1.57 psf (75 Pa) as measured in accordance with ASTM E 283.

E. Condensation Resistance Factor: CRF of 52 at doors when measured in accordance with AAMA 1503.1.

F. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 6.00 lbf/sq ft (290 Pa).

G. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

H. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and inner sheet of infill panel and heel bead of glazing compound.

I. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 130 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

1.6 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding

required.

D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, dimensional limitations.

E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

F. Samples: Submit two samples 12x12 inches (300x300 mm) in size illustrating finished aluminum surface, glass, infill panels, glazing materials.

G. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

H. Report of field testing for water leakage.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in City and Borough of Juneau & Juneau School District's name and registered with manufacturer.

1.7 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at Alaska.

B. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum three years of documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.9 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.10 WARRANTY

A. See Section 01780 - Contract Closeout, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: See below under description of products.

B. Exterior: Kawneer North America; Product 1600 Wall system 3 with Insulclad 360 Entrances and TrifabUT High Thermal Performance Wall system with Insulclad 360 Entrance, in locations indicated on drawings.

C. Interior: Kawneer North America ; Product TRIFAB 451T Wall system with 500 Wide Stile Entrances.

D. Other Acceptable Manufacturers:

1. Substitutions: See Section 01600 - Materials and Equipment.

2.2 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.

1. Glazing Rabbet: For 1 inch (25 mm) insulating glazing at both interior and exterior assemblies.

2. Glazing Position: Front-set.

3. Design Wind: Design for Exposure C, 120mph 3-secon gust; positive and negative pressure.

4. Water Leakage Test Pressure Differential: 6.24 lbf/sq ft (300 Pa).

5. Air Infiltration Test Pressure Differential: 6.24 psf (300 Pa).

6. Condensation Resistance Factor: 50 minimum at doors, 78 at frames and 70 at glass.

7. Overall U-Value Including Glazing: U=.33, maximum at 1600 Wall, U=0.25 maximum at TrifabUT Wall

8. Finish: Class I natural anodized.

B. Performance Requirements:

1. Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E 330, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
   a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.

2. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

3. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft (0.3 L/s/sq m) of wall area, measured at specified differential pressure across assembly in accordance with ASTM E 283.

4. Condensation Resistance Factor: Measure in accordance with AAMA 1503 with 1 inch (25 mm) insulating glass installed.

5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

6. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and inner sheet of infill panel and heel bead of glazing compound.

7. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

2.3 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.

1. Framing members for exterior (unheated) applications need not be thermally broken.

2. Glazing stops: Flush.

3. Cross-Section: As indicated on drawings.

4. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.
   a. 2-1/2 x 6 inch nominal dimension (1600 wall).

B. Doors: Glazed aluminum Typ., with thermal break.

1. Thickness: 2-1/4" inches

2. Top Rail: 5 inches wide.

3. Vertical Stiles: 5 inches wide.

4. Middle Rail (where occurs): 8-1/2 inches wide.

5. Bottom Rail: 7" inches wide.

6. Glazing Stops: Square.

7. Finish: Same as storefront.

2.4 MATERIALS

A. Extruded Aluminum: ASTM B 221 (ASTM B 221M).

B. Structural Steel Sections: ASTM A 36/A 36M; galvanized in accordance with requirements of ASTM A 123/A 123M.

C. Fasteners: Stainless steel.

D. Exposed Flashings: 0.032 inch (0.8 mm) thick aluminum sheet; finish to match framing members.

E. Concealed Flashings: 0.018 inch (0.5 mm) thick stainless steel.

F. Perimeter Sealant: Type 8 specified in Section 07900.

G. Glass: As specified in Section 08800.

1. Glass in Exterior Frames: Type IG-1 (tempered where indicated).

2. Glass in Exterior Doors: Type IG-1 (tempered).

3. Glass in Interior Frames: Type IG-3 and IG-4 (tempered). .

H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

I. Glazing Accessories: As specified in Section 08800.

J. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

K. Bituminous Paint: For isolation of dissimilar metals and metal/concrete contact, product as recommended by manufacturer.

2.5 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating or AAMA 612 clear anodic coating with electrolytically deposited organic seal; not less than 0.7 mils (0.018 mm) thick.

2.6 HARDWARE

A. Door Hardware: Storefront manufacturer's standard type to suit application.

1. Include for each interior and exterior door weatherstripping and sill sweep strip (retracting type).

2. See Section 08710 for remainder of required hardware

B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

C. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

D. Threshold: Extruded aluminum, one piece per door opening, ribbed surface with thermal break; provide on all doors. See details for conditions.

2.7 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

E. Arrange fasteners and attachments to conceal from view.

F. Reinforce components internally for door hardware.

G. Reinforce framing members for imposed loads.

H. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.2 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Coordinate attachment and seal of perimeter air and vapor barrier materials.

I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

J. Install operating sash.

K. Set thresholds in bed of mastic and secure.

L. Install hardware using templates provided.

1. See Section 08710 for hardware item identification and installation requirements.

M. Install glass in accordance with Section 08800, using exterior dry glazing method, typical.

N. Install perimeter sealant in accordance with Section 07900. Joints not to exceede 3/8" in width.

O. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft (1.5 mm/m) non-cumulative or 1/16 inches per 10 ft (1.5 mm/3 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.4 FIELD QUALITY CONTROL

A. See Section 01400 - Quality Control, for independent testing and inspection requirements. Inspection by owner and architect will monitor quality of installation and glazing.

B. Test installed storefront for water leakage in accordance with AAMA 501.2.

3.5 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.6 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

3.7 PROTECTION

A. Protect installed products from damage during subsequent construction.

END OF SECTION 08410

SECTION 08520 - ALUMINUM WINDOWS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Extruded aluminum windows with operating sash and security screen.

B. Operating hardware.

1.2 RELATED REQUIREMENTS

A. Section 07620 – Sheet Metal Flashing and Trim

B. Section 07900 - Joint Sealers: Perimeter sealant and back-up materials.

C. Section 08410 - Metal-Framed Storefronts

D. Section 08800 - Glazing.

1.3 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 1998.

B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2004.

C. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

D. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2008.

E. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2007.

F. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004.

G. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

H. SSPC-Paint 25 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II; Society for Protective Coatings; 1997 (Ed. 2004).

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions.

C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and installation requirements.

D. Samples: Submit one samples, 12 x 12 inch (300 x 300 mm) in size illustrating typical corner construction, accessories, and finishes.

E. Submit one sample of operating hardware.

F. Certificates: Certify that windows meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer and Installer Qualifications: Company specializing in fabrication of residential aluminum windows of types required, with not fewer than three years of experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.7 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C).

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.8 WARRANTY

A. See Section 01780 - Contract Closeout, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: See below under description of products.

B. Basis of Design: For installation at 1600 wall matching existing system; Product 6200T Isolock by Kawneer. At new window installation in non-storefront assemblies, Product Trifab451UT by Kawneer. www.kawneer.com.

1. Substitutions: See Section 01600 - Materials and Equipment.

2.2 WINDOWS

A. Windows: Tubular aluminum sections, factory fabricated, factory finished, thermally broken, vision glass (see section 08800), related flashings, anchorage and attachment devices.

1. Type: Reverse Hopper (in-swing).

2. Performance Class and grade: HC50

3. Air Infiltration: Limit air infiltration through assembly to 0.3 cu ft/min/sq ft (1.5 L/s/sq m) of wall area, measured at a specified differential pressure across assembly in accordance with ASTM E 283.

4. Water Infiltration Test Pressure Differential: 15 pounds per square foot (718 Pa).

5. Thermal Movement: Resists thermal movement caused by 180 degrees F (82.2 degrees C) surface temperature without buckling stress on glass, joint seal failure, damaging loads on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.

6. Condensation Resistance Factor: 50 minimum.

7. Overall U-value, 6200T, including glazing: 0.35, maximum.

8. Overall U-value, Trifab451UT, including glazing: 0.26 maximum.

9. Acoustical Performance: ASTM E 90 and E 1332; STC 38 and OITC 30 (projecting).

10. Life Cycle Requirements: No damage to fasteners, hardware parts or other components that would render operable windows in operable and not reduction in air and water infiltration resistance when tested according to AAMA 910.

2.3 COMPONENTS

A. Frames: thermally broken with interior portion of frame insulated from exterior portion; flush glass stops of snap-on type.

B. A. Security Screens: Kane Manufacturing Corp., or OWNER-approved equal. 12 mesh, 0.028" diameter stainless steel wire cloth mounted continuously at all edges to 16 ga., 1" x 1" galvanized steel frame with die-cast steel reinforced corners and removable aluminum alloy concealment plate. Screens are to be mounted to continuous aluminum angel mounting clips with security type stainless steel fasteners in accordance with manufacturer's standard detail. Screen Finish: black powder-coated Stainless Steel. Frame Finish: Match aluminum windows.

C. Operable Sash Weatherstripping: Resilient plastic; permanently resilient, profiled to achieve effective weather seal.

D. Fasteners: Stainless steel.

E. Glass and Glazing Materials: As specified in Section 08800.

F. Sealant and Backing Materials: As specified in Section 07900.

2.4 MATERIALS

A. Extruded Aluminum: ASTM B 221 (ASTM B 221M), 6063 alloy, T6 temper.

2.5 HARDWARE

A. Sash lock: Lever handle with cam lock.

B. Projecting Sash Arms: Cadmium plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.

C. Pulls: Manufacturer's standard type.

D. Bottom Rollers: Stainless steel, adjustable.

E. Limit Stops: Resilient rubber.

2.6 FABRICATION

A. Fabricate components with smallest possible clearances and shim spacing around perimeter of assembly that will enable window installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices.

D. Arrange fasteners and attachments to ensure concealment from view.

E. Prepare components with internal reinforcement for operating hardware.

F. Provide steel internal reinforcement in mullions as required to meet loading requirements.

G. Provide internal drainage of glazing spaces to exterior through weep holes.

H. Assemble security screen frames with mitered and reinforced corners. Secure wire mesh tautly in frame. Fit frame with security fastener type retainers.

I. Double weatherstrip operable units.

J. Factory glaze window units.

2.7 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating or AAMA 612 clear anodic coating with electrolytically deposited organic seal; not less than 0.7 mils (0.018 mm) thick.

B. Operator and Exposed Hardware: Enameled to color as selected from manufacturer's standards.

C. Apply 1 coat of bituminous coating to concealed aluminum and steel surfaces in contact with dissimilar materials.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.2 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Install sill and sill end angles.

E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.

G. Install operating hardware not pre-installed by manufacturer.

H. Install glass and infill panels in accordance with requirements specified in Section 08800.

I. Install perimeter sealant in accordance with requirements specified in Section 07900.

3.3 TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft (1.5 mm/m) non-cumulative or 1/8 inches per 10 ft (3 mm/3 m), whichever is less.

3.4 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.5 CLEANING

A. Remove protective material from factory finished aluminum surfaces.

B. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

3.6 SCHEDULE

A. See drawing opening types for locations.

END OF SECTION 08520

SECTION 08710 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Hardware for wood, hollow steel, and aluminum doors.

B. Electrically operated and controlled hardware.

C. Lock cylinders for doors for which hardware is specified in other sections.

D. Thresholds.

E. Weatherstripping, seals and door gaskets.

1.2 RELATED REQUIREMENTS

A. Section 06410 - Custom Cabinets: Cabinet hardware.

B. Section 08110 - Steel Doors and Frames.

C. Section 08211 - Flush Wood Doors.

D. Section 08310 - Access Doors and Panels

E. Section 08410 - Metal-Framed Storefronts: Hardware for doors in storefront not included in this section, including:

1. Integral weatherstripping and door sweeps.

2. Thresholds.

3. Installation of cylinders not included in this section.

F. Section 16851 - Fire Alarm System: Electrical connection to activate door closers and release magnetic holders.

g. Section 13720-Access Control System: Card access system and Security System components and coordination information not included in this section.

1.3 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and

Facilities; International Code Council; 2003.

B. BHMA A156.1 - American National Standard for Butts and Hinges; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.1).

C. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.2).

D. BHMA A156.3 - American National Standard for Exit Devices; Builders Hardware Manufacturers Association; 2001 (ANSI/BHMA A156.3).

E. BHMA A156.4 - American National Standard for Door Controls - Closers; Builders Hardware Manufacturers Association, Inc.; 2000 (ANSI/BHMA A156.4).

F. BHMA A156.5 - American National Standard for Auxiliary Locks & Associated Products; Builders Hardware Manufacturers Association; 2001 (ANSI/BHMA A156.5).

G. BHMA A156.6 - American National Standard for Architectural Door Trim; Builders Hardware Manufacturers Association; 2005 (ANSI/BHMA A156.6).

H. BHMA A156.7 - American National Standard for Template Hinge Dimensions; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.7).

I. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; Builders Hardware Manufacturers Association, Inc.; 2005 (ANSI/BHMA A156.8).

J. BHMA A156.13 - American National Standard for Mortise Locks & Latches; Builders Hardware Manufacturers Association; 2005 (ANSI/BHMA A156.13).

K. BHMA A156.15 - American National Standard for Release Devices - Closer Holder, Electromagnetic and Electromechanical; Builders Hardware Manufacturers Association; 2006 (ANSI/BHMA A156.15).

L. BHMA A156.16 - American National Standard for Auxiliary Hardware; Builders Hardware Manufacturers Association; 2002 (ANSI/BHMA A156.16).

M. BHMA A156.18 - American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.18).

N. BHMA A156.21 - American National Standard for Thresholds; Builders Hardware Manufacturers Association; 2009 (ANSI/BHMA A156.21).

O. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2005 (ANSI/BHMA A156.22).

P. BHMA A156.23 - American National Standard for Electromagnetic Locks; Builders Hardware Manufacturers Association, Inc.; 2004 (ANSI/BHMA A156.23).

Q. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.

R. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 2004.

S. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; Door and Hardware Institute; 1993; also in WDHS-1/WDHS-5 Series, 1996.

T. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2010.

U. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2009.

V. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.

B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

C. Convey City and Borough of Juneau & Juneau School District's keying requirements to manufacturers.

D. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by all affected installers.

E. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.5 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.

C. Shop Drawings:

1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts, electrical characteristics and connection requirements, and lists of parts provided.

2. Wiring Diagrams: Power, signal, and control wiring to include the following:
   a. System Schematic.
   b. Point-to-point wiring diagram.
   c. Detail interface between electrified door hardware and access control system.
   d. Operation Narrative: describe operation of doors controlled by electrified hardware.

D. Submit manufacturer's parts lists and templates.

E. Samples: Prior to preparation of hardware schedule:

1. Submit 1 sample of hinge, latchset, lockset, closer, and card reader illustrating style, color, and finish.

2. Approved samples will be incorporated into the Work.

F. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.

G. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

H. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

I. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

J. Keys: Deliver with identifying tags to City and Borough of Juneau & Juneau School District by security shipment direct from hardware supplier.

K. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in City and Borough of Juneau & Juneau School District's name and registered with manufacturer.

L. Maintenance Materials and Tools: Furnish the following for City and Borough of Juneau & Juneau School District's use in maintenance of project.

1. See Section 01600 - Materials and Equipment, for additional provisions.

2. Tools: One set of all special wrenches or tools applicable to each different or special hardware component, whether supplied by the hardware component manufacturer or not.

1.6 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by ARCHITECT and CONTRACTOR.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

C. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with 8 years of experience.

D. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in

the work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.8 WARRANTY

A. See Section 01780 - Contract Closeout, for additional warranty requirements.

B. Provide five year warranty for door closers and locksets.

PART 2 - PRODUCTS

2.1 GENERAL

A. Listed items establish minimum standards for performance, installation fit and quality. Manufacturers are listed, and some items are proprietary.

B. All hardware to be provided with finish 630 - brushed stainless steel, unless aluminum, in which case finish shall be clear anodized.

C. Substitutions: See Section 01600 - Materials and Equipment.

2.2 DOOR HARDWARE - GENERAL

A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.

B. Provide all items of a single type of the same model by the same manufacturer. Note some hardware items are proprietary.

C. Provide products that comply with the following:

1. Applicable provisions of federal, state, and local codes.

2. Fire-Rated Doors: NFPA 80.

3. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.

4. Hardware for Smoke and Draft Control Doors: Provide hardware that enables door

assembly to comply with air leakage requirements of the applicable code.

5. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

D. Function: Lock and latch function numbers and descriptions of manufactures series as shown on the drawings.

E. Electrically Operated and/or Controlled Hardware: Provide all power supplies, power transfer hinges, relays, controllers, and interfaces required for proper operation; provide wiring between hardware and control components and card reader, and to building power connection.

F. Finishes: Identified in schedule.

G. Fasteners:

1. Wood Doors: Sex bolts.

2. Concrete and Masonry Substrates: Stainless steel machine screws and lead expansion shields.

2.3 LOCK CYLINDERS

A. Standard Lock Cylinders: BHMA A156.5, Grade 2.

B. Cylinders: Best IC (cores):

1. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.

2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.

C. Permanent Cores: Best IC (cores), to be provided by OWNER, complying with the following:

1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.

D. Construction Keying: Comply with the following:

1. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

2. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
   a. OWNER will replace construction cores with permanent cores, and will return construction cores to CONTRACTOR.

E. Manufacturer: Same manufacturer as for locks and latches.

F. Manufacturers: Best Access Systems; Div. of The Stanley Works (BAS), unless otherwise authorized by OWNER.

2.4 HINGES

A. Hinges: Basis of design: FBB 199 - Stainless Steel Ball Bearing hinges. Stanley Hardware: www.stanleyworks.com.

B. Hinges: Provide hinges on every swinging door.

1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.

2. Provide ball-bearing hinges at all doors having closers.

3. Provide hinges in the quantities indicated.

4. Provide non-removable pins on exterior outswinging doors.

5. Where electrified hardware is mounted in door leaf, provide power transfer hinges, unless otherwise noted.

C. Quantity of Hinges Per Door:

1. Doors up to 60 inches (1.5 m) High: Two hinges.

2. Doors From 60 inches (1.5 m) High up to 90 inches (2.3 m) High: Three hinges.

3. Doors 90 inches (2.3 m) High up to 120 inches (3 m) High: Four hinges.

4. Doors over 120 inches (3 m) High: One additional hinge per each additional 30 inches (762 mm) in height.

D. Manufacturers - Hinges:

1. Assa Abloy McKinney: www.assaabloydss.com.

2. Bommer Industries, Inc: www.bommer.com.

3. C. R. Laurence Co., Inc: www.crlaurence.com.

4. Hager Companies: www.hagerco.com.

5. Stanley Hardware: www.stanleyworks.com.

6. Substitutions: See Section 01600 - Materials and Equipment.

2.5 PUSH/PULLS

A. At Mortise Lock and Latch Sets; Operating Trim: Lever #12 and forged escutcheon M on both sides.

B. Operating trim at doors with exiting bar hardware: Precision Hardware 2900C Lever with Escutcheon.

C. Dummy Trim at doors with exiting bar; Pull with Plate: Precision Hardware 1700C

D. Dummy Trim Exiting Bar: Precision Hardware 671dr3

E. Push/Pulls: Comply with BHMA A156.6.

1. Provide push and pull on doors not specified to have lockset, latchset, exit device, or auxiliary lock.

2. On solid doors, provide matching push plate and pull plate on opposite faces.

2.6 LOCKS AND LATCHES

A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.

1. Hardware schedule indicates locking functions required for each door.

2. If no hardware set is indicated for a swinging door provide an office lockset.

3. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.

4. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.

5. Existing wood doors will require modifications for new hardware installation. Remove and/or patch existing cut-away to facilitate installation of new hardware.

B. Electrically Operated Locks: Fail secure unless otherwise indicated.

C. Lock Cylinders: Manufacturer’s standard tumbler type, six-pin interchangeable core.

1. Provide cams and/or tailpieces as required for locking devices required.

D. Keying: Provide construction cores. Cores and keying by owner..

E. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

2.7 MORTISE LOCKSETS

A. Mortise Locksets: 40HW Series Mortise Latch, with Electronic Latch Retraction (ELR) and Card Reader where indicated. Provide corresponding stainless steel strike.

B. Locking Functions: As defined by manufacturer and indicated in the drawings:

1. Office for use at Classrooms, per Juneau School District Requirement; Key not required to lock from inside, remains locked upon exit unless keyed open. Indicated locksets in schedule to be provided by Owner, and installed by Contractor.

2. Provide corresponding power supply and door controller by hardware manufacturer at locations with Electronic Latch Retraction.

3. Provide power transfer hinge matching specified hinges (CEFBB199), or power transfer cable (Best 8WDTL) as indicated at doors with ELR.

C. Manufacturers - Mortise Locksets:

1. Best Access Systems, division of Stanley Security Solutions: www.bestlock.com.

2. No Substitutions.

2.8 AUXILIARY LOCKS

A. Locking Functions: As defined in BHMA A156.5, and as follows:

1. Mortise Deadlock, Unoccupied: "R" E015 or F17, deadbolt by key outside and turn inside.

B. Manufacturers - Auxiliary Locks: Same as other locks.

2.9 AUTOMATIC FLUSHBOLT

A. Automatic flushbolts: Lever extension bolts in leading edge of door, one bolt into floor, one bolt into top of frame.

1. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.

2. Floor Bolts: Provide dustproof strike except at metal thresholds.

B. Automatic Flushbolts: Automatically latch upon closing of door; automatic retraction of bolts when active leaf is opened.

C. Coordinators: Provide on doors having closers and self-latching or automatic flushbolts to ensure that leaves close in proper order.

D. Manufacturers - Flushbolts:

1. Assa Abloy McKinney: www.assaabloydss.com.

2. Hager Companies: www.hagerco.com.

3. Ives: www.ives.ingersollrand.com.

4. Triangle Brass Manufacturing Co., Inc: www.trimcobbw.com.

5. Substitutions: See Section 01600 - Materials and Equipment.

2.10 EXIT DEVICES

A. Exit Devices: Apex 2000 series, with Electronic Latch Retraction (ELR) and Card Reader where indicated. Provide stainless steel strike plate at jamb, floor, or head, as applicable.

B. Locking Functions: Functions as defined in BHMA A156.3, and as follows:

1. Entry/Exit, Free Swing: Key outside retracts latch, latch holdback (dogging) for free swing during occupied hours, not fire-rated; outside trim must be specified as lever or pull.

2. Provide corresponding power supply and door controller by hardware manufacturer at locations with Electronic Latch Retraction. Provide dual throw (SPDT) position switch.

3. Provide power transfer hinge matching specified hinges (CEFBB199) as indicated at doors with ELR.

C. Manufacturer: Precision Hardware: www.precisionhardware.com

1. No Substitutions.

2.11 ADA OPPERATOR AND REQUIRED EQUIPMENT

A. General: Provide ADA compliant electric door operator, power supply and controller, concealed wiring, and two door operator buttons per installed location. Coordinate with Electronic Latch Retraction Hardware and Card Reader.

1. Push -side mounted operator.

2. Touchless switch plate.

3. Integral hydraulic closer.

4. Basis of design: Stanley/Precision Hardware Group Low Energy Opperator D-4990

5. Substitutions: See Section 01600 - Materials and Equipment.

2.12 DOOR CONTACTS

A. General: Recesses or flush mounted in new frames, surface mounted on existing frames.

B. Available Manufacturers:

1. Sentrol; www.gesecurity.com.

2. Substitutions: See Section 01600 - Materials and Equipment.

2.13 ELECTRIC KEY/CARD ACCESS

A. A. General: Match systems implemented by the Juneau School District. Hardware items listed established minimum standard for performance. Electric Key/Card Access to be provided and programmed by ASG. ASG will provide wiring diagrams for installation of the system. Coordinate installation and operation of system.

B. Equipment, provide quantities required to complete project :

1. Lenel - LNL500 / Controller

2. Lantronics MSS 1-T-01 / Network Adaptor

3. Lenel - LNL1300 RDR Interface

4. Altronix - AL600ULX Power Supply

5. Lenel - LNL1100 Input Board

6. (200) HID 1326 PROX CARD II (School District Facility Code)

7. NEMA Enclosures for all electronic components.

2.14 CLOSERS

A. Concealed Closers: 2030 Series concealed in aluminum door head, typical, w/ bumper stop in track.

B. Closers: 4310 Series Surface Mount (inboard or secure side of door, typ.).

C. Closers: Complying with BHMA A156.4.

1. Provide surface-mounted, door-mounted closers unless otherwise indicated.

2. Provide a door closer on every exterior door.

3. Provide a door closer on every fire- and smoke-rated door. Spring hinges are not an acceptable self-closing device unless specifically so indicated.

4. On pairs of swinging doors, if an overlapping astragal is present, provide coordinator to ensure the leaves close in proper order.

5. At corridors, locate door-mounted closer on room side of door.

6. At outs-winging exterior doors, mount closer in inside of door.

D. Manufacturers - Closers:

1. LCN: www.lcnclosers.com.

2. No substitutions.

2.15 STOPS AND HOLDERS

A. Stops: Complying with BHMA A156.8; provide a stop for every swinging door, unless otherwise indicated.

1. Provide wall stops, unless otherwise indicated.

2. If wall stops are not practical, due to configuration of room or furnishings, provide overhead stop.

3. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop unless specifically so stated.

B. Wall Stops: Stanley CD80-4011 Stainless Steel

C. Floor Stops: Ives FS444 - Satin Nickel finish

D. Overhead Holders/Stops: Glynn-Johnson 100-Series heavy duty overhead stop

E. Magnetic Holder/Releases: Wall mounted, Complying with BHMA A156.15; fail safe; doors release to close automatically when electrical current is interrupted; holding force: 25 to 40 pounds-force (111 to 177 N). 120 Volt.

1. LCN, or to match those existing at this facility.

F. Manufacturers - Overhead Holders/Stops:

1. Assa Abloy, Rixson, or Sargent: www.assaabloydss.com.

2. C. R. Laurence Co., Inc: www.crlaurence.com.

3. DORMA Group North America: www.dorma-usa.com/usa.

4. Glynn-Johnson: www.glynn-johnson.com.

5. Substitutions: See Section 01600 - Materials and Equipment.

G. Wall and Floor Stops/Holders: Cast stainless steel w/ non-marking rubber.

1. Assa Abloy McKinney: www.assaabloydss.com.

2. C. R. Laurence Co., Inc; www.crlaurence.com.

3. Hager Companies: www.hagerco.com.

4. Hiawatha, Inc: www.hiawathainc.com.

5. Triangle Brass Manufacturing Co., Inc: www.trimcobbw.com.

6. Substitutions: See Section 01600 - Materials and Equipment.

2.16 GASKETING AND THRESHOLDS

A. Smoke Seals: Pemko SS88, Black

B. Gaskets: Complying with BHMA A156.22.

1. On each door in smoke partition, provide smoke gaskets; top, sides, and meeting stile of pairs. If fire/smoke partitions are not indicated on drawings, provide smoke gaskets on each door identified as a "smoke door" and 20-minute rated fire doors.

2. On each exterior door, provide jamb and head weather stripping gaskets, unless otherwise indicated; top, sides, and meeting stiles of pairs.
   a. Basis of design: Pemko 379CPK adjustable Weather seal.

3. On each exterior door, provide door bottom sweep, unless otherwise indicated.
   a. Basis of design: Pemko 4131CSL at interior door applications, and 4131CNBL at exterior door applications not included in 08410.

C. Thresholds:

1. At each exterior door, provide a thermally broken aluminum threshold unless otherwise indicated.

2. Field cut threshold to frame for tight fit.

3. ADA compliant height.

4. Basis of Design: Pemko 253XAFG

5. Fasteners At Exterior Locations: Non-corroding.

D. Manufacturers - Gasketing and Thresholds:

1. Assa Abloy McKinney: www.assaabloydss.com.

2. Hager Companies: www.hagercom.com.

3. National Guard Products, Inc: www.ngpinc.com.

4. Pemko Manufacturing Co: www.pemko.com.

5. Zero International, Inc: www.zerointernational.com.

6. Substitutions: See Section 01600 - Materials and Equipment.

2.17 PROTECTION PLATES AND ARCHITECTURAL TRIM

A. Protection Plates:

1. Kickplate: Provide on push side of every door with closer, except storefront and all-glass doors. Brushed Stainless steel. 8" tall x with of door, minus 1".

B. Drip Guard: Provide projecting drip guard over all exterior doors unless they are under a projecting roof or canopy.

C. Manufacturers - Protection Plates and Architectural Trim:

1. Assa Abloy McKinney: www.assaabloydss.com.

2. C. R. Laurence Co., Inc: www.crlaurence.com.

3. Hager Companies: www.hagerco.com.

4. Hiawatha, Inc: www.hiawathainc.com.

5. Triangle Brass Manufacturing Co., Inc: www.trimcobbw.com.

6. Substitutions: See Section 01600 - Materials and Equipment.

2.18 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

A. Provide products that comply with the following:

1. Applicable provisions of Federal, State, and local codes.

2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.

3. Applicable provisions of NFPA 101, Life Safety Code.

4. Fire-Rated Doors: NFPA 80.

5. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.

6. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code.

7. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.

2.19 KEYING

A. Door Locks: Provide construction cores. Final keying and cores will be by owner.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.

B. Verify that electric power is available to power operated devices and of the correct characteristics.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Do not install surface mounted items until finishes applied to substrate are complete.

D. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.

E. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted:

1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."

2. For steel doors and frames: See Section 08110.

3. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."

3.3 FIELD QUALITY CONTROL

A. Provide an Architectural Hardware Consultant to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.4 ADJUSTING

A. Adjust work under provisions of Section 01700.

B. Adjust hardware for smooth operation.

3.5 CLEANING

A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.6 PROTECTION

A. Protect finished Work under provisions of Section 01700.

B. Do not permit adjacent work to damage hardware or finish.

3.7 SCHEDULE - See Drawings.

END OF SECTION 08710

SECTION 08800 - GLAZING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Glass.

B. glazing assemblies.

C. Glazing compounds and accessories.

1.2 RELATED REQUIREMENTS

A. Section 06200 - Finish Carpentry: display case components with requirement for glass.

B. Section 07900 - Joint Sealers: Sealant and back-up material.

C. Section 08110 - Steel Doors and Frames: Glazed doors and borrowed lites.

D. Section 08211 - Flush Wood Doors: Glazed doors.

E. Section 08410 - Metal-Framed Storefronts: Glazed windows and doors.

F. Section 08520 - Aluminum Windows: Glazed windows.

G. Section 10800 - Toilet, Bath, and Laundry Accessories: Mirrors.

1.3 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2004.

C. ASTM C 864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005.

D. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2010.

E. ASTM C 1036 - Standard Specification for Flat Glass; 2006.

F. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass; 2004.

G. ASTM C 1172 - Standard Specification for Laminated Architectural Flat Glass; 2009.

H. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2009.

I. ASTM E 773 - Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units; 2001.

J. ASTM E 774 - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units; 1997.

K. ASTM E 1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2009a.

L. ASTM E 2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2008.

M. GANA (GM) - GANA Glazing Manual; Glass Association of North America; 2004.

N. GANA (SM) - FGMA Sealant Manual; Glass Association of North America; 2008.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. See Section 01300 - Contractor Submittals, for submittal procedures.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Samples: Submit two samples 12X12 inch in size of glass units, showing coloration and design.

E. Samples: Submit 6 inch long bead of glazing sealant, color as selected.

F. Certificates: Certify that products meet or exceed specified requirements.

G. Maintenance Materials: Furnish the following for City and Borough of Juneau & Juneau School District's use in maintenance of project.

1. See Section 01600 - Materials and Equipment, for additional provisions.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum 10 years documented experience.

1.7 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 50 degrees F (10 degrees C).

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.8 WARRANTY

A. See Section 01780 - Contract Closeout, for additional warranty requirements.

B. Sealed Insulating Glass Units: Provide a five (5) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

C. Laminated Glass: Provide a five (5) year warranty to include coverage for delamination, including replacement of failed units.

PART 2 - PRODUCTS

2.1 GLAZING TYPES

A. Type IG-1Sealed Insulating Glass Units: Vision glazing.

1. Application(s): All exterior glazing unless otherwise indicated.

2. Outboard Lite: Annealed float glass, 1/4 inch (6 mm) thick, minimum.
   a. Tint: None (clear).
   b. Glass and Coating: Energy Advantage Low-E, with coating on #2 surface.

3. Middle Lite: Suspended Heatmirror film 88
   a. Tint: Clear.

4. Inboard Lite: Annealed float glass, 1/4 inch (6 mm) thick, minimum.
   a. Glass and Coating: Eclipse Advantage Clear (untinted), with frost coating on #3 surface.
   b. Tint: Clear.

5. Space between lites filled with Krypton gas.

6. Basis of glass Design: Pilkington North America Inc: www.pilkington.com.

7. Fully Tempered where glazed lites are in exterior doors, glazed sidelights and panels next to doors, in other locations required by applicable federal, State, and local codes and regulations, or where indicated in the drawings.

8. Spacer: Nonconductive.

9. Total Thickness: 1 inch (25 mm).

10. U-value: U=0.14

11. Total Visible Light Transmittance: 60-70% percent, nominal.

12. Total Solar Heat Gain Coefficient: 0.41-0.52 percent, nominal.

13. Glazing Method: Exterior Gasketed Method (dry).

B. Type IG-2 - Sealed Insulating Glass Units: Obscure Glazing; Translucent, showing shadows but not forms.

1. Application(s): lower lights at exterior bathroom windows, as shown in locations as indicated on drawings.

2. Assembly: same as IG-1, but with frosted 3rd surface (outboard face of inboard lite)

3. Basis of glass Design: Pilkington North America Inc: www.pilkington.com.

4. Outboard Lite: Annealed float glass, 1/4 inch (6 mm) thick, minimum.
   a. Glass and Coating: Energy Advantage Low-E, with coating on #2 surface.
   b. Tint: Clear.

5. Inboard Lite: Annealed float glass, 1/4 inch (6 mm) thick, minimum.
   a. Coating: Eclipse Advantage Clear (untinted), with frost coating on #3 surface.
   b. Tint: Clear.

6. Total Thickness: 1 inch (25 mm).

7. Obscuring by heat treated glass frit, or chemical etcching.

C. Type IG-3 - Sealed Acoustic Glass Units: Interior acoustic glazing.

1. Outboard Lite: Laminated float glass, 1/4 inch (6 mm) thick, minimum.
   a. Tint: Clear.

2. Inboard Lite: Laminated float glass, 1/4 inch (6 mm) thick.
   a. Tint: Clear.

3. Total Thickness: 1 inch (25 mm).

4. Glazing Method: Gasket glazing.

D. Type S-1 - Single Safety Glazing: Non-fire-rated.

1. Applications: Provide this type of glazing in the following locations:
   a. Glazed lites in doors, except fire doors.
   b. Glazed sidelights to doors, except in fire-rated walls and partitions.
   c. Other locations required by applicable federal, state, and local codes and regulations.
   d. Other locations indicated on the drawings, including display cases sliding glass and shelf glass.

2. Type: Fully tempered float glass as specified.

3. Tint: Clear.

4. Thickness: 1/4 inch (6 mm).

5. Glazing Method: Interior dry method, tape and tape.

6. Flame polish edges at sliding glass and shelf glass at display cases.

5. Glazing Method: Interior dry method, tape and tape, at fixed window units.

2.2 EXTERIOR GLAZING ASSEMBLIES

A. Structural Design Criteria: Select type and thickness to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with ASCE 7.

1. Use the procedure specified in ASTM E 1300 to determine glass type and thickness.

2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.

3. Thicknesses listed are minimum.

B. Air and Vapor Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier:

1. In conjunction with vapor retarder and joint sealer materials described in other sections.

2. To utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.

3. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

2.3 GLASS MATERIALS

A. Float Glass Manufacturers:

1. Zeledyne: www.versaluxglass.com.

2. AGC Flat Glass North America, Inc: www.afgglass.com.

3. Guardian Industries Corp: www.sunguardglass.com.

4. Pilkington North America Inc: www.pilkington.com.

5. PPG Industries, Inc: www.ppgglazing.com.

6. Substitutions: See Section 01600 - Materials and Equipment.

B. Float Glass: All glazing is to be float glass unless otherwise indicated.

1. Annealed Type: ASTM C 1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).

2. Heat-Strengthened and Fully Tempered Types: ASTM C 1048.

3. Tinted Types: Color and performance characteristics as indicated.

4. Thicknesses: 1/4 inch minimum, typical; for exterior glazing comply with specified requirements for wind load design regardless of specified thickness.

2.4 SEALED INSULATING GLASS UNITS

A. Manufacturers:

1. Any of the manufacturers specified for float glass.

2. Any fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty, if any.

B. Sealed Insulating Glass Units: Types as indicated.

1. Durability: Certified by an independent testing agency to comply with ASTM E 2190.

2. Edge Spacers: low conductivity, continuous and sealed corners. Basis of design: Super Spacer Premium Plus, by Edgetech, or Owner Approved Equal.

3. Edge Seal Construction: Glass to elastomer with supplementary silicone sealant.

4. Purge interpane space with dry Argon.

5. Unit thickness: 1 inch.

2.5 PLASTIC FILMS

A. Manufacturers:

1. CPFilms, Inc: www.cpfindusprod.com.

2. 3M Window Film: www.3m.com/US/arch_construct/scpd/windowfilm.

3. Substitutions: Refer to section 01600 - Materials and Equipment

B. Plastic Film: Mylar type, visible light transmittance of 88 percent. UV stable.

2.6 GLAZING COMPOUNDS

A. Manufacturers:

1. Bostik Inc: www.bostik-us.com.

2. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.

3. Pecora Corporation: www.pecora.com.

4. BASF Construction Chemicals-Building Systems: www.chemrex.com.

5. Dow Corning: www.dowcorning.com .

6. Substitutions: Not permitted.

B. Silicone Sealant: Type 8. Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; cured Shore A hardness of 25-40; black color.

2.7 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C 864 Option I. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) x width of glazing rabbet space minus 1/16 inch (1.5 mm) x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 3 inch (75 mm) long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Continuous Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum length of bearing/pressure surface x one half the width of the glazing contact area x thickness to suit application (no less than 1/4"), self adhesive on one face.

D. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; 1/8x1/2 inch (3 x 12 mm) size; black color.

E. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C 864 Option I; black color.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

D. Install sealants in accordance with ASTM C 1193 and FGMA Sealant Manual.

E. Install sealant in accordance with manufacturer's instructions.

3.3 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

A. Place setting blocks at 1/4 points with edge block no more than 6 inches (150 mm) from corners.

B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.4 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.5 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape.

3.6 SCHEDULE

A. Aluminum Windows: Type IG-1 and IG-2, exterior dry method.

B. Metal-Framed Storefronts, Doors (exterior): Type IG-1, thicknesses required to comply with performance requirements, exterior dry method.

C. Metal-Framed Storefronts, Doors (interior): Type IG-3, dry method.

D. Hollow Steel Frames:

1. Interior: Type S-1, interior wet/dry method with sealant tape and Type 8 sealant.

E. Flush Wood Doors:

1. Interior: Type S-1, interior wet/dry method with sealant tape and Type 8 Sealant.

F. Display Case: Loose. Coordinate with details.

END OF SECTION 08800

SECTION 09111 - NON-LOADBEARING METAL FRAMING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Metal partition, ceiling, and soffit framing.

B. Framing accessories.

1.2 RELATED REQUIREMENTS

A. Section 05400 - Cold Formed Metal Framing: Exterior wall stud framing.

B. Section 05400 - Cold Formed Metal Framing: Execution requirements for anchors for attaching work of this section.

C. Section 05500 - Metal Fabrications: Metal fabrications attached to stud framing.

D. Section 05500 - Metal Fabrications: Execution requirements for anchors for attaching work of this section.

E. Section 05510 - Metal Stairs: Execution requirements for anchors for attaching work of this section.

F. Section 05400 - Cold Formed Metal Framing: Execution requirements for anchors for attaching work of this section.

G. Section 06100 - Rough Carpentry: Wood blocking within stud framing.

H. Section 06100 - Rough Carpentry: Wall sheathing.

I. Section 06200-Finish Carpentry: furring and suspension for wood soffit and ceiling assembly.

J. Section 07260 - Weather Barriers.

K. Section 07212 - Board and Batt Insulation: Insulation.

L. Section 07620 - Sheet Metal Flashing and Trim: Head and sill flashings.

M. Section 08310 - Access Doors and Panels.

N. Section 08520 - Aluminum Windows: Product requirements for window anchors.

O. Section 09260 - Gypsum Board Assemblies: Execution requirements for anchors for attaching

work of this section.

1.3 REFERENCE STANDARDS

A. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)

B. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members; 2009a.

C. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2009a.

D. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.

E. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

1.4 SUBMITTALS

A. See Section 01300 - Contractor Submitttals, for submittal procedures.

B. Shop Drawings:

1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories, and items of other related work.

2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.

C. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

E. LEED Submittal: Documentation of recycled content and location of manufacture.

1.5 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.1 FRAMING MATERIALS

A. Non-Loadbearing Framing System Components: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf (240 Pa).

1. Studs: C shaped with flat or formed webs with knurled faces.

2. Runners: U shaped, sized to match studs.

3. Ceiling/Carrying Channels: C shaped.

4. Furring: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).

B. Load bearing Studs: As specified in Section 05400.

C. Ceiling Hangers: Type and size as specified in ASTM C 754 for spacing required.

D. 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.

1. 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.

2. Material: ASTM A 653/A 653M steel sheet, SS Grade 50, with G60/Z180 hot dipped galvanized coating.

3. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings.

4. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet (3660 mm).

E. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs.

F. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C 754.

G. Fasteners: ASTM C 1002 self-piercing tapping screws.

H. Sheet Metal Backing: 0.036 inch (0.9 mm) thick, galvanized.

I. Anchorage Devices: Power actuated or Drilled expansion bolts.

J. Acoustic Insulation: Fiberglass batt insulation as specified in Section 07212. Fill stud cavities.

K. Acoustic Sealant: As specified in Section 07900.

L. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

2.2 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

3.2 INSTALLATION OF STUD FRAMING

A. Extend partition framing to structure where indicated and to ceiling in other locations.

B. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

C. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs as indicated.

D. Align and secure top and bottom runners at 24 inches (600 mm) on center.

E. At partitions indicated with an acoustic rating:

1. Place one bead of acoustic sealant between runners and substrate, studs and adjacent construction.

2. Place one bead of acoustic sealant between studs and adjacent vertical surfaces.

F. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

G. Align stud web openings horizontally.

H. Secure studs to tracks using crimping method. Do not weld.

I. Stud splicing is not permissible.

J. Fabricate corners using a minimum of three studs.

K. Double stud at wall openings, door and window jambs, not more than 2 inches (50 mm) from each side of openings.

L. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

M. Blocking: Use wood blocking secured between studs. Provide blocking for support of plumbing fixtures.

N. Backing: Use sheet metal backing across face of studs to support wall-attached devices in locations there is no plywood sheathing. Provide both wood blocking and sheetmetal backing at locations where heavy devices, such as TV brackets, are positioned with no plywood sheathing.

3.3 CEILING AND SOFFIT FRAMING

A. Comply with requirements of ASTM C 754.

B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

C. Install furring independent of walls, columns, and above-ceiling work.

D. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.

E. Space main carrying channels at maximum 72 inch (1 800 mm) on center, and not more than 6 inches (150 mm) from wall surfaces. Lap splice securely.

F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

G. Place furring channels perpendicular to carrying channels, not more than 2 inches (50 mm) from perimeter walls, and rigidly secure. Lap splices securely.

H. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches (600 mm) past each opening.

I. Laterally brace suspension system.

3.4 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation From Plumb: 1/8 inch in 10 feet (3 mm in 3 m).

END OF SECTION 09111

SECTION 09260 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Acoustic insulation.

C. Gypsum wallboard.

D. Joint treatment and accessories.

E. Water-resistive barrier over exterior wall sheathing.

1.2 RELATED REQUIREMENTS

A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05400 - Cold Formed Metal Framing: Exterior wind-load-bearing metal stud framing.

C. Section 06100 - Rough Carpentry: Building framing (repairs to existing) and furring.

D. Section 06100 - Rough Carpentry: Wood blocking product and execution requirements.

E. Section 07212 - Board and Batt Insulation: Acoustic insulation.

F. Section 07840 - Firestopping: Top-of-wall assemblies at fire rated walls.

G. Section 07900 - Joint Sealers: Acoustic sealant.

H. Section 09111 - Non-Loadbearing Metal Framing.

I. Section 09300 - Tiling (Tile): Tile backing board.

1.3 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 1999 (R2005).

B. ASTM C 475/C 475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002 (Reapproved 2007).

C. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members; 2009a.

D. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2006.

E. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2009a.

F. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board; 2008.

G. ASTM C 954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2007.

H. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.

I. ASTM C 1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2009.

J. ASTM C 1280 - Standard Specification for Application of Gypsum Sheathing; 2009.

K. ASTM C 1396/C 1396M - Standard Specification for Gypsum Board; 2009a.

L. ASTM C 1629/C 1629 - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2006.

M. ASTM D 3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2000 (Reapproved 2005).

N. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

O. ASTM E 413 - Classification for Rating Sound Insulation; 2004.

P. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2007.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate special details associated with acoustic seals.

C. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

D. Test Reports: For all stud framing products that do not comply with ASTM C 645 or C 754,

provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

E. LEED Submittals:

1. For gypsum wallboard, submit documentation of recycled content and location of manufacture.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum 10 years of documented experience.

B. Copies of Documents at Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

PART 2 - PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C 840 and GA-216.

B. Interior Partitions Indicated as Acoustic: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E 413, based on tests conducted in accordance with ASTM E 90.

2.2 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:

1. American Gypsum: www.americangypsum.com.

2. CertainTeed Corporation: www.certainteed.com.

3. Georgia-Pacific Gypsum LLC: www.gp.com/gypsum.

4. Lafarge North America Inc: www.lafargenorthamerica.com.

5. National Gypsum Company: www.nationalgypsum.com.

6. PABCO Gypsum: www.pabcogypsum.com.

7. Temple-Inland Inc: www.templeinland.com.

8. USG Corporation: www.usg.com.

9. Substitutions: See Section 01600 - Materials and Equipment.

B. Wallboard: Paper-faced gypsum wallboard as defined in ASTM C 1396/C 1396M; sizes to minimize joints in place; Tapered edges.

1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.

2. Glass-mat-faced gypsum panels as defined in ASTM C 1658/C 1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.

3. Mold Resistance: Score of 10, when tested in accordance with ASTM D 3273.
   a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.

4. Type: Fire-resistance rated Type X, UL or WH listed.

5. Thickness:
   a. Vertical Surfaces: 5/8 inch (16 mm).
   b. Ceilings: 1/2 inch (16 mm).
   c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.

C. Impact-Rated Wallboard: Tested to Level 3 soft-body and hard-body impact in accordance with ASTM C 1629.

1. Application: All new gypsum board in hallways within 48" of finish floor not receiving wainscot or wall covering panel..

2. Mold Resistance: Score of 10, when tested in accordance with ASTM D 3273.

3. Type: Fire-resistance rated Type X, UL or WH listed.

4. Thickness: 5/8 inch (16 mm).

5. Edges: Tapered.

D. Ceiling Board: Special sag-resistant gypsum ceiling board as defined in ASTM C 1396/C 1396M; sizes to minimize joints in place; ends square cut.

1. Application: Ceilings and soffits, unless otherwise indicated.

2. Thickness: 1/2 inch (13 mm).

3. Edges: Tapered.

2.3 ACCESSORIES

A. Acoustic Insulation: ASTM C 665; preformed glass fiber, friction fit type, unfaced. Thickness to match wall depth.

B. Acoustic Sealant: As specified in Section 07900.

C. Water-Resistive Barrier: No. 15 asphalt felt.

D. Finishing Accessories: ASTM C 1047, galvanized steel, rolled zinc, or aluminum, 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.
   a. Special moldings will also include:
      1) "L" 2-1/2 inch; Fry Reglet DRML-250.
      2) "Reveal Molding" 1/2 x 5/8 inch; Fry Reglet DRM-625-50.

E. Joint Materials: ASTM C 475 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. Ready-mixed vinyl-based joint compound.

F. High Build Drywall Surfacer: 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.

G. Screws for Attachment to Steel Members Less Than 0.03 inch (0.7 mm) In Thickness, to Wood Members, and to Gypsum Board: ASTM C 1002 self-piercing tapping type; cadmium-plated for exterior locations.

H. Screws for Attachment to Steel Members From 0.033 to 0.112 inch (0.8 to 2.8 mm) in Thickness: ASTM C 954; steel drill screws for application of gypsum board to loadbearing steel studs.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION

A. Metal Framing: See section 09111.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.

1. Level ceiling system to a tolerance of 1/1200.

2. Laterally brace entire suspension system.

D. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches (100 mm) from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches (600 mm) on center.

E. Acoustic Furring: Install resilient channels at maximum 24 inches (600 mm) on center. Locate joints over framing members.

F. Blocking and Backing: Install wood blocking and/or sheetmetal backing for support of:

1. Framed openings.

2. Wall mounted cabinets.

3. Plumbing fixtures.

4. Toilet partitions.

5. Toilet accessories.

6. Wall mounted door hardware.

7. Wall mounted furnishings at classroom (TV bracket locations indicated, projector screen mount locations).

3.3 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: See Section 07900. Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.4 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

3.5 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C 840, as follows:

1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

2. Level 5: Walls and ceilings to receive egg shell, semi-gloss, or gloss paint finish, and other areas specifically indicated.

3. Level 3: Walls to receive textured wall finish.

4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.

5. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

6. Level 0: Temporary partitions and surfaces indicated to be finished in later stage of project.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.

3. Taping, filling and sanding is not required at base layer of double layer applications.

C. At Level 5 finish locations, spray apply high build drywall surface over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

D. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.6 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION 09260

SECTION 09300 - TILE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Tile for shower receptors.

D. Cementitious backer board as tile substrate.

E. Ceramic trim.

F. Non-ceramic trim.

1.2 RELATED REQUIREMENTS

A. Section 07900 - Joint Sealers.

B. Section 15410 - Plumbing Fixtures: Shower receptor.

1.3 REFERENCE STANDARDS

A. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2005.

1. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2005.

B. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar; 1999 (R2005).

1. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex Portland Cement Mortar; 1999 (R2005).

2. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 1999 (R2005).

C. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with

Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (R2005).

D. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (R2005).

1. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (R2005).

2. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (R2005).

E. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (R2005).

F. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 1999 (R2005).

G. ANSI A118.1 - American National Standard Specifications for Dry-Set Portland Cement Mortar; 1999 (R2005).

H. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 1999 (R2005).

I. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar; 1999 (R2005).

J. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 1999 (R2005).

K. ANSI A118.7 - American National Standard Specifications for Polymer Modified Cement Grouts for Tile Installation; 1999 (R2005).

L. ANSI A118.8 - American National Standard Specifications for Modified Epoxy Emulsion Mortar/Grout; 1999 (R2005).

M. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (R2005).

N. ANSI A136.1 - American National Standard for Organic Adhesives for Installation of Ceramic Tile; 1999 (R2005).

O. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2008.

P. TCNA (HB) - Handbook for Ceramic Tile Installation; 2010.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. See Section 01300 - Contractor Submittals, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 x 18 inches (450 x 450 mm) in size illustrating pattern, color variations, and grout joint size variations.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

G. Maintenance Materials: Furnish the following for City and Borough of Juneau & Juneau School District's use in maintenance of project.

1. See Section 01600 - Materials and Equipment, for additional provisions.

2. Extra Tile: 10 square feet (1 square meters) of each size, color, and surface finish combination. ¼ quantity for accent and glass tile.

H. LEED Submittal: Documentation of recycled content and location of manufacture.

1.6 QUALITY ASSURANCE

A. Maintain one copy of The Tile Council of North America Handbook and ANSI A108 Series/A118 Series on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum 5 years of documented experience.

C. Installer Qualifications: Company specializing in performing tile installation, with minimum of 5 years of documented experience.

1.7 MOCK-UP

A. Construct tile mock-up where indicated on the drawings, incorporating all components specified for the location.

1. Minimum size of mock-up is indicated on the drawings.

2. Approved mock-up may remain as part of the Work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.9 FIELD CONDITIONS

A. Do not install adhesives in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during installation of mortar materials.

PART 2 PRODUCTS

2.1 TILE

A. Manufacturers: All products by the same manufacturer.

1. American Olean: www.americanolean.com.

2. Dal-Tile Corporation: www.daltile.com.

3. Summitville Tiles, Inc: www.summitville.com.

4. Substitutions: See section 01600 - Materials and Equipment.

B. Porcelain Ceramic Floor Tile (CT-1, CT-2, CT-5): ANSI A137.1, and as follows:

1. Moisture Absorption: 0 to 0.5 percent.

2. Size and Shape: 1 inch square.

3. Edges: Square.

4. Surface Finish: Matte glazed abrasive content.

5. Colors: As scheduled.

6. Basis of Design: Daltile “Keystones”, with between 8% and 19% pre-consumer recycled content.

7. Installation method: Thin-set. Grout: Polymer Modified, white in color.

C. Glazed Wall Tile (CT-3, CT-4): ANSI A137.1, and as follows:

1. Moisture Absorption: 3.0 to 7.0 percent.

2. Size and Shape: 4 inch by 8 inch (102 by 203 mm).

3. Edges: Cushioned.

4. Surface Finish: High gloss.

5. Colors: To be selected by architect from manufactures full line of tile meeting design criteria.

6. Basis of Design: Daltile “Natural Hues”, price group 2 withy 21% pre-consumer recycled content.

7. Installation method: Thin-set. Grout: Polymer Modified.

D. Gradient Glass Tile (CT-7/GGT, CT-8/GGT):

1. Manufacturers:
   a. Optico Gradient Glass Tile;
   b. Substitutions: See section 01600 - Materials and Equipment

2. Moisture Absorption: none.

3. Edges: Cushioned.

4. Surface Finish: gloss/polished.

5. Shape: Square

6. Pattern:
   a. CT-7 Commons Columns (2-1/2 columns): “Orange” (orange to blue gradient, base to top of column faces).
   b. CT-8 Drinking Fountain niche (2 locations): “ Jasmine” (green to blue gradient, floor to soffit).

7. Installation method: Thin-set. Grout: Polymer Modified, white in color.

E. Accent Glass Tile (CT-6/GT):

1. Moisture Absorption: none.

2. Edges: Cushioned.

4. Surface Finish: gloss/polished.

5. Shape: liner

6. Pattern: Random blend for 4 inch accent band, colors chosen from full line of those available.

7. Installation method: Thin-set. Grout: Polymer Modified, white in color.

2.2 TRIM AND ACCESSORIES

A. Trim: Matching bullnose, double bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.

1. Applications: Use in the following locations:
   a. Open Edges: Bullnose.
   b. Inside Corners: Jointed.
   c. Floor to Wall Joints: Cove base.

2. Manufacturer: Same as for tile.

B. Non-Ceramic Trim: Brushed stainless steel, style and dimensions as indicated on drawings, for setting using tile mortar or adhesive.

1. Applications: Use in the following locations:
   a. Open edges of wall tile: Bullnose stretcher tile, with all special edge conditions, to match wall tile.
   b. Open edges of floor tile and transitions to other floring finishes: Blanke "Carpet Trim", and Blanke " ReducerTrim (to LINT/LIN). Both consdition s in stainless steel.
   c. Wall corners, outside, at commons columns (14 locations, full height): Blanke "Corner Protection Profile", Stainless steel.
   d. Thresholds at door openings: Blanke "DRIVE", Stainless steel.
   e. Expansion and control joints, floor and wall: where required, Blanke “Surface Expansion Joint”.
   f. Floor to wall joints: Built up porcelain tile cove base matching floor tile type (color may vary, per schedule). At Glass Tile (GT), provide Blanke “Edger Protector Trim”, stainless steel, 1/8” above floor finish.
   g. Borders and other trim as indicated on drawings: Blanke "Floor Accent Profile" (shown used to create reveal at walls).

2. Manufacturer:
   a. Schluter-Systems: www.schluter.com.
   b. Genesis APS International: www.genesis-aps.com.
   c. Blanke: www.blanke-co.com.
   d. Substitutions: See Section 01600 - Materials and Equipment.

2.3 ADHESIVE MATERIALS

A. Manufacturers:

1. Bonsal American, Inc; StayFlex 590: www.prospec.com

2. Bostik Inc: www.bostik-us.com.

3. Mapei Corporation: www.mapei.com.

4. Substitutions: See Section 01600 - Materials and Equipment

B. Organic Adhesive: ANSI A136.1, thinset bond type; use Type I in areas subject to prolonged moisture exposure.

C. Epoxy Adhesive: ANSI A118.3, thinset bond type.

D. Tile Setting Adhesive: Elastomeric, waterproof, liquid applied.

2.4 GROUT MATERIALS

A. Manufacturers:

1. Bonsal American, Inc; ProSpec Sanded Tile Grout 700: www.prospec.com

2. Bostik Inc: www.bostik-us.com.

3. Custom Building Products: www.custombuildingproducts.com.

4. Substitutions: See Section 01600 - Materials and Equipment

B. Standard Grout: Polymer modified cement grout, sanded or unsanded, as specified in ANSI A118.7.

1. Colors: To be selected by ARCHITECT from manufacturer's standard range.

C. Silicone Rubber Grout: Silicone sealant, moisture and mildew resistant type, color as selected; use for expansion joints in ceramic tile installation.

2.5 ACCESSORY MATERIALS

A. Waterproofing Membrane at Showers: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.

1. Material: Fluid or Trowel-applied water-based acrylic membrane, 25 mils (0.6 mm) thick, minimum, with continuous polyester fabric reinforcement.

2. Manufacturers:
    a. AVM Industries, Inc; System 700: www.avmindustries.com.
    b. Substitutions: See Section 01600 - Materials and Equipment

B. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced, 1/2 inch (13 mm) thick; 2 inch (50 mm) wide coated glass fiber tape for joints and corners.

C. Mesh Tape: 2-inch (50 mm) wide self-adhesive fiberglass mesh tape.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Coordinate slopes in concrete slabs to drain during concrete finishing where slope to floor drains is required. This work is to be completed by tile installer.

B. Verify that wall surfaces are smooth and within the tolerances specified for that type of work, are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

E. Verify that required floor-mounted utilities, including floor drains, shower recepters, and cleanout cover plates, are in correct location and set to correct elevation.

3.2 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge. shim as required for flush installation with adjacent gypsum board.

3.3 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and The Tile Council of North America Handbook recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

E. Form internal angles square and external angles bullnosed.

F. Install non-ceramic trim in accordance with manufacturer's instructions.

G. Install thresholds where indicated – see details. Typically to be centered under doors, when transition occurs at a door opening.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

J. Allow tile to set for a minimum of 48 hours prior to grouting.

K. Grout tile joints. Use standard grout unless otherwise indicated.

L. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

M. Apply penetrating stone floor sealer at slate flooring areas in accordance with manufacturers recommendations.

3.4 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-portland cement bond coat, with standard grout, unless otherwise indicated.

1. Where waterproofing membrane is indicated, install in accordance with TCA Handbook Method F122, with latex-portland cement grout.

3.5 INSTALLATION - SHOWER WALLS

A. At tiled shower receptors install in accordance with The Tile Council of North America Handbook Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.

B. Grout with standard grout as specified above.

C. Seal joints between tile work and other work with sealant Type 4 specified in Section 07900.

3.6 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with The Tile Council of North America Handbook Method W244, using membrane at toilet rooms.

3.7 CLEANING

A. Clean tile and grout surfaces.

3.8 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 09300

SECTION 09511 - SUSPENDED ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.2 RELATED REQUIREMENTS

A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 07212 - Board and Batt Insulation: Acoustical insulation.

C. Section 07900 - Joint Sealers: Acoustical sealant.

D. Section 08310 - Access Doors and Panels: Access panels.

E. Section 13851 - Fire Alarm System: Fire alarm components in ceiling system.

F. Section 13925 - Fire Suppression Sprinklers: Sprinkler heads in ceiling system.

G. Section 15850 - Air Outlets and Inlets: Air diffusion devices in ceiling.

H. Section 16511 - Interior Lighting: Light fixtures in ceiling system.

I. Section 16723 - Public Address and Music Equipment: Speakers in ceiling system.

1.3 REFERENCE STANDARDS

A. ASTM C 636/C 636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 2008.

B. ASTM E 580/E 580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2009a.

C. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products; 2008.

D. GEI (SCH) - GREENGUARD "Children and Schools" Certified Products; GREENGUARD Environmental Institute; current listings at www.greenguard.org.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.5 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components.

D. Samples: Submit two samples 24x24 inch (600x600 mm) in size illustrating material and finish of acoustical units.

E. Maintenance Materials: Furnish the following for City and Borough of Juneau & Juneau School District's use in maintenance of project.

1. See Section 01600 - Product Requirements, for additional provisions.

2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

F. LEED Submittal: Documentation of recycled content and location of manufacture.

1.6 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

A. Manufacturers:

1. Armstrong World Industries, Inc: www.armstrong.com.

2. Acoustic Ceiling Products, Inc.: www.acpideas.com.

3. CertainTeed Corporation: www.certainteed.com.

4. Hunter Douglas Contract: www.hunterdouglascontract.com.

5. Pinta Acoustic, Inc: www.pinta-acoustic.com/link.

6. USG: www.usg.com.

7. Substitutions: See Section 01600 - Materials and Equipment

B. Acoustical Units - General: ASTM E 1264, Class A.

C. Acoustical Panels Type ACT-1: Painted mineral fiber, ASTM E 1264 Type III, or Type IV with the following characteristics:

1. VOC Content: Certified as Low Emission by one of the following :
   a. GreenGuard Children and Schools; www.greenguard.org.
   b. Product listing in the CHPS Low-Emitting Materials Product List at; www.chps.net/manual/lem_table.htm.

2. Size: 24 x 48 inches (600 x 1200 mm).

3. Thickness: 3/4 inches (19 mm).

4. Composition: Wet felted.

5. Density: 12 lb/cu ft (5.5 kg/cu cm).

6. Light Reflectance: 90 percent, determined as specified in ASTM E 1264.

7. NRC Range: 70 to 80, determined as specified in ASTM E 1264.

8. Ceiling Attenuation Class (CAC): 35, determined as specified in ASTM E 1264.

9. Edge: Reveal edge (Tegular).

10. Surface Color: White.

11. Surface Pattern: Fine Texture.

12. Product: Ultima 1914HRC by Armstrong.

D. Acoustical Panels Type ACT-2: Scrubbable face for Kitchen Use faced mineral fiber, ASTM E 1264 Type IV, with the following characteristics:

1. VOC Content: Certified as Low Emission by one of the following :
   a. GreenGuard Children and Schools; www.greenguard.org.
   b. Product listing in the CHPS Low-Emitting Materials Product List at; www.chps.net/manual/lem_table.htm.

2. Size: 12 x 24 inches (300 x 600 mm).

3. Light Reflectance: 85 percent, determined as specified in ASTM E 1264.

4. NRC Range: 70 to 80, determined as specified in ASTM E 1264.

5. Ceiling Attenuation Class (CAC): 35, determined as specified in ASTM E 1264.

6. Edge: Square.

7. Surface Color: White.

8. Surface Pattern: Smooth.

9. Product: Ultima High Washibility 1937 by Armstrong.

10. Suspension System: Exposed grid.

E. Acoustical Panels Type ACT-3: Painted mineral fiber, ASTM E 1264 Type III or Type IV with the following characteristics:.

1. VOC Content: Certified as Low Emission by one of the following :
   a. GreenGuard Children and Schools; www.greenguard.org.
   b. Product listing in the CHPS Low-Emitting Materials Product List at; www.chps.net/manual/lem_table.htm.

2. Size: 24 x 48 inches (600 x 1 200 mm).

3. Light Reflectance: 84 percent, determined as specified in ASTM E 1264.

4. NRC Range: 50 to 70, determined as specified in ASTM E 1264.

5. Ceiling Attenuation Class (CAC): 35, determined as specified in ASTM E 1264.

6. Panel Edge: Angled Tegular.

7. Surface Pattern: Scored Tegular, Medium Testure.

8. Surface Color: White.

9. Suspension System: Exposed grid.

2.2 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Perimeter Moldings: Same material and finish as grid.

1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

2. At window walls with roller Blinds, provide Axiom Building Perimeter system by Armstrong, includeing perimeter pocket sized to blinds, aiwith unslotted perimeter face plate. System color tomatch grid color (white).

C. Acoustical Sealant For Perimeter Moldings: Specified in Section 07900.

D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636/C 636M, ASTM E 580/E 580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where

carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches (150 mm) of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.

1. Use longest practical lengths.

2. Overlap and rivet corners.

3.3 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:

1. Make field cut edges of same profile as factory edges.

2. Double cut and field paint exposed reveal edges.

G. Where round obstructions occur, provide preformed closures to match perimeter molding.

H. Install hold-down clips on panels within 20 ft (6 m) of an exterior door.

I. Install plastic lay-in panels at following minimum distance from conventional light sources:

1. Halogen, 60 W: 14 inches (355 mm) minimum.

2. Incandescent, 120 Watt: 15 inches (380 mm) minimum.

3. Quartz Halogen, 500 Watt: 23 inches (584 mm) minimum.

3.4 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 09511

SECTION 09625 - RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fluid-applied polyurethane flooring over rubberized base mat.

B. Painted game lines.

C. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03300 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

C. Section 09650 - Resilient Flooring.

1.3 REFERENCE STANDARDS

A. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2006a.

B. ASTM D 2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2005.

C. ASTM F 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2008.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

C. Shop Drawings: Fabrication and installation details, and layout, colors, and widths of game lines and equipment locations.

D. LEED Submittal: Documentation of recycled content and location of manufacture.

E. Selection Samples: Manufacturer's color charts for flooring materials specified and game line

paints, indicating full range of colors and textures available.

F. Verification Samples: Actual flooring material specified, not less than 12 in (300 mm) square, mounted on solid backing.

1. Include samples of game lines, illustrating colors selected.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer certified in writing by the flooring manufacturer to be qualified for installation of specified flooring system.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.

B. Store materials in dry and clean location until needed for installation. During installation, handle in a manner that will prevent marring and soiling of finished surfaces.

1.7 FIELD CONDITIONS

A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70-95 degrees F (21-35 degrees C) for not less than 48 hours before the beginning of installation and for not less than 48 hours after installation has been completed. Subsequently, do not allow temperature in installed spaces to drop below 50 degrees F (10 degrees C) or to go above 100 degrees F (38 degrees C).

PART 2 PRODUCTS

2.1 FLUID-APPLIED ATHLETIC FLOORING

A. Manufacturers: All products by the same manufacturer.

1. Robbins Sports Surfaces; Pulastic FA 7+3: www.robbinsfloor.com.

2. Substitutions: Not Permitted.

B. Polyurethane Flooring Over Rubberized Base Mat:

1. Total System Thickness: Minimum 3/8 in (10 mm); with minimum.15 in (3 mm) polyurethane.

2. Base Mat: Prefabricated rubber mat of recycled rubber granules in polyurethane binder.

3. Sealer: Manufacturer's standard two-component polyurethane compound designed to seal base mat before application of resin topcoat.

4. Resin: Two-component, solid, pigmented, self-leveling polyurethane without fillers, zero mercury formulation, with properties as follows:
   a. Tensile strength: Minimum 1000 psi (6.9 MPa), per ASTM D 412.
   b. Hardness: Minimum 70, when tested in accordance with ASTM D 2240 using Type A durometer.
   c. Ultimate Elongation: Minimum 100 percent, per ASTM D 412.

5. Finish: Manufacturer's standard pigmented two-component polyurethane topcoat, matte finish, in color as selected from manufacturer's standards.

C. Game Lines: Manufacturer's standard pigmented polyurethane paint. Colors: As selected by ARCHITECT.

2.2 ACCESSORIES

A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.

B. Adhesive: Water-resistant type recommended by flooring manufacturer for project conditions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates for conditions detrimental to installation of athletic flooring. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of athletic flooring to substrate.

C. Verify that concrete sub-floor surfaces are dry enough and ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.2 PREPARATION

A. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius (1/1000).

B. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

C. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.3 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Comply with manufacturer's recommendations and approved shop drawings.

C. Fluid-Applied Polyurethane Flooring Over Base Mat:

1. Mix components in strict accordance with manufacturer's written instructions, and apply at manufacturer's recommended rates. Allow sufficient curing time between coatings.

2. Unroll base mat and allow to relax before beginning installation.

3. Apply adhesive to substrate with notched trowel, and roll base mat into fresh adhesive. Do not allow compression fit at any seams. Roll mat with weighted linoleum roller immediately upon application of base mat and again after 45 minutes to insure that base mat is firmly adhered to substrate.

4. Thoroughly mix and apply seal coat to surface of base mat with steel trowel.

5. Apply resin wear layer in number of lifts recommended by manufacturer, applying wet-into-wet to achieve a seamless surface. Sand any imperfections in surface after wear layer has cured.

6. Thoroughly mix and apply finish coat with airless sprayer to achieve uniform appearance.

7. Lay out game lines using tape and taping machine approved by flooring manufacturer. Apply game line paint with roller, and allow to dry before removing tape.

3.4 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.5 PROTECTION

A. Protect finished athletic flooring from construction traffic to insure that it is without damage upon completion of the work.

END OF SECTION 09625

SECTION 09650 - RESILIENT FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.2 RELATED REQUIREMENTS

A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03300 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

1.3 REFERENCE STANDARDS

A. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2009a.

B. ASTM F 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2008.

C. ASTM F 1861 - Standard Specification for Resilient Wall Base; 2008.

D. ASTM F 2195 - Standard Specification for Linoleum Floor Tile; 2007.

E. BAAQMD 8-51 - Bay Area Air Quality Management District Regulation 8, Rule 51, Adhesive and Sealant Products; www.baaqmd.gov; 2002.

F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 2006.

G. RFCI - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute; 1998.

H. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plan.

D. Selection Samples: Submit manufacturer's complete set of color samples for ARCHITECT's initial selection.

E. Verification Samples: Submit two samples, 12 x12 inch (305x305 mm) in size illustrating color and pattern for each resilient flooring product specified.

F. Concrete Testing Standard: Submit a copy of ASTM F 710.

G. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.

H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

I. LEED Report: Report recycled content and VOC emission of flooring; VOC content of adhesives.

1. For linoleum flooring, report rapidly-renewable content and urea-formaldehyde content.

J. Maintenance Materials: Furnish the following for City and Borough of Juneau & Juneau School District's use in maintenance of project.

1. See Section 01600 - Product Requirements, for additional provisions.

2. Extra Flooring Material: 50 square feet of each type and color.

3. Extra Wall Base: 20 linear feet of each type and color.

K. LEED Submittal: Documentation of recycled content and location of manufacture.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect roll materials from damage by storing on end.

1.6 FIELD CONDITIONS

A. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

PART 2 PRODUCTS

2.1 TILE FLOORING

A. Linoleum Tile: Homogeneous wear layer bonded to backing, with color and pattern through wear layer thickness:

1. Minimum Requirements: Comply with ASTM F 2195, Type corresponding to type specified.

2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.

3. VOC Content: As specified in Section 01616.

4. Backing: Synthetic fabric.

5. Wear Layer Thickness: 0.098 inch (2.5 mm), minimum, excluding backing.

6. Pattern: Solid color.

7. Color: As selected by architect from manufacturers full range.

8. Manufacturers:
   a. Forbo Linoleum, Inc: www.forbo-industries.com.
   b. Tarkett Inc: www.tarkett.com.
   c. Substitutions: See Section 01600 - Materials and Equipment

B. Feature Strips: Of same material as tile, widths as indicated on teh drawings..

2.2 RESILIENT BASE

A. Resilient Base: ASTM F 1861, Type TP, rubber, thermoplastic; top set Style B, Cove, and as follows:

1. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.

2. Height: 4 inch (100 mm).

3. Thickness: 0.125 inch (3.2 mm) thick.

4. Finish: Satin.

5. Length: Roll.

6. Color: Color as selected from manufacturer's standards.

7. Accessories: Premolded external corners and end stops.

8. Manufacturers:
   a. Burke Flooring: www.burkemercer.com.
   b. Johnsonite, Inc: www.johnsonite.com.
   c. Roppe Corp: www.roppe.com.
   d. Substitutions: See Section 01600 - Materials and Equipment

2.3 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.

1. Provide only products having lower volatile organic compound (VOC) content than required by the more stringent of the South Coast Air Quality Management District Rule No.1168 and the Bay Area Air Quality Management District Regulation 8, Rule 51.

C. Moldings, Transition and Edge Strips: as detailed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Verify that concrete sub-floor surfaces are dry enough and ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings.

B. Prepare sub-floor surfaces as recommended by flooring and adhesive manufacturers.

C. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

D. Prohibit traffic until filler is cured.

E. Clean substrate.

F. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.3 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

1. Metal Strips: Attach to substrate before installation of flooring using stainless steel screws.

2. Resilient Strips: Attach to substrate using adhesive.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

I. Install feature strips where indicated.

3.4 TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless manufacturer's instructions say otherwise.

3.5 RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units. Heat-crimped corners permitted only with approval of sample by Architect and Owner.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.6 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's instructions.

3.7 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

3.8 SCHEDULE

A. Color Identification; All Linoleum tile product to be provided by Owner and installed by Contractor. Accessories to be provided by contractor:

1. LINT-1: Color 1
2. LINT-2: Color 2
3. LINT-3: Color 3

END OF SECTION 09650

SECTION 09680 - CARPET

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Carpet with bonded backing, direct-glued.

B. Removal of existing carpet.

C. Accessories.

D. **Special note: Carpet will be procured by Owner and provided for the Contractor to install. Specification provided to afford basis of installation. Selection criteria submittals for carpet will not be required, however accessory materials submittals will be required.**

1.2 RELATED REQUIREMENTS

A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 01732 - Waste Management: Reclamation/Recycling of new carpet scrap, new cushion scrap, removed carpet, and removed carpet cushion.

C. Section 03300 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied carpet.

D. Section 09650 - Resilient Flooing: Termination edging of adjacent floor finish.

E. Section 09650 - Resilient Flooing: Rubber Base

1.3 REFERENCE STANDARDS

A. ASTM D 2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2006.

B. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2009a.

C. ASTM F 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2008.

D. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.

E. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug

Institute; Current Edition.

F. CRI (GLP) - Green Label Plus Carpet Testing Program - Approved Products; Carpet and Rug Institute; Current Edition.

G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 2006.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate seaming plan, method of joining seams, direction of carpet pile and pattern, location of edge moldings and edge bindings.

C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

D. Samples: Submit two samples 24x24inch (616x616mm) in size illustrating color and pattern for each carpet and cushion material specified.

F. LEED Report: Submit data documenting VOC content of carpet, cushion, and adhesives; copy of current CRI Approved Products Listing is acceptable. Submit data identifying pre-consumer and post-consumer recycled content.

G. Manufacturer's Installation Instructions: Indicate special procedures.

H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

I. Warrantee: provide 25 year non-prorated limited warranty against excessive wear, static, delamination, edge ravel, zippering, and backing resiliency loss.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet with minimum three years experience.

1.6 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain minimum 70 degrees F (21 degrees C) ambient temperature 24 hours prior to, during and 24 hours after installation.

C. Ventilate installation area during installation and for 72 hours after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Carpet:

1. Interface, Inc: www.interfaceinc.com.

2. Shaw Floors: www.shawfloors.com.

3. C&A/Tandus Company: www.tandus.com

4. Substitutions: See Section 01600 - Materials and Equipment

2.2 CARPET

A. Walk-off Carpet (WOM): Walk-off/Clean-off system carpet:

1. Basis of Design Product: Abrasive Action manufactured by C&A.

2. Roll Width: 6 ft (1830 mm).

3. Color: Charcoal.

4. Backing: Monolithic, PVC backing.

5. Substitutions: See Section 01600 - Product Requirements.

B. Carpet (CPT): Tufted and bonded-back nylon, conforming to the following criteria:

1. Basis of Design Product: High Performance Powerbond Ethos Cushion backed broadloom nylon carpet manufactured by C&A.

2. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E 648 or NFPA 253.

3. Surface Flammability Ignition: Pass ASTM D 2859 (the "pill test").

4. VOC Content: Provide CRI Green Label Plus certified product; in lieu of labeling, independent test report showing compliance is acceptable.

5. Color: “Outside The Lines”

6. Pattern: Crayon.

7. Roll Width: 6 ft (1830 mm)

8. Max. Electrostatic Charge: 3 Kv. @ 20 percent R.H..

9. Rows: 13 per inch (5 per cm).

11. Gage: 1/13.

12. Stitches: 8.2 per inch (3.2 per cm).

14. Pile Weight: 18 oz/sq yd

15. Yarn Size and Type: 6.6dpf Nylon

2.3 ACCESSORIES

A. Sub-Floor Filler: Type recommended by carpet manufacturer.

B. Tackless Strip: Carpet gripper, of type recommended by carpet manufacturer to suit application, with attachment devices.

C. Adhesives - General: Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.

E. Seam Adhesive: Recommended by manufacturer.

F. Contact Adhesive: Compatible with carpet material; releasable type.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive carpet.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesives to sub floor surfaces.

D. Verify that concrete sub-floor surfaces are dry enough and ready for adhesive installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions if test results are not within limits recommended by carpet manufacturer and adhesive materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Remove existing carpet and carpet cushion.

B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

D. Clean substrate.

3.3 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet and cushion in accordance with manufacturer's instructions and CRI Carpet Installation Standard.

C. Verify carpet match before cutting to ensure minimal variation between dye lots.

D. Lay out carpet and locate seams in accordance with shop drawings:

1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.

2. Do not locate seams perpendicular through door openings.

3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.

4. Locate change of color or pattern between rooms under door centerline.

5. Provide monolithic color, pattern, and texture match within any one area.

E. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

3.4 DIRECT-GLUED CARPET

A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.

B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.

C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.

D. Roll with appropriate roller for complete contact of adhesive to carpet backing.

E. Trim carpet neatly at walls and around interruptions.

3.5 CLEANING

A. Remove excess adhesive from floor and wall surfaces without damage.

B. Clean and vacuum carpet surfaces.

3.6 Special condition: Carpet will be provided by Owner for installation by Contractor. all accessories and glues will be provided by contractor.

END OF SECTION 09680

SECTION 09841 - FABRIC WALL PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes burlap covered wall panels.

B. Related Sections include the following:

1. Division 6 Section “Rough Carpentry”.

2. Division 9 Section “Paints and Coatings” for finishing of panels

1.3 SUBMITTALS

A. Product Data: For each type of panel edge, core material, and mounting indicated.

B. Shop Drawings: For wall panels. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Include elevations showing panel sizes. Indicate panel edge and core materials. Coordinate with details provided.

C. Coordination Drawings: Show intersections with wall base, chair rails, electrical outlets and switches, lighting fixtures, electrical panels, fire extinguisher cabinets and other adjacent work.

D. Samples for Verification: For the following products. Prepare Samples from same material to be used for the Work.

1. Fabric: Full-width by 36-inch- long Sample from dye lot to be used for the Work, and as follows:
   a. With specified treatments applied.

2. Mounting Device: Full-size Sample.

E. LEED Submittal:

1. Product Data for Credit EQ 4.1: For installation adhesive, including printed statement of VOC content.

2. Product Data for Credit MR 4.1 and 4.2: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
   a. Include statement indicating costs for each product having recycled content.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of acoustical wall panel.

G. Maintenance Data: For acoustical wall panels to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain wall panels through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide wall panels with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Spread Index: 25 or less.

2. Smoke-Developed Index: 450 or less.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials, fabrication, and installation.

1. Install mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
   a. Include intersection at wall and ceiling corner and door opening.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with wall panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

C. Protect panel edges from crushing and impact.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install wall panels until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Verify locations of wall panels by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Panels: For each panels type provide full size units equal to 2 percent of amount installed, but no fewer than 4.

2. Acoustical Wall Panel Mounting Devices: Full-size units equal to 5 percent of amount installed, but no fewer than 5 attachment devices.

PART 2 PRODUCTS

2.1 Available Manufacturers: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

A. Homasote Company

2.2 MATERIALS

A. Burlap Panels

1. Manufacturer: Homasote Company

2. Substrate: NCFR(R) fiberboard manufactured from100 percent recycled wood fiber material; physical properties as follows:
   a. Thickness: 1/2 inch (13 mm).
   b. Density: 34-40 pcf (545-640 kg/cubic m).
   c. Water Absorption by volume (2 hour immersion):5 percent maximum.
   d. Expansion, 50 to 90 percent relative humidity: 0.30 percent.
   e. NRC: 0.20.
   f. Flame Spread: <25, per ASTM E 84.
   g. Smoke Developed: 20, per ASTM E 84.
   h. Fuel Contributed: 0.
   i. Classification: Class A, per NFPA.

3. Fabric: Burlap: Natural colored tight-weave fabric, chemically treated to resist fire.

2.3 FABRICATION

A. Fabric Facing: Stretched straight, on the grain, tight, square, and free from puckers, ripples,

wrinkles, sags, blisters, seams, adhesive, or other foreign matter. Wrap fabric around long edges of panel to back side. Laminate to substrate.

B. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:

1. Thickness.

2. Edge straightness.

3. Overall length and width.

4. Squareness from corner to corner.

C. Moldings: Clear finished wood (maple), as detailed for top and bottom unwrapped edges, and cut penetrations for devices which are not self-trimming. Vertical wrapped edges are to be butted together.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine fabric, substrates, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of acoustical wall panels.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Follow manufacturer's instructions for allowing panels to be exposed to environmental temperature and humidity conditions for not less than 24 hours before start of installation.

B. Install wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

C. Comply with wall panel manufacturer's written instructions for installation of panels using type of concealed mounting accessories indicated or, if not indicated, as recommended by manufacturer. Anchor panels securely to supporting substrate.

D. Follow manufacturer's instruction for installation using adhesive. Panels shall be adhered tight and flat to substrate wall, with no evidence of bowing or movement post installation.

E. Follow Manufacturer's instructions for cutting panels.

F. Installation Tolerances: As follows:

1. Variation from Level and Plumb: Plus or minus 1/16 inch.

2. Variation of Panel Joints from Hairline: Not more than 1/16 inch wide.

3.3 CLEANING

3.4 Retain only applicable paragraphs below.

A. Clip loose threads; remove pills and extraneous materials.

B. Clean panels, to remove dust and other foreign materials according to manufacturer's written instructions.

3.5 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that acoustical wall panels are without damage or deterioration at time of Substantial Completion.

B. Replace wall panels that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 09841

SECTION 09850 - ACOUSTICAL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiberglass matt ceiling panels for visually concealed locations.

1.2 RELATED REQUIREMENTS

A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

1.3 REFERENCE STANDARDS

A. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2009a.

B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

C. ASTM E 795 - Standard Practices for Mounting Test Specimens During Sound Absorption Tests; 2005.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed data sheets for products specified.

D. Selection Samples: Manufacturer's color charts panels, acoustic material, indicating full range of fabrics, colors, and patterns available .

E. LEED Submittal: Documentation of recycled content and location of manufacture.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company with not less than 5 years of experience in manufacturing acoustical products similar to those specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect acoustical panels from moisture during shipment, storage, and handling. Deliver in factory-wrapped bundles; do not open bundles until panels are needed for installation.

B. Store panels flat, in dry, well-ventilated space; do not stand panels on end.

C. Protect panel edges from damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acoustical Panels:

1. Armstrong World Industries, Inc: www.armstrong.com.

2. CertainTeed Corporation: www.certainteed.com.

3. Essi Acoustical Products Company: www.essiacoustical.com.

4. USG: www.usg.com.

5. Substitutions: See Section 01600 - Materials and Equipment

B. Provide all acoustical panels by one manufacturer.

2.2 ACOUSTICAL PANELS

A. Mineral Fiber Core Ceiling Panels (installed above Linear Wood Ceiling in Commons 145):

1. Density: 7-10 lb/cu ft (112-160 kg/cu m).

2. Noise Reduction Coefficient (NRC): 0.70-0.80 when tested in accordance with ASTM C 423 for Type A mounting, per ASTM E 795.

3. Panel Width: 40 inches (1016 mm).

4. Panel Length: 60 inches (1525 mm).

5. Panel Thickness: 4”.

6. Corners: Square.

7. Mounting: Through Panel.

8. Finish panel fabric and fastener color: Black

.

2.3 FABRICATION

A. General: Fabricate panels to sizes and configurations indicated.

2.4 ACCESSORIES

A. Through Panel Mounting Accessories: Black coated screw and plate washer at 24" centers at perimeter and field. Panels applied directly to underside of structural metal decking.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates for conditions detrimental to installation of acoustical panels. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Mineral Fiber Core Ceiling Panels to be installed tight to structural decking between structural trusses above interior lineal wood ceilings. Panel installation to extend full length of trusses.

3.3 CLEANING

A. Clean fabric facing upon completion of installation from dust and other foreign materials, following manufacturer's instructions.

B. Remove surplus materials, trimmed portions of panels, and debris resulting from installation.

3.4 PROTECTION

A. Provide protection of installed acoustical panels until completion of the work.

B. Replace panels that cannot be cleaned and repaired to satisfaction of the ARCHITECT.

END OF SECTION 09850

SECTION 09900 - PAINTS AND COATINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, varnishes, and other coatings.

C. Materials for backpriming woodwork.

D. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.

2. Prefabricated steel stairs and steel alternating tread stairs.

3. Exposed surfaces of steel lintels and ledge angles.

4. Prime surfaces to receive wall coverings.

5. Mechanical and Electrical:
   a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.

6. Access Panels (other than stainless steel).

E. Do Not Paint or Finish the Following Items:

1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.

2. Items indicated to receive other finishes.

3. Items indicated to remain unfinished.

4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.

5. Non-metallic roofing and flashing.

6. Stainless steel, anodized aluminum, and bronze items.

7. Floors, unless specifically so indicated (See Stained concrete, this section).

8. Ceramic and other tiles.

9. Glass.

10. Structural and precast concrete, unless specifically so indicated.

11. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

A. Section 01355 - LEED Certification Procedures: LEED rating system definition.

B. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

C. Section 05120 – Structural Steel: Shop-primed items.

D. Section 05500 - Metal Fabrications: Shop-primed items.

E. Section 05510 - Metal Stairs: Shop-primed items.

F. Section 09960 - High-Performance Coatings.

G. Section 13915 - Identification for Fire Suppression Piping and Equipment: Color coding scheme for items to be painted under this section.

H. Division 15 - Mechanical Identification: Painted identification and Color coding scheme for items to be painted under this section.

1.3 DEFINITIONS

A. Conform to ASTM D 16 for interpretation of terms used in this section.

1.4 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D 16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2008.

C. ASTM D 4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and

Wood-Base Materials; 2007.

D. GreenSeal GS-11 - Paints; 1993.

E. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings; Fourth Edition.

F. USGBC LEED-NC - LEED Green Building Rating System for Scools; U.S. Green Building Council; 2009.

1.5 SUBMITTALS

A. See Section 01300 - Contractor Submittals, for submittal procedures.

B. Product Data: Provide data on all finishing products, including VOC content.

C. Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on aluminum sheet, 6x8 inch (152x203 mm) in size.

D. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.

E. Certification: By manufacturer that all paints and coatings do not contain any of the prohibited chemicals specified; GreenSeal GS-11 certification is not required but if provided shall constitute acceptable certification.

F. Schedule of proposed products, applications, and corresponding MPI numbers.

G. LEED Report: VOC content of all interior opaque coatings actually used.

H. Manufacturer's Instructions: Indicate special surface preparation procedures.

I. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

J. Maintenance Materials: Furnish the following for City and Borough of Juneau & Juneau School District's use in maintenance of project.

1. See Section 01600 - Materials and Equipment, for additional provisions.

2. Extra Paint and Coatings: 1 gallon (4 L) of each color; store where directed.

3. Label each container with color in addition to the manufacturer's label.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified,

with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 10 years experience.

C. MPI Standards; www.paintinfo.com/mpi:

1. Products: complying with MPI standards indicated and listed in "MPI Approved Products List".

2. Preperation and workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual"

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 45 degrees F (7 degrees C) for interiors; 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.

E. Minimum Application Temperature for Varnish Finishes: 65 degrees F (18 degrees C) for interior or exterior, unless required otherwise by manufacturer's instructions.

F. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide all paint and coating products from the same manufacturer to the greatest extent possible.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to the following:

1. Benjamin Moore & Co: www.benjaminmoore.com..

2. Duron, Inc: www.duron.com.

3. Glidden Professional: www.gliddenprofessional.com.

4. Benjamin Moore & Co: www.benjaminmoore.com.

5. PPG Architectural Finishes, Inc: www.ppgaf.com.

6. Pratt & Lambert Paints: www.prattandlambert.com.

C. Substitutions: See section 01600 - Materials and Equipment

2.2 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.

1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.

4. Supply each coating material in quantity required to complete entire project's work from a single production run.

5. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Volatile Organic Compound (VOC) Content: Comply with Section 01616.

D. Chemical Content: The following compounds are prohibited:

1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).

2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.

E. Flammability: Comply with applicable code for surface burning characteristics.

F. Colors: To be selected from manufacturer's full range of available colors.

1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to City and Borough of Juneau & Juneau School District.

2. Extend colors to surface edges; colors may change at any edge as directed by ARCHITECT.

3. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.3 CONCRETE STAIN - TRANSLUCENT

A. Acid solution concrete stain: comprised of acid solution, wetting agents and metallic ions to chemically combine with Portland cement to form permanent colors. Provide ready mixed, in no less than 8 colors including reds, greens, blues and browns. Anticipate two color pattern selections for single concrete floor areas identified. Color transitions shall occur at joint lines identified on the floor plans.

1. Coordinate concrete slab finishing, preparation and protection before and after application. Steel trowel finish with field formed control joints.

2. Coordinate protection of slab prior to preparation and after application.

3. Finish with manufacturer recommended acrylic floor sealer.

2.4 PAINT SYSTEMS - EXTERIOR

A. (CLRF) Wood, Transparent, varnish, No Stain:

1. Fire retardant treatment.

2. Clear Gloss: Two coats of varnish.

B. Concrete, Opaque, Latex, 3 Coat:

1. One coat of block filler.

2. Semi-gloss: Two coats of latex enamel.

C. Ferrous Metals, Primed or painted, Latex, 2 Coat:

1. Sand entire surface and Touch-up with rust-inhibitive primer recommended by top coat manufacturer.

2. Gloss: Two coats of latex enamel; .

D. Galvanized Metals, Alkyd, 3 Coat:

1. One coat galvanize primer.

2. Gloss: Two coats of alkyd enamel .

2.5 PAINT AND STAIN SYSTEMS - INTERIOR

A. Wood, Opaque, Latex, 3 Coat:

1. One coat of latex primer sealer.

2. Semi-gloss: Two coats of latex enamel.

B. (CLRF) Wood, Transparent, Lacquer, No Stain:

1. One coat lacquer sanding sealer.

2. Satin: Two coats of lacquer

C. Concrete walls and ceilings, Opaque, Latex, 3 Coat:

1. One coat of block filler.

2. Semi-gloss: Two coats of latex enamel.

D. Ferrous Metals, Unprimed, Latex, 3 Coat:

1. One coat of latex primer.

2. Gloss: Two coats of latex enamel.

E. Galvanized Metals, Alkyd, 3 Coat:

1. One coat galvanize primer.

2. Gloss: Two coats of alkyd enamel.

F. Gypsum Board walls and ceilings, Latex, 3 Coat:

1. One coat of alkyd primer sealer.

2. Eggshell: Two coats of latex enamel.

G. Gypsum Board above ceilings and at utility spaces, Alkyd Primer, 1 Coat:

1. One coat of alkyd primer sealer.

H. Stained Concrete Floors, Transparent, acid-based chemical, 2-coat, polished:

1. Preparation includes sanding floor.

2. Hand-application and neutralization of chemical stain.

2. Polish and Sealer: Two coats acrylic, UV stable sealer.

2.6 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of coatings until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Gypsum Wallboard: 12 percent.

2. Concrete: 12 percent.

3. Interior Wood: 10 percent, measured in accordance with ASTM D 4442.

4. Exterior Wood: 10 percent, measured in accordance with ASTM D 4442.

5. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete Surfaces to be Painted: Remove dirt, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

H. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

I. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-PC 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).

J. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

L. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

M. Exterior Wood to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior calking compound after sealer has been applied. Prime concealed surfaces.

N. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

O. Concrete floor slabs to be chemically stained: Remove all grease and oils, paint droppings, taping compounds, caulks, sealants and other surface contaminants. Do not grind such that grinding marks are visible to translate through stained surface. A diamond pad with a light touch is recommended. To open up concrete surface for stain penetration, buff floor with #80 or #100 grit paper or screen mesh. Carefully wash surface after buffing with water and non-acidic detergent. Surface must be clean and dry, and free of streak-marks, footprints and residues prior to application of stain.

3.3 APPLICATION – PAINTS AND CLEAR FINISHES

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Exterior Wood to Receive Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer or sealer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's instructions.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

G. Sand wood and metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

A. See Section 01400 - Quality Control, for general requirements for field inspection.

3.5 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION

A. Protect finished coatings until completion of project.

B. Touch-up damaged coatings after Substantial Completion.

3.7 SCHEDULE – COLORS

A. Architect will coordinate room wall and soffit accent color schedule during the submittal process utilizing no more than 6 different colors. Anticipates all classrooms and administrative areas one color of white. Commons space as unique color, hallway niches and vestibules as unique accent colors.

B. Architect will select two colors Stained Concrete slab color from manufacturers full range of color.

END OF SECTION 09900

SECTION 09960 - HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. High performance coatings.

B. Special preparation of surfaces.

1.2 RELATED REQUIREMENTS

A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 09900 - Paints and Coatings.

1.3 REFERENCE STANDARDS

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

B. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

C. SSPC-SP 3 - Power Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

D. SSPC-SP 6 - Commercial Blast Cleaning; Society for Protective Coatings; 2006.

E. SSPC-SP 7 - Brush-Off Blast Cleaning; Society for Protective Coatings; 2006.

1.4 PERFORMANCE REQUIREMENTS

A. Provide coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:

1. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/24, maximum, when tested in accordance with ASTM E 84.

2. Abrasion resistance: 130 mg loss, when tested in accordance with ASTM D 4060, CS-17 wheels, 1000g load, 1000 cycles..

3. Impact resistance: >100 in-lbs, when tested in accordance with ASTM D 2794.

4. Hardness: B, when tested in accordance with ASTM D 3366.

5. Water resistance: No blistering and 90% gloss retention, when tested in accordance with ASTM D 4585, 1000 hours.

6. Lead content: None.

7. Scrubbability: Excellent, when tested in accordance with ASTM D 6142, Federal Standard 141C, 10,000 cycles.

B. Moderate Exposure: All minimum criteria, plus:

1. Solvent resistance: Verry Good, when tested in accordance with ASTM D 24 Hour Spot test.

1.5 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating coating materials.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include cleaning procedures and repair and patching techniques.

1.6 QUALITY ASSURANCE

A. Maintain one copy of each referenced document that applies to application on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.7 FIELD CONDITIONS

A. Do not install materials when temperature is below 55 degrees F (13 degrees C) or above 90 degrees F (32 degrees C).

B. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

C. Restrict traffic from area where coating is being applied or is curing.

D. Ensure all fresh concrete has cured no less than 28 days, or as recommended by finish manufacturer.

1.8 WARRANTY

A. See Section 01780 - Construction Closeout , for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.1 MATERIALS

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.

1. Lead content: Not greater than 0.06 percent by weight of total nonvolatile content.

2. Chromium content, as hexavalent chromium, zinc chromate, or strontium chromate: None.

3. Maximum volatile organic compound (VOC) content: 275 g/l.

4. Colors: Selected from manufacturer's standard colors.

B. Epoxy Floor Coating: Two coats, polyamide epoxy, non-skid finish.

1. Product characteristics:
   a. Percentage of solids by volume: 37%, minimum.
   b. Dry film thickness, per coat: 2.0 mils, minimum.
   c. Comply with the performance requirements specified above for moderate exposure.

2. Products meeting design requirements:
   a. Columbia Paint & Coatings: Industrial Heavy Duty Waterbase Epoxy, 05-930, with manufacturer recommended anti-slip aggregate.
   b. Benjamin Moore & Co.; Industrial Maintenance Coatings; Waterborne Polyamide Epoxy Gloss Coating, M42, with manufacturer recommended anti-slip aggregate.
   c. ICI Paints; Devoe Coatings, Tru-Glaze WB Epoxy, semi-gloss 4426 with manufacturer recommended anti-slip aggregate.
   d. PPG Architectural Finishes, Inc.; Aquapon, Water Base Epoxy, 98-1 Series with manufacturer recommended anti-slip aggregate.

3. Substitution of manufacturers with products meeting all performance criteria, as approved by Owner.

C. Primers: As recommended by coating manufacturer for specific substrate, unless otherwise specified.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

C. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 16 percent, or as approved for warrantee by manufacturer.

3.2 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.

C. Remove finish hardware, fixture covers, and accessories and store.

D. Existing Painted and Sealed Surfaces:

1. Strip existing paint and coatings from surface.

2. Clean with mixture of trisodium phosphate and water to remove surface grease and foreign matter.

E. Ferrous Metal:

1. Solvent clean.

2. Remove loose rust, loose mill scale, and other foreign substances using power tools according to SSPC-SP 3.

F. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.3 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

B. Concrete: Prior to priming, patch with masonry filler to produce smooth surface.

3.4 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's instructions, to thicknesses specified.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.5 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.6 PROTECTION

A. Protect finished work from damage.

3.7 SCHEDULE

A. Concrete Floors in Boiler Room, Janitorial Rooms: Opaque epoxy floor coating, non-skid finish.

END OF SECTION 09960

SECTION 10100 - VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Markerboards and Tackboards.

B. 2-panel Sliding Markerboard Assembly

1.2 RELATED REQUIREMENTS

A. Section 06100 - Rough Carpentry: Blocking and supports.

B. Section 06200 - Finish Carpentry: Wood frame.

C. Section 09111 - Non-Loadbearing Metal Framing: Concealed supports in metal stud walls.

D. Section 09900 - Paints and Coatings: Finishing of wood frame.

1.3 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard; 2004.

B. ASTM A 424 - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2009a.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on markerboard, tackboard, trim, and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.

D. Samples: Submit color charts for selection of color and texture of chalkboard, markerboard, tackboard, tackboard surface covering, and trim.

E. LEED Submittal: Documentation of recycled content and location of manufacture.

F. Samples: Submit two samples 2 by 2 inch (50 by 50 mm) in size illustrating materials and finish, color and texture of markerboard, tackboard, tackboard surfacing, and trim.

1.5 QUALITY ASSURANCE

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

1.6 WARRANTY

A. See Section 01780 - Contract Closeout, for additional warranty requirements.

B. Provide five year warranty for chalkboard and markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Visual Display Boards:

1. MooreCo, Inc\Best-Rite: www.moorecoinc.com.

2. Claridge Products and Equipment, Inc: www.claridgeproducts.com.

3. Polyvision Corporation (Nelson Adams); Product e3 Environmental Ceramic Steel: www.polyvision.com.

4. Substitutions: See Section 01600 - Materials and Equipment

5. Substitutions: See Section 01600 - Product Requirements.

2.2 VISUAL DISPLAY BOARDS

A. Fixed Markerboards: Porcelain enamel on steel, laminated to core.

1. Metal Face Sheet Thickness: 0.024 inch, 24 gage (0.61 mm).

2. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.

3. Backing: Aluminum foil, laminated to core.

4. Size: As indicated on drawings.

5. Length: As indicated on drawings.

6. Frame: Extruded aluminum, with concealed fasteners.

7. Frame Finish: Anodized, natural.

8. Accessories: Provide chalk tray, tack-strip map rail, and flag holder (x2).

9. Use one of the following or any equivalent made by one of the listed manufacturers: Polyvision e3 Environmental Ceramic Steel - 110 Series with top tack strip map rail and bottom marker tray..

B. Sliding Marker Board Assembly: Two marker boards mounted parallel in silding track and frame assembly with open back to be installed over bult-in shelving assembly.

1. Markerboards to match those specified herein. Two per assembly, 48" tall x 72" long each.

2. Frame: Aluminum extrusion, with track assembly for two panelsfinish to match marker board frame, with marker tray.

3. Use one of the following or any equivalent made by one of the listed manufacturers: Polyvision e3 Environmental Ceramic Steel - H Series Angle Mount with top cork tack strip/map rail and bottom marker tray. No fixed back panel.

2.3 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A 424, Type I, Commercial Steel, with fired-on vitreous finish.

1. No less thatn 75% recycled content in steel components.

B. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.

C. Foil Backing: Aluminum foil sheet, 0.005 inch (0.13 mm) thick.

D. Adhesives: Type used by manufacturer.

2.4 ACCESSORIES

A. Map Rail: Extruded aluminum, manufacturer's standard profile, with 1/4" thick cork insert and runners for accessories; 1 inch (25 mm) wide overall, full width of frame.

B. Map Supports: Formed aluminum sliding hooks and roller brackets to fit map rail.

C. Temporary Protective Cover: Sheet polyethylene, 8 mil (0.2 mm) thick.

D. Flag Holders: Cast aluminum bored to receive 1 inch (25 mm) diameter flag staff, bracketed to fit top rail of board. Provide two per board, unless otherwise noted.

E. Cleaning Instruction Plate: Provide instructions for chalkboard cleaning on a metal plate fastened to perimeter frame near tack rail.

F. Marker/Eraser Tray: Aluminum, manufacturer's standard profile one piece full length of chalkboard, molded ends; concealed fasteners, same finish as frame.

G. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

C. Verify flat wall surface for frameless adhesive-applied boards.

3.2 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Secure units level and plumb.

3.3 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

B. Cover with protective cover, taped to frame.

C. Remove temporary protective cover at date of Substantial Completion.

3.4 SCHEDULE : See drawing notes.

END OF SECTION 10100

SECTION 10121 - TACKABLE WALL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Site fabricated tackable wall covering

B. Accessories as required for complete installation.

1.2 RELATED REQUIREMENTS

A. Section 10100 - Visual Display Boards: Prefabricated markerboards.

1.3 REFERENCE STANDARDS

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.
4. Specimen warranty.
5. LEED documentation.

C. Test Reports: Certified test data from an independent test agency verifying that wall systems meet specified requirements for fire performance.

D. Shop Drawings: Elevations indicating proposed locations of fabric seams and details indicating typical transitions to other finish surfaces.

E. Selection Samples: Fabric swatches representing manufacturer's full range of available colors, textures, and patterns.

F. Verification Samples:

1. For each fabric specified, minimum size 8 inches (200 mm) square, representing actual product in color, texture, and pattern.

2. Actual samples of all track profiles to be employed, including transitions between dissimilar profiles.

3. Tackable core backing material, minimum 12 inches (300 mm) square.

G. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in City and Borough of Juneau & Juneau School District's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide all components of tackable wall systems by a single manufacturer, including recommended primers, adhesives, and sealants.

B. Installer Qualifications: Firm specializing in site-fabricated wall systems, with not less than 5 years of documented experience in installing wall systems of the type specified, and approved by the manufacturer.

C. Surface Burning Characteristics: Provide system with flame spread index of 25, maximum, and smoke developed index of 40, maximum, when tested in accordance with ASTM E 84.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect fabric, core, and track from excessive moisture in shipment, storage, and handling. Do not deliver materials to project until wet work such as concrete and plaster has been completed.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 FIELD CONDITIONS

A. Do not begin installation until interior conditions have reached temperature and humidity that will be maintained during occupancy. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 5-year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Tackable Wall Systems:

1. Forbo: www.forbo.com.

2. Pollyvision: www.polyvision.com.

3. Walltalkers: www.walltalkers.com.

4. Substitutions: See Section 01600 - Materials and Equipment

2.2 DESIGN REQUIREMENTS

A. Provide materials and systems made of recycled content, at least 50 percent post-consumer or post-industrial, and/or products with greater than 60 percent qualifying as Rapidly Renewable materials.

B. Verify that all adhesives and sealants employed in installation of tackable wall systems are low-emission types, with low VOC ratings.

2.3 MATERIALS

A. Frame: hardwood, species maple, milled as per details and notes with clear finish.

1. Profile: As indicated, 2 inch (50 mm) overall height, 3/4" thick with rabbet edge.

2. Intermediate Joints: Butt joints square.

3. Color: natural, clear finished.

B. Tackable Wall Covering, Classroom Tack Surface (WCV): Reinforced cork or linoleum cork sheet, no less than 48" wide rolls, and no less than 3/8" thick. fine grain texture.

C. Basis of Design: Walltalkers, a division of RFJ International Co., "Tac-wall". www.walltalkers.com.

D. Colors: as selected by Architect from manufacturers full range of colors.

E. Fasteners and Adhesives: As recommended by manufacturer of tackable wall system for project

conditions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify that all casework, marker boards, door and window jambs, finished ceiling, and other finished items abutting tackable wall systems have been installed.

C. If substrate preparation is the responsibility of another installer, notify ARCHITECT of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove wall plates and other obstacles, and prepare substrates to receive core material in accordance with manufacturer's instructions.

3.3 INSTALLATION

A. Install tackable wall systems at locations indicated, complying with manufacturer's instructions.

3.4 CLEANING

A. Clean exposed surfaces of tackable wall system, complying with manufacturer's instructions for cleaning and repair of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 PROTECTION

A. Protect installed products until completion of project, using methods that will ensure that the finished work will be without damage or deterioration at Date of Substantial Completion.

END OF SECTION 10121

SECTION 10170 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Solid plastic toilet compartments.

B. Urinal screens.

1.2 RELATED REQUIREMENTS

A. Section 05500 - Metal Fabrications: Concealed steel support members.

B. Section 06100 - Rough Carpentry: Blocking and supports.

C. Section 10800 - Toilet, Bath, and Laundry Accessories.

1.3 REFERENCE STANDARDS

A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.5 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

C. Product Data: Provide data on panel construction, hardware, and accessories.

D. Samples: Submit two samples of partition panels, 6x6 inch (300x300 mm) in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. LEED documentation supporting material recycled content.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Plastic Toilet Compartments:

1. Yemm & Hart "Green Partitions": www.yemmhart.com

2. Bradley: www.bradleycorp.com.

3. Accurate: www.accuratepartitions.com.

4. Substitutions: Section 01600 - Materials and Equipment

2.2 COMPONENTS

A. Toilet Compartments: Solid molded HDPE plastic panels, doors, and pilasters, floor-mounted headrail-braced.

1. Color: Two colors as selected.

2. Recycled HDPE content: no less than 50%.

B. Door and Panel Dimensions:

1. Thickness: 1 inch (25 mm).

2. Door Width: 24 inch (610 mm).

3. Door Width for Handicapped Use: 36 inch (915 mm).

4. Height: 58 inch (1 473 mm).

5. Thickness of Pilasters: 1 inch (25 mm).

C. Urinal Screens: Wall mounted with continuous panel brackets, and floor-to-ceiling vertical upright consisting of pilaster anchored to floor and ceiling.

2.3 ACCESSORIES

A. Pilaster Shoes: Formed ASTM A 666, Type 304 stainless steel with No. 4 finish, 3 in (75 mm) high, concealing floor fastenings.

1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

B. Head Rails: Hollow anodized aluminum tube, 1 x 1-5/8 inch (25 x 41 mm) size, with anti-grip strips and cast socket wall brackets.

C. Pilaster Brackets: Polished stainless steel.

D. Wall Brackets: Continuous type, satin stainless steel.

E. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.

1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.

F. Hardware: Satin stainless steel:

1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.

2. Nylon bearings.

3. Door Latch: Slide type with exterior emergency access feature.

4. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.

5. Coat hook with rubber bumper; one per compartment, mounted on door.

6. Provide door pull for outswinging doors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch (9 to 13 mm) space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch (6 mm).

B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.4 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION 10170

SECTION 10350 – FLAGPOLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes a ground-set flagpole made from aluminum.

B. Related Sections include the following:

1. Section 03300 - Cast-in-Place Concrete for flagpole footing.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide flagpole assemblies, including anchorages and supports, capable of withstanding the effects of wind loads, determined according to NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles.

1. Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.
2. Basic Wind Speed: 3-second gust speed at 33 feet above ground.
3. Performance: 100 mph wind while flagged, 125 mph while unflagged.

1.4 SUBMITTALS

A. Product Data: For each type of flagpole required.

B. Shop Drawings: Include elevations and details showing general arrangement, jointing, fittings and accessories, grounding, and anchoring and supporting systems.

1. Include details of foundation system for ground-set flagpoles.

C. Structural Calculations: For flagpoles indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain all flagpoles as a complete unit, including fittings, accessories, bases, and anchorage devices, from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General: Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

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. American Flagpole; a Kearney-National Inc. Company.
2. Baartol Company Inc. (The)
3. Concord Industries, Inc.
4. Pole-Tech Company Inc.

2.2 FLAGPOLES

A. Flagpole Construction: Construct flagpoles in one piece.

B. Exposed Height: 30 feet

C. Aluminum Flagpoles: Provide cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241, Alloy 6063, with a minimum wall thickness of 3/16 inch. Heat treat after fabrication to comply with ASTM B 597, Temper T6.

D. Foundation Tube: Galvanized corrugated-steel foundation tube, 0.064-inch minimum nominal wall thickness. Provide with 3/16-inch steel bottom plate and support plate; 3/4-inch- diameter, steel ground spike; and steel centering wedges all welded together. Galvanize steel parts, including foundation tube, after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole.

1. Provide flashing collar of same material and finish as flagpole.

2.3 FITTINGS

A. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. 0.063-inch spun aluminum, finished to match flagpole

B. Internal Halyard, Cam Cleat System: 5/16-inch-diameter, braided polypropylene halyard; cam cleat; and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

C. Halyard Flag Snaps: Provide two stainless-steel swivel snap hooks per flag halyard allowing the attachment of two flags.

1. Provide with neoprene or vinyl covers.

D. Flags: Provide heavy duty commercial grade nylon flags of the appropriate size based on pole height.

a. Provide the following flags:

1) United States of America
2) State of Alaska

2.4 MISCELLANEOUS MATERIALS

A. Concrete: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi

B. Sand: ASTM C 33, fine aggregate.

C. Elastomeric Joint Sealant: Single-component neutral-curing silicone joint sealant complying with requirements in Division 7 Section "Joint Sealants" for Use NT (nontraffic) and for Use M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

2.5 FINISHES

A. Metal Finishes, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Aluminum: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

1. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.

PART 3 - EXECUTION

3.1 PREPARATION

A. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.

B. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms and foundation tube, sleeve, or anchor bolts in position, to prevent displacement during concreting.

C. Place concrete immediately after mixing. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than seven days or use nonstaining curing compound.

D. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.

B. Foundation-Tube Installation: Install flagpole in foundation tube, seated on bottom plate between steel centering wedges. Plumb flagpole and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION 10350

SECTION 10400 - IDENTIFICATION DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Room and door signs.

B. Interior directional and informational signs not covered by other provisions in the design.

C. Emergency evacuation maps.

D. Building identification signs.

1.2 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.

B. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; 1994..

1.3 SUBMITTALS

A. See Section 01300 - Contractor Submittals, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.

2. When content of signs is indicated to be determined later, request such information from City and Borough of Juneau & Juneau School District through ARCHITECT at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.

3. Submit for approval by City and Borough of Juneau & Juneau School District through ARCHITECT prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Verification Samples: Submit samples showing colors specified.

G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.6 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 - PRODUCTS

2.1 SIGNAGE APPLICATIONS

A. Accessibility Compliance: All signs are required to comply with ADAAG and ANSI/ICC A 117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. All Signage Types: Unless otherwise indicated:

1. Character Font: Helvetica, Arial, or other sans serif font.

2. Character Case: Upper case only.

3. Background Color: Clear annodized aluminum.

4. Character Color: Contrasting color.

C. Room and Door Signs: Provide a sign for every doorway for every room scheduled, whether it has a door or not, not including corridors, lobbies, and similar open areas.

1. Sign Type: Flat signs with applied character panel media as specified.

2. Provide "tactile" signage, with letters raised minimum 1/32 inch (0.8 mm) and Grade II braille.

3. Use applied character panel signs as specified.

4. Character Height: 1 inch (25 mm).

5. Sign Sizes:
   a. Type 1: 3x6 inch; number + Braille, single side flat wall mount
   b. Type 2: 9x9 inch, name, number and Braille, flat wall mount - single side
   c. Type 3: 9x9 inch name and number only, perpendicular wall mount - double side
   d. Type 4: Individual wall mounted 4" tall letters
   e. Type 5: 9x9 inch ADA and Restroom (boys or girls) pictograph with Braille.
   f. Type 6: 6x6 inch single ADA toilet, symbol, with Braille.

6. Identify with the room names and numbers shown on the “Identification/Signage” portion of the finish schedule on sheets A12.2 and A12.3.

D. Emergency Evacuation Maps:

1. Map content to be provided by City and Borough of Juneau & Juneau School District.

2. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.

2.2 SIGN TYPES

A. Flat Signs: Signage media without frame.

1. Edges: Square.

2. Corners: Radius.

3. Finish: Natural (clear) anodized.

4. Wall Mounting of One-Sided Signs: Concealed screws gypsum wall board, two-sided clear adhesive tape at glass surfaces, exposed screws at other wall panels.

5. Wall mounting of individual letters: two-sided adhesive tape.

6. Wall Mounting of Two-Sided Signs: Aluminum wall bracket, powder coated, color

selected from manufacturer's standard colors, attached with screws in predrilled mounting holes, set in clear silicone sealant.

B. Color and Font: Unless otherwise indicated:

1. Character Font: Helvetica, Arial, or other sans serif font.

2. Character Case: Upper case only.

3. Character Color: Contrasting color to be selected from manufacturers full range of colors.

2.3 TACTILE SIGNAGE MEDIA

A. Applied Character Panels: Metal faced acrylic plastic base, with applied acrylic plastic letters and Braille.

1. Total Thickness: 1/8 inch (3 mm).

2. Sign Edges: Square.

3. Letter Thickness: 1/8 inch (3 mm).

4. Letter Edges: Bevelled.

5. Panel Corners: Radiused.

6. Mounting: Concealed or exposed screws.

2.4 DIMENSIONAL LETTERS

A. Colored Acrylic Letters:

1. Mounting: Tape adhesive or concealed pin.

2.5 ACCESSORIES

A. Concealed Screws: Stainless steel.

B. Exposed Screws: Stainless steel.

C. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs where indicated:

1. Room and Door Signs: Locate on wall at latch side of door with centerline of sign at 60 inches (1525 mm) above finished floor.

2. If no location is indicated obtain City and Borough of Juneau & Juneau School District's instructions.

D. Protect from damage until Substantial Completion; repair or replace damage items.

END OF SECTION 10400

SECTION 10523 - FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire extinguishers.

B. Fire blankets.

C. Fire extinguisher cabinets.

D. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 06100 - Rough Carpentry: Wood blocking product and execution requirements.

1.3 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2010.

B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate cabinet physical dimensions.

C. Product Data: Provide extinguisher operational features.

1.5 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage.

1. Stored Pressure Operated: Deep Drawn.

2. Class: A:B:C.

3. Size: 10 pound (4.54 kg).

4. Finish: Baked polyester powder coat, red color.

2.2 FIRE EXTINGUISHER CABINETS

A. Metal: Formed stainless steel sheet; 0.036 inch (0.9 mm) thick base metal.

B. Cabinet Configuration: Semi-recessed type.

1. Sized to accommodate accessories.

2. Trim: Returned to wall surface, with 2 inch (25 mm) projection, 1 inch (25 mm) wide face.

3. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.

C. Door: 0.036 inch (0.9 mm) thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with two butt hinge. Provide nylon catch.

D. Door Glazing: Plastic, clear, 1/8 inch (3 mm) thick acrylic. Set in resilient channel gasket glazing.

E. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.

F. Weld, fill, and grind components smooth.

G. Finish of Cabinet Interior: White enamel.

2.3 ACCESSORIES

A. Fire Blanket: Fire retardant treated wool; red, 62 x 84 inch (1 575 x 2 135 mm) size.

B. Extinguisher Brackets: Formed steel, chrome-plated.

C. Graphic Identification: Painted on cabinet.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 28 inches (710 mm) from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place extinguishers and accessories in cabinets.

3.3 SCHEDULES

A. Corridors: Water Type 2A, 2 1/2 gallon (11 L) capacity, polished chrome finish, placed in 12 inch (300 mm) wide x 30 inch (760 mm) high x 10 inch (250 mm) deep recessed polished stainless steel cabinet; location and quantity per plans.

B. Fire Blanket: Install one in kitchen next to Fire Extinguisher Cabinet shown on plans, and one in boiler room next to fire extinguisher shown on plans.

END OF SECTION 10523

SECTION 10800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Accessories for public toilet rooms, showers, and utility rooms.

B. Grab bars.

C. Child care accessories

1.2 RELATED REQUIREMENTS

A. Section 06100 - Rough Carpentry: Concealed supports for accessories, including in wall framing and plates and above ceiling framing.

B. Section 06100 - Rough Carpentry: Placement of concealed anchor devices.

C. Section 06100 - Rough Carpentry: Placement of reinforcement for backing plate reinforcement.

D. Section 10170 - Plastic Toilet Compartments.

E. Section 15410 - Plumbing Fixtures: for protective guards not identified in this section.

1.3 REFERENCE STANDARDS

A. ASTM A 167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip; 1999 (Reapproved 2009).

B. ASTM A 269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2008.

C. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.

D. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.

E. ASTM C 1036 - Standard Specification for Flat Glass; 2006.

F. ASTM F 2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004.

G. GSA CID A-A-3002 - Mirrors, Glass; U.S. General Services Administration; 1996.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.5 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products listed are made by Bobrick: www.bobrick.com, unless otherwise noted.

B. Other Acceptable Manufacturers:

1. A & J Washroom Accessories Inc: www.ajwashroom.com.

2. American Specialties, Inc: www.americanspecialties.com.

3. Bradley Corporation: www.bradleycorp.com.

4. Substitutions: Section 01600 - Materials and Equipment.

C. All items of each type to be made by the same manufacturer.

2.2 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

1. Grind welded joints smooth.

2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Provide 3 keys for each accessory to City and Borough of Juneau & Juneau School District; master key all lockable accessories.

C. Stainless Steel Sheet: ASTM A 666, Type 304.

D. Stainless Steel Tubing: ASTM A 269, Type 304 or 316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M, with G90/Z275 coating.

F. Mirror Glass: Float glass, ASTM C 1036 Type I, Class 1, Quality Q2, with silvering, copper coating, and suitable protective organic coating to copper backing in accordance with GSA CID A-A-3002.

G. Adhesive: Two component epoxy type, waterproof.

H. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, security type.

I. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FINISHES

A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.

B. Back paint components where contact is made with building finishes to prevent electrolysis.

2.4 TOILET ROOM ACCESSORIES

A. Toilet Tissue (Jumbo-Roll) Dispenser (TTD): Double roll, surface mounted bracket type, clear plastic. .

1. Product: Item No. SCA-56T manufactured by SCA Tork.

2. Substitutions: Not Permitted.

B. Paper Towel Dispenser (PTD): roll paper type.

1. Cover: Transparent.

2. Capacity: 8 inch diameter roll.

3. Manufacturers:
   a. Kimberly-Clark "In-Sight LEV-R-Matic II Roll Towel Dispenser. http://www.kcprofessional.com .

4. Substitutions: Not permitted.

C. Waste Receptacle (RWR): semi-recessed, stainless steel, seamless lower door for access to container, reinforced panel full height of door, continuously welded bottom pan and seamless exposed flanges.

1. Liner: Removable, heavy-duty vinyl liner, attached at a minimum of 4 points with stainless steel grommets and hooks.

2. Minimum capacity: 12 gallons (45 liters).

3. Product: B-3644 Classic Series Recessed Waste Receptacle manufactured by Bobrick.

D. Soap Dispenser (SD): Liquid soap dispenser, wall-mounted, surface, with cartridge tank.

1. Minimum Capacity: 34 ounces (1 liters).

2. Product: Proline Soap Dispenser manufactured by deb SBS. www.debsbsinc.com.

3. Substitutions: Not Permitted.

E. Mirrors (MIR): Stainless steel framed, 6 mm thick float glass mirror.

1. Size: 18 inch x 36 inch.

2. Frame: 0.05 inch (1.3 mm) angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.

3. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.

4. Adjustable Tilt Mirrors: Stainless steel piano hinge full width of base and elbow hinges at sides of mirror, for minimum tilt forward from top of 6 inches (150 mm).

5. Product: B165 1836 manufactured by Bobrick.

F. Grab Bars (GB): Stainless steel, 1-1/4 inches (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches (38 mm) clearance between wall and inside of grab bar.

1. Length and configuration: As indicated on drawings. Typical corner configuration requires two GBs.

G. Purse Shelf (SH): Fold-down, with spring-loaded hinge designed to automatically return shelf to vertical position when not in use; 0.03 inch (0.8 mm) satin-finished stainless steel, with 1/4 inch (6 mm) rolled or 1/2 inch (12 mm) channel edge at shelf front.

1. Product: B-287 manufactured by Bobrick.

H. Sanitary Napkin Receptacle (SNR): Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

1. Product: 270 series manufactured by Bobrick.

2.5 CHILDCARE ACCESSORIES

A. Diaper Changing Station, Fold-Down Changing Table (DCT): Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F 2285.

1. Style: Horizontal.

2. Material: Stainless steel.

3. Mounting: Recessed.

4. Minimum Rated Load: 250 lbs (113.4 kg) at Typical, 400 lbs (181 kg) at Speciial Needs

5. Basis of Design:
   a. Typical Single Bathroom: Foundations Model 100-SS-R, Horizontal Recessed-mounted stainless steel Baby Changing Station. www.foundations.com.
   b. Special Needs Bathroom: Foundations Model 100-SSE-R, Horizontal Recessed-mounted stainless steel Special Needs Changing Station. www.foundations.com.

2.6 UNDERLAVITORTY GUARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Plumberex Specialty Products, Inc.

2. TIC Products.

3. Truebro, Inc.

B. Under Lavatory Guard:

1. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without remogvingg coverings.

2. Material and Finish: Antimicrobial, molded plastic, white.

2.7 SHOWER AND TUB ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1 inch (25 mm) outside diameter, 0.04 inch (1.0 mm) wall thickness, satin-finished, with 3 inch (75 mm) outside diameter, minimum 0.04 inch (1.0 mm) thick satin-finished stainless steel flanges, for installation with exposed fasteners.

1. Product: B-270 manufactured by Bobrick.

B. Shower Curtain:

1. Material: Opaque vinyl, 0.008 inch (0.2 mm) thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.

2. Size: 36 by 72 inches (914 by 1830 mm), hemmed edges.

3. Grommets: Stainless steel; pierced through top hem on 6 inch (150 mm) centers.

4. Color: White.

5. Shower curtain hooks: Chrome-plated or stainless steel spring wire designed for snap closure.

6. Product: 204-3 manufactured by Bobrick.

C. Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, hinges and mechanical fasteners of Type 304 stainless steel, handed (to be confirmed with shower design) seat.

1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of color as selected.

2. Product: B-5181 manufactured by Bobrick.

D. Robe Hook (RH): Heavy-duty stainless steel, single-prong, bracket and back plate for concealed attachment, satin finish.

1. Product: B-2116 manufactured by Bobrick.

2.8 UTILITY ROOM ACCESSORIES

A. Mop and Broom Holder (MOP): 0.05 inch (1.3 mm) thick stainless steel, Type 304, hat-shaped channel.

1. Holders: 3 spring-loaded rubber cam holders.

2. Length: 36 inches (900 mm).

3. Length: Manufacturer's standard length for number of holders.

4. Product: B-223 manufactured by Bobrick.

5. Quantity: One at each mop sink in plan (3 total).

B. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.

1. Drying rod: Stainless steel, 1/4 inch (6 mm) diameter.

2. Hooks: 4, 0.06 inch (1.6 mm) stainless steel rag hooks at shelf front.

3. Mop/broom holders: 3 spring-loaded rubber cam holders at shelf front.

4. Length: 36 inches (900 mm).

5. Product: B239-34 manufactured by Bobrick.

6. Quantity: One at kitchen.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

D. See Section 06100 for installation of blocking, reinforcing plates, and concealed anchors in walls, and ceilings.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights and Locations: As required by accessibility regulations, as indicated on drawings.

END OF SECTION 10800

SECTION 11131 - PROJECTION SCREENS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Front projection screen assemblies.

1.2 RELATED REQUIREMENTS

A. Section 06100 - Rough Carpentry: Wood blocking in walls and ceilings.

B. Section 09260 - Gypsum Board Assemblies: Suspended gypsum board ceilings for recessed screens, and openings in gypsum board partitions for fixed and rear projection screens.

C. Section 09900 - Paints and Coatings: Field painting.

D. Section 16155 - Equipment Wiring: Electrical supply, conduit, and wiring for electric motor operated projection screens.

1.3 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Installation methods.

4. Wiring diagrams for motor operators and actuators, and controls and switches.

C. Shop Drawings: For custom installations, indicate dimensions, verified field measurements, mounting details, and interface with adjacent construction.

D. Samples: For screen fabrics, submit two 4 by (4 mm) in size.

E. Samples: For case and frame finishes, submit two 2 by (4 mm) in size, illustrating color and texture of finish.

F. Operation and Maintenance Data: Provide manufacturer's operation and maintenance

instructions.

G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in City and Borough of Juneau & Juneau School District's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Experienced in manufacturing products specified in this section.

B. Installer Qualifications: Experienced in installation of the work of this section.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver projection screens to project site in manufacturer's original unopened packaging. Inspect for damage and size before accepting delivery.

B. Store in a protected, clean, dry area with temperature maintained above 50 degrees F (10 degrees C). Stack according to manufacturer's recommendations.

C. Acclimate screens to building temperatures for 24 hours prior to installation, or in accordance with manufacturer's recommendations.

1.6 FIELD CONDITIONS

A. Maintain interior of building between 60 degrees F (15 degrees F) and 75 degrees F (24 degrees F) during and after installation of projection screens.

1.7 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Provide 5 year manufacturer warranty for projection screen assembly.

PART 2 PRODUCTS

2.1 FRONT PROJECTION SCREENS

A. Manufacturers:

1. Bretford: www.bretford.com.

2. Da-Lite Screen Company: www.da-lite.com.

3. Draper, Inc: www.draperinc.com.

4. Substitutions: See Section 01600 - Materials and Equipment.

B. Front Projection Screens: Factory assembled unless otherwise indicated.

1. In Classrooms and Conference room: Manual, matte light diffusing fabric screen, wall mounted.
   a. Screen Viewing Area: 45 inches (1140 mm) by 80 inches (2080 mm).
   b. Extra Drop Length: Bottom of screen to be 31 inches above finished floor (with mounting height at 96"), extra drop may not be required.
   c. Provide factory bracket extensions as required for stand-off wall. Screen shall not touch projecting marker board or marker board tray below when fully extended.

2. In Commons: Motorized, matte light diffusing fabric screen, horizontally tensioned , ceiling recessed.
   a. Screen Viewing Area: 2280 inches (mm) by 160 inches (4060 mm).
   b. Extra Drop Length: As needed at top of screen for bottom of screen to be 24 inches above floor (with mounting height at 120" aff).

C. Matte Light Diffusing Fabric: Light diffusing screen fabric; washable, flame retardant and mildew resistant.

1. Material: Matte white vinyl on fiberglass backing, with nominal gain of 1.0 over viewing angle not less than 70 degrees from axis, horizontally and vertically.

2. Seams: No seams permitted in fabric up to 96 inches (2438 mm) high by 72 inches (1830 mm) wide.

D. Masking Borders: Black, four sides.

E. Extra Drops: Black; 11 inches (279 mm).

F. Exposed Screen Cases: Steel; integral roller brackets.

1. Finish: Baked enamel.

2. Color: White.

3. End Caps: Steel; finished to match case.

4. Mounting: Wall.

G. Concealed-in-Ceiling Screen Cases: Steel; integral roller brackets.

1. Door Slat: Self trim; self-closing and -opening.

2. Case Finish: Primer.

3. Case Color: Grey.

4. End Caps: Steel; finished to match case.

H. Manually-Operated Screens:

1. Roller: 1-3/4 inch (44 mm) aluminum; spring loaded with locking device.

2. Screen Pull: Ring on bottom bar.

3. Vertical Tensioning: Screen fabric weighted at bottom with steel bar with plastic end caps.

I. Electrically-Operated Screens:

1. Roller: 2 inch (51 mm) aluminum, with locking device.

2. Vertical Tensioning: Screen fabric weighted at bottom with steel bar with plastic end caps.

3. Horizontal Tensioning: Tab-guided cable system.

J. Provide mounting hardware, brackets, supports, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

2.2 ELECTRICAL COMPONENTS

A. Electrical Components: Listed and classified by UL as suitable for the purpose specified and indicated.

B. Motors: Direct drive, 110 V, 60 Hz.

1. Screen Motor: Mounted inside roller; three wire with ground; quick reverse type; equipped with thermal overload cut-off.
   a. Electrical Characteristics: 1.2 amps.
   b. Motor mounted on sound absorber.

2. Door and Adjustable Masking Motor: Mounted inside roller; three wire with ground; quick reverse type; equipped with thermal overload cut-off.
   a. Electrical Characteristics: 1.2 amps.

C. Controls: 3 position control switch with plate.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate is finished and ready to accept screen installation.

B. If substrate preparation is the responsibility of another installer, notify ARCHITECT of unsatisfactory preparation before proceeding.

C. Verify that openings for recessed screens are correctly sized.

D. Verify type and location of electrical connections.

E. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

3.2 PREPARATION

A. Coordinate screen installation with installation of projection systems.

B. Coordinate installation with adjacent construction and fixtures, including ceilings, walls, lighting, fire suppression, and registers and grilles.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.

B. Do not field cut screens.

C. Install screens in mountings as specified and noted on drawings.

D. Install screens in accordance with manufacturer's instructions. Verify that screens are aligned horizontally and vertically, and that spacing between screens is uniform and of minimum size. Install plumb and level.

F. Install electrically operated screens ready for connection to power and control systems by others.

G. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.

H. Test electrical screens for proper working condition. Adjust as needed.

3.4 PROTECTION

A. Protect installed products until completion of project. Touch up, repair, or replace damaged products before Substantial Completion.

END OF SECTION 11131

SECTION 11400 - FOOD SERVICE EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Conditions and General Requirements of the project in Division 1 including all supplementary documents apply to the requirements of this section.

B. Work to be provided and installed includes, but is not limited to:
1. Furnish all labor, materials and services necessary for the assembly, setting in place and sealing of all equipment as specified in the equipment schedule. Work must be in strict compliance with the contract documents.
2. Coordinating work of other sections and providing support and accommodation to related work.
3. Cutting of all holes in equipment, including holes for pipes, drains, electrical outlets required for this section. Work shall include welded sleeves, collars, ferrules, or escutcheons.
4. Repair of all damage to building resulting from work of this section.
5. Remove all debris resulting from work of this section.
6. Clean and make ready for operation all Kitchen Equipment Contractor (KEC) supplied equipment and existing/re-install equipment.
7. Furnish faucets, sink wastes, drain fittings, tail pieces and strainers for food service equipment.
8. Mechanical and electrical devices furnished for installation by others shall comply with requirements of mechanical and electrical sections.
9. The furnishing of items required by regulations, but not specified or indicated.
10. Provide locations for all utility(electrical, plumbing and mechanical) rough-in points and the wall reinforcement (backing plates), wood support blocking and any other special support system.
11. Training of owner’s personnel staff in the commissioning, operation and maintenance of the equipment.

1.2 RELATED WORK IN OTHER SECTIONS

A. General: Utility rough-ins and final connections between rough-in and the equipment shall be provided for water, waste, electricity, and supply and exhaust air systems.

B. Electrical: All wiring, conduits, switches, plugs, fuses, heat tapes, breakers, disconnects, junction boxes, magnetic starters, electric receptacles, transformers, etc. or other electrical apparatus required by codes or as specified. All field wiring of any nature including but not limited to power connections, including interconnections between components, including the mounting and wiring of light fixtures provided and the insulation of conduit line through refrigerated zones.

C. Mechanical

1. Plumbing: Floor drains, floor sinks, strainers, sumps, drain lines from equipment to floor drains or floor-sinks, P-traps, shut-off valves, control valves, grease traps, funnels vents, check valves, pressure regulating valves or apparatus required by codes or regulations. Cover, finish or paint all exposed piping to match adjacent metals or finish.
2. Ventilation: Duct work from the hoods to the fans, connecting trim, flue pipes, exhaust fans, room ventilators as required by codes or specified.

D. Architectural and Structural

1. Openings: Provide all necessary opening or penetrations, routs, cut-outs, etc. in or through he architectural walls, ceilings or floors as necessary for the installation of the food service equipment and accessories.
2. Supports: Provide concealed metal anchorage in the building structure, metal channels, etc. and other members to support the hanging equipment especially the hoods.
3. Floor: Provide the floor finish, coved base, raised equipment bases, and recessed floor openings. Caulk, seal or grout the floor around all equipment installed into the recessed opening(s).

1.3 QUALITY ASSURANCE

A. All work shall be in accordance with the governing health, building and safety, and fire protection codes and regulations. Rulings and interpretations of State and local enforcing agencies shall be considered part of the regulations, including equipment licensing fees, and necessary signatures and/or notaries on food service drawings as may be required.

B. Regulatory Agencies

1. Regulations of the U.S. Department of Agriculture, Alaska Department of Environmental Conservation, Alaska State Fire Marshal and Juneau Building & Engineering Department govern the requirements of this Section. The KEC to comply with rulings and interpretations of these agencies and the owner's representative and make necessary adjustments with no additional cost to the Owner.
2. The publications listed below form a part of this specification to the extent referenced.
    a. American National Standards Institute (ANSI)
    b. American Society for Testing and Materials (ASTM)
    c. American Society of Mechanical Engineers (ASME)
    d. National Electrical Manufacturing Association (NEMA)
    e. National Fire Protection Association (NFPA)
    f. National Sanitation Foundation (NSF)
    g. Underwriters Laboratories (UL)
    h. Intertek Testing Services NA (ITSNA) (formerly ETL Testing Laboratories)

C. The responsibility for obtaining applications, permits and inspections required by the Alaska Department of Environmental Conservation, Alaska State Fire Marshal and Juneau Building Department and other regulatory agencies having jurisdiction shall be the General Contractor's unless noted otherwise.

D. All materials used shall be free of asbestos, lead, PCB's and any other regulated materials.

1.4 BID DOCUMENTS

A. Basis of the bid and all work for this project shall be the equipment specified in this section and as indicated on the drawings. The bidder shall submit their bid based on the equipment and manufacturers specifically stated in the specifications. All equipment shall be of the latest model.

B. Any request for substitutions must be submitted in accordance with section 01630. The Food Service Consultant must review any alternate or substitute item prior to the scheduled bid opening date. Acceptance of proposed alternate or substitution is entirely at discretion of the Owner and Food Service Consultant in accordance with the requirements of section 01630. In addition, any alternate or substitution is subject to all of the following qualifications:
   1. Equal in quality of materials used, in structural strength, finish, and in details of construction.
   2. Equal in mechanical and electrical characteristics, performance and capacity.
   3. Availability of replacement parts and maintenance service, including in-state service and repair representatives.
   4. Brand names and models in current use at this or Owner's other facilities.

1.5 SUBMITTALS

A. General: Comply with requirements of Section 01300.

B. Manufacturer's Data: KEC to submit manufacturer's specification for each new item of equipment. The data shall be inserted in a neatly bound three ring binder with the Contractor's name and project name on the cover. Include the following:
   1. Index sheet with item number, item description, quantity, brand name and model number;
   2. Cover information sheet for each item in sequence, clearly labeled in the upper right hand corner with the item and model number and quantity furnished. Cover sheets for each item shall include all plumbing, mechanical and/or electrical information, accessories, options and any special features or cautions.
   3. Where no printed data exists, submit the required information in the form of a shop drawing.

C. Rough-in Drawings: KEC to submit plumbing, electrical, support blocking and any other type of rough-in drawings, drawn to a scale of not less than l/4" to twelve inches and informatively labeled and titled. Every mechanical and electrical point for connection or location shall be clearly identified and dimensioned. Critical notes to other trades shall be clearly and completely identified for appropriate action. All dimensions shall be related to finished surfaces, center-lines, heights, etc above the finished floor or walls.

D. Maintenance Manuals: After the installation is completed and concurrent with the kitchen demonstration (see paragraph 3.07-B), the KEC to submit four neatly bound sets of maintenance manuals, in the same format as the submittal manual. Include the serial number on the cover sheet. The maintenance manual will include operating and maintenance instructions, wiring diagrams, replacement parts lists and other information pertinent to the proper operation and upkeep of the various items of mechanical and electrical equipment.

It is the responsibility of the KEC to fill out and forward all warranty and registration forms required by various manufacturers for the equipment installed.

1. Include names, addresses and telephone numbers of authorized service agencies, for all items.
2. Include complete warranty information including proof of warranty, number of years and any special conditions.

1.6 CONSTRUCTION DOCUMENTS

A. The equipment drawings constitute a part of these specifications. They show locations of equipment and the general arrangement of mechanical and electrical services. Necessary deviation from the illustrated arrangements to meet structural conditions or building configurations shall be considered a part of the work of this section.

B. Drawings and equipment specifications are intended to compliment one another. Therefore, neither should be considered complete without the other. Should there be a conflict between the drawings and the specifications, contact the Owner's Representative for clarification.

1.7 PROJECT COORDINATION

A. Deliver all the equipment necessary to complete the work as scheduled.

B. Protect all equipment from weather, humidity, temperature variations, dirt, dust and other contaminants. Fiberboard, cardboard or plywood shall be taped on surfaces as required to protect them from damage until project is turned over to the owner.

C. Equipment shall not be used as tool and material storage, workbench, scaffold or stacking area.

D. If equipment is damaged in some way, KEC shall repair or replace the item(s) as required.

E. This contractor shall cooperate with other trades and exchange information, drawings or other pertinent data required to properly install the food service equipment.

1.8 WARRANTY AND SERVICE

A. The KEC shall warrant (Guarantee) all of the equipment furnished under this Section against defective material, design and workmanship for the period of one year from the date of beneficial occupancy or final acceptance of the equipment and installation.
   1. The manufacturer of the cold storage room(s) shall guarantee the panel sections and doors be free from all defects of material and workmanship, under normal usage, for a period of five (5) years.
   2. All self-contained refrigeration equipment shall include an additional, minimum four year extended warranty on sealed compressor/motor assemblies. The extended warranty shall include parts only.

B. Service
   1. During the period of guarantee, the KEC shall provide a trained and qualified, local facility to repair or replace defective equipment without cost to the owner for labor, material, travel or other expenses, unless such service is required because of misuse, negligence, willful damage, improper maintenance or accident.
   2. Repairs shall be performed during regular working hours on regular working days. Repair work shall start within three days after notification of a problem.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal
   1. Stainless Steel: All new, first grade, material; U.S. Standard Gauges as specified or shown; 18-8, Type 304, No. 4 finish, ASTM A-167.
   2. Galvanized Steel: All new, commercial quality, zinc coated carbon steel; U.S. Standard Gauges as specified or shown, ASTM A 526.
   3. Steel Pipe: All new, commercial quality, galvanized; rust resistant coating on thread.

B. Hardware
   1. Locks
      a. All refrigerated and heated cabinets of the reach-in and roll-in type shall be furnished with heavy-duty cylinder locks, on all doors; all keyed alike.
   2. Catches
      a. For metal sliding doors, catches shall be stainless steel recessed type Component Hardware model M21-2580, or equal.
   3. Hinges
      a. For metal cabinet doors, hinge shall be heavy-duty, stainless steel continuous type; Component Hardware model M48-0132.

4. Casters
    a. Shall be heavy-duty, bright zinc or chrome plated, ball- bearing type with greaseproof rubber, neoprene or polyurethane tires. Wheels shall be 5 inches diameter with minimum width treads of 1-1/8 inches and minimum capacity of 250 lb.'s per caster. Furnish with rubber donut bumpers and wheel brakes where specified.

C. Plumbing Fixtures
1. Faucets
    a. Deck mounted mixing faucet assemblies shall be Fisher Model 3315 with 12 inch swivel gooseneck spout and non-splash aerator.
    b. Splash mounted mixing faucet assemblies for ware wash sinks shall be Fisher Model 84824 with 12 inch swing nozzle.
    c. All faucet assemblies shall be polished chrome plated.
2. Rotary Wastes
    a. Shall be Fisher Model 22322 with stainless steel basket strainer, or equal.
3. Pre-Rinse Assemblies
    a. Splash mounted pre-rinse assemblies shall be Fisher Model 13382 with Model 2902 wall bracket.
    b. All pre-rinse assemblies shall be polished chrome plated.
4. Vacuum Breakers
    a. All exposed vacuum breakers shall be Watts 288A or equal.
    b. All exposed piping above the back splash shall be chrome plated.

D. Electrical Fixtures
1. Furnish a control switch and starter with overload protection for each motor driven appliance and electrical heating unit, unless specified otherwise. All switches shall be located out of the heat zone.
2. Furnish and install all electrical devices unless specified otherwise, and provide all internal wiring of electrical apparatus built into or forming an integral part of fabricated equipment, complete to a J-box or breaker panel, as shown on plans, ready for final connection.
3. Make cutouts and install appropriate boxes or outlets in fabricated fixtures complete with wiring conduit, outlet and stainless steel cover plates.
4. All outlets and plugs shall conform to NEMA standards.
5. All electrical devices shall be first quality "Specification Grade".
6. Furnish cord and plug for all mobile and portable equipment unless specified, or indicated otherwise.
    a. Cord to be type SO rubber covered, wire(s) of proper current capacity. Furnish appropriate length.
    b. Plug to be multi-prong, ground type of proper NEMA configuration. (Verify for matching receptacle).
7. Furnish and install all fluorescent (including ballasts) and incandescent fixtures, with lamps, as specified and/or shown on the drawings. Light switches and disconnects (unless a part of a fixture) shall be furnished and install by the Electrical Contractor.

E. Miscellaneous
1. Sealants shall be translucent liquid silicone rubber, containing no solvents, and are non-hardening, non-toxic and water resistant, capable of maintaining elasticity between minus 65° F. and plus 250° F.

2. Sound Deadening: Apply non-combustible, hard drying sound deadening mastic on the under-surface of worktables, pot and preparation sinks and dish tables, with a minimum of 0.125 inch thickness, sprayed or painted on. Apply the mastic material after the reinforcing members have been installed.
3. Gas Flexes: All gas fired stationary appliances, when specified, shall have a 36" or 48" long gas connector with a flexible, corrugated type 304 stainless steel tubing, a flexible PVC plastic coating resistant to heat and cleaning chemicals, and threaded carbon steel zinc plated fittings. Gas connector shall be AGA, NFPA, NSF certified and comply with ANSI standard Z21.69.

2.2 FABRICATION

A. General
1. Custom fabricated equipment shall be fabricated by one manufacturer in an approved manner complying with current standards of the National Sanitation Foundation, and acceptable to Owner's Representative. The manufacturer shall have a minimum of five years documented experience in the manufacturing of food service equipment.

B. Workmanship:
1. Welding: Heli-arc or electric arc method with welding rod of the same composition as parts welded. Welded joints shall be ground smooth, polished, and re-grained to match the original finish. Materials 18 gauge or heavier shall be welded. No welds are to be visible on exposed surface. Welds are required to be non-toxic on surfaces that are exposed to unpackaged food. Continuously weld all joints on tops, shelves, face joints in base cabinets, field joints and others where required. Field joints in stainless steel tops, etc. where required due to limitations of sheet sizes, equipment sizes, or installation requirements, shall be made sanitary, tight, and without open seams by means of spot welding, or if detailed, by properly designed draw fastening, trim strip, or commercial joint material to suit the intended purpose. Butt joints made by riveting straps at seams and filing with solder will not be accepted.
2. Fasteners: No exposed rivets, screw or bolt heads will be permitted on fixtures or installation materials.
3. Finishing: Depressions, warps, burns, brake bend marks, burrs, fins, or irregular projections are not allowed. Welds on galvanized steel are to be ground smooth, cleaned and coated with an approved galvanizing repair compound.
   a. Painted galvanized surfaces: Remove film with phosphoric acid or similar solution. Apply a primer coat and finish coat of hammer-tone enamel paint.
4. Sanitation: Close all hollow sections in tops by continuous welding. Provide a 5/8" minimum cove at all horizontal and vertical intersections of sheet metal.

C. Materials:

1. General: Metal gauges specified are minimum and refer to U.S. Standard Gauge for sheets and plates and tubular material.
2. Stainless Steel: United States standard gauge 18-8, Type 304 stainless steel with not over 0.012% carbon, No.4 finish unless otherwise specified.
3. Galvanized Steel: Cold rolled, stretcher leveled, furniture grade galvanized steel sheet conforming to requirements of ASTM Designation A526, free of scale, rust etching, scratches, rugged edges, waves, and other imperfections.

D. Sheet Metal Gauges and Materials

Description	Gauge	Material
Dish Tables	14	Stainless Steel
Work Tables	16	Stainless Steel
Counters	16	Stainless Steel
Hoods	18	Stainless Steel
Under-Shelves	18	Stainless Steel
Wall Shelves	16	Stainless Steel
Reinforcing Members	14	Galvanized Steel
Unexposed Cabinet Base	16	Galvanized Steel
Exposed Cabinet Base	18	Stainless Steel
Sinks	16	Stainless Steel
Drain Boards	16	Stainless Steel

E. Counters & Tables

1. Tops: All metal tops shall be on one-piece welded construction, reinforced on the underside with closed galvanized steel hat channel sections welded in place such that tops can support heavy weights without deflection. Cross braces shall be located not more than 30 inches on centers.
2. Edges
   a. Turn-down edges shall be turned down two inches at 90 degrees with 3/4" wide hem turned back 30 degrees at the bottom. Outside corners shall be rounded on a 3/4" radius.
   b. Raised rolled rim edges shall be coved up 2 inches minimum with a 1-1/2" wide rim rolled 180 degrees and turned down to the table top with smooth, de-burred edges and bull-nose corners.
3. Back Splash: The back splash shall be coved up as specified, sloped back 2" at the top on a 45 degree angle and turned down at ¾" at its rear. The ends shall be closed. The back splash shall be secured to the wall over stainless steel wall clips.
4. Gussets: Gussets shall be stainless steel fully enclosed, a minimum of 3" in diameter at the top, reinforced with a bushing and shall be continuously welded to a channel or angle.
5. Legs and Cross rails: All equipment legs and cross rails shall be 16 gauge stainless steel seamless tubing 1-5/8 inch diameter, unless otherwise noted. Cross rails shall be welded to the legs and the welds ground smooth, or a cross rail brace fitting equal to Component Hardware models A35-1010, A35-1020 or A35-1030 shall be used.
6. Feet: All legs shall be fitted with sanitary stainless steel bullet feet with not less than 1-inch adjustment (Component Hardware model A10-0851 or equal) or with flanged feet with mounting holes (Component Hardware model A10-0854 or equal) as specified.

7. Under shelves: Radius notch shelf corners and weld to legs with tight joints at all intersections or use Component Hardware quick corner/center brackets models A37-1010 or A37-1020 at each shelf corner or center leg. Edges shall be turned down two inches and under ½" on the front and turned up two inches on the backs and sides.

F. Sinks

1. Sinks shall be of the dimensions specified or shown and conform to NSF standards. Sinks that are integral with drain boards shall be fabricated and constructed of same gauge and material as drain board and splash. Sinks that are integral with table or counter top may be fabricated or die formed.
   a. Fabricated sinks shall be of same gauge and material as top.
   b. Die formed sinks shall be not less than 18 gauge stainless steel.
2. Vertical and horizontal corners shall be fully covered to a radius of not less than 5/8 inches. Partitions between adjacent sink compartments shall be one inch apart
3. The sink bottoms shall be scored or "cross broke" to assure drainage to the waste outlet. Provide waste and overflow fittings, drain plug with quick-opening valve for each compartment and a faucet(s).
4. Sinks installed adjacent to walls shall be anchored and sound deadened.

G. Drawers

1. Furnish all-welded 16 gauge stainless steel drawer front and interlocking channel supports, with large ball-bearing wheel suspension and stops; shall be easily removable; recessed stainless steel drawer pulls; reinforced plastic die-formed, easily removable, drawer insert.
   a. For drawers mounted on underside of open tables, furnish 18 gauge stainless steel enclosure on sides and rear.

H. Shelves

1. Wall mounted shelves shall be turned down 1-1/2 inches at front and ends, and turned up 2 inches at back. Shelf shall be mounted on 14 gauge stainless steel brackets and anchored securely to wall.
2. Where rolled edges are indicated, they shall be die-rolled down 1- ½ inches. Elevated shelf supports shall extend below table or counter tops and be securely attached to structural frame or under shelf.

I. Wall Flashing

1. Wall flashing shall be of 20 gauge stainless steel affixed to wall with heavy duty, heat-resistant adhesive.
2. Flashing shall be fabricated from maximum width sheets for minimum amount of vertical joints and shall be sealed with silicone and capped with J-molding at the edges. Do not use exposed screws or fasteners.
3. Stainless steel wall flashing shall be installed as shown or specified.
   a. The flashing shall extend from the top of the back splash to a height of 2'-0" behind sinks, dish tables and dishwashers.
   b. Stainless steel wall flashing shall be installed extending from the bottom of the hood to the top of the floor coving, as specified.
4. Corner Guards shall be fabricated 16 gauge stainless steel angles, 3 inch by 3 inch minimum, 5 feet high and have a 90 degree bend. Affix to wall with adhesive and stainless steel fasteners at top and bottom.
5. Wall Guards shall be fabricated 16 gauge stainless steel channels, 3" x wall thickness x 3" minimum, full height of wall from floor to ceiling and have 90 degree bends. Affix to wall with adhesive and stainless steel fasteners.

2.3 EXHAUST HOOD

A. Class One Type

1. General: Each hood or ventilator to be a high velocity centrifugal grease extractor, with the air inlet opening parallel to the cooking equipment being ventilated. Hood to contain one or more removable “extractor inserts” with a true grease extraction efficiency of 80%. Extractor inserts to contain full length self-draining baffles and to be easily removable with an extractor removal tool for periodic cleaning. The grease collecting gutter at the bottom of the extractor housing to slope to one end to a removable stainless steel grease collecting container. Provide full length hanger angles at the front and rear of the hood to suspend from the overhead building structure and a continuous angle at the rear to attach to the building wall.
2. If specified, provide each hood with an air supply plenum, duct collar(s) and full length perforated face panel for low velocity discharge make-up air.
3. Construction: The hood shall be fabricated of not less than 18 gauge stainless steel, type 304.
4. Light Fixtures: Light fixtures to be mounted and pre-wired to a single connection point. Hoods built in multiple sections to be furnished with junction boxes for field connection by the electrical contractor. Kitchen Equipment Contractor to provide all necessary bulbs for the hood light fixtures.
   a. Incandescent fixtures: Provide UL listed 100 watt, equal to Component Hardware model L50-1004.
   b. Fluorescent fixtures: Provide fully recessed UL listed, two-bulb type of the length specified, equal to Component Hardware series NSF-8200.
5. Approvals: Ventilator to be UL and NSF Listed, and comply with all requirements of NFPA-96, IMC, and UMC.

2.4 FIRE SUPPRESSION SYSTEM

A. General: Hoods to be equipped with an automatic fire protection system utilizing a wet chemical agent for grease related fires. The system shall be approved for uniform, overlapping protection of equipment associated with cooking including burners, ranges, ovens, and ventilating equipment including hoods, ducts, plenums and filters. The system shall meet all requirements of NFPA-96, NFPA-17A and UL-300. The stainless steel enclosure cabinet will be wall mounted and contain automan regulated release assembly and mechanism, pressurized expellant cartridge and agent storage tank. Additionally, the system shall have the required quantity of nozzles, blow-off caps, detectors, cartridges, wet chemical agent, fusible links, pulleys, cable and conduit for the fire system arrangement. The system shall be capable of automatic detection and actuation and/or remote manual actuation. The system shall allow for automatic detection by means of specific alloy rated fusible link detectors, which when the temperature exceeds the rating of the link, the link separates allowing the regulated release to actuate.

B. Piping: All piping within the hood shall be field piped with all exposed piping, fittings and nozzles chrome plated or chrome sleeved. Use UL listed hood penetration fittings where pipe penetrates the canopy, plenum or duct collar.

C. Fuel Shut-off: The fire suppression system shall have the means of automatically shutting the fuel and/or power supply off to the cooking appliances. Provide a mechanically operated gas line shut-off valve for field installation in the main gas supply piping to the cooking appliances, and/or a micro-switch mounted in the enclosure cabinet that will signal the electrical contactors to shunt the power supply to the cooking appliances.

D. For interconnecting to the building life safety system, the fire suppression system shall include a set of normally open (N. O.) volt free alarm contacts to monitor system fire mode.

E. Certification: Upon completion of installation, the entire system is to be field inspected and certified by a qualified and certified technician. Provide copies of the certification report to the Owner's Representative and in the maintenance manual.

2.5 ITEMIZED EQUIPMENT SCHEDULE

A. All of the above shall be considered a part of the following itemized specifications. Items noted or indicated as custom-fabricated shall comply with the standards previously described. All standard materials, components and features normally furnished with that model, whether specifically delineated or not, shall be considered inherent in the specifications. Provide accessories as listed.

B. Each model number includes the code *L043 as a suffix. This code is known as the Specifier Identification System created by the North American Food Equipment Manufacturers Association (NAFEM). It is not to be removed. Its purpose is to identify the specifier to the manufacturer in the event it is necessary to communicate questions, clarifications and comments, from prior to bid award through the final purchase. It is to be used on all correspondence including fax and e-mail when communicating with manufacturer representatives and factories.

Item 1 Shelving, Dry Storage (Alternate Bid 2)
Quantity: Six each
Manufacturer: Intermetro
Model: Super-erecta*L043
Four (4) each 24" wide x 54" long
Two (2) each 24" wide x 48" long
Notes: 1. Five tier
2. 86" posts
3. s-clips
4. Super-brite finish

Item 2 Filter System, Ice Maker (Alternate Bid 2)
Quantity: One each
Manufacturer: Cuno/3M
Model: Ice Assure 1-1*L043
Notes: 1. Mount at convenient height to allow easy replacement of cartridge.
2. Spare cartridge CFS8112-S
3. Pressure gauge

Item 3 Ice Machine with Bin (Alternate Bid 2)
Quantity: One each
Manufacturer: Manitowoc
Model: QY-0274A*L043
Notes: 1. Stainless steel finish
2. Ice Scoop
3. 115 volt with cord & plug
4. Energy Star rated

Item 4 Reach-in Freezer, One Door (Alternate Bid 2)
Quantity: One each
Manufacturer: True Mfg
Model: T-23F*L043
Notes: 1. Casters
2. 120 volt with cord & plug
3. Energy Star rated

Item 5 Reach-in Cooler, Two Door (Existing)
Quantity: One each
Manufacturer: Beverage Aire
Model: Unknown
Notes: 1. 120 volt with cord & plug

Item 6 Utility Cart (Alternate Bid 2)
Quantity: One each
Manufacturer: Lakeside
Model: 422*L043
Notes: 1. Stainless steel
2. 500 pound capacity
3. Casters

Item 7 Spare Number

Item 8 Hand Sink
Quantity: One each
Manufacturer: Krowne
Model: HS-7*L043
Notes: 1. Stainless steel
2. Wrist blade handle faucet H-102
3. Mount front edge 34" AFF

Item 9 Base Cabinets with Stainless Steel Counter Top

Quantity: One lot
Manufacturer: Custom fabrication
Model: Custom stainless steel and millwork fabrication, 7'-0" long x 7'-0" long x 30" wide x 36" high.
Notes:
1. 16 gauges stainless steel counter top
2. 1-1/2" turn down and ½" turn under at the front and side edges of stainless steel top
3. 6" high stainless steel back splash integral with top
4. 3/4" FSC wood products grade millwork base cabinets with hinged doors in accordance with section 01354 LEED for Schools
5. 3/4" sub top under-layment (to support the stainless steel counter top)
6. Toe kick base
7. Neutral melamine interior finish
8. Standard laminate color exterior finish
9. Heavy duty brushed satin hardware pulls, drawer slides, door locks and hinges
10. Owner/Architect to select laminate color.

Item 10 Wall Cabinets

Quantity: One lot
Manufacturer: Custom fabrication
Model: Custom millwork fabrication, 7'-0" long x 6'-6" long x 30" high x 12" deep
Notes:
1. Size and configuration per drawing
2. 3/4" FSC wood products grade millwork wall cabinets with hinged doors in accordance with section 01354 LEED for Schools
3. Neutral melamine interior finish
4. Standard laminate color exterior finish
5. Heavy duty brushed satin hardware pulls, door locks and hinges
6. Owner/Architect to select laminate color.

Item 11 Wall Flashing

Quantity: One lot
Manufacturer: Custom fabrication
Model: Custom stainless steel fabrication
Notes:
1. Size and configuration per drawing
2. Stainless steel construction, 20 gauge
3. 78" high x full length of exhaust hood
4. 6" wide vertical fluting
5. Trim at each vertical seam
6. J-trim at each end

Item 12 Exhaust Hood, Class One

Quantity: One each
Manufacturer: Gaylord Industries
Model: GX2-BDL-54*L043
Notes:
1. 7'-6" long x 54" wide x 24" high
2. Stainless steel construction, 18 gauge

3. Stainless steel enclosure on left end of hood for fire suppression system and Melink Intelli-hood system
4. Melink Intelli-hood system with I/O processor, key pad, exhaust & supply fan VFD's mounted in enclosure, optical sensors, temp sensor for LEED compliance
5. Pre-wired incandescent light fixtures (two)
6. Pre-wired fan & light switch mounted on the front face of the hood
7. Extractor removal tool
8. 18 gauge stainless steel closure panels from the top of the hood to the finished ceiling.
9. 120 volt

Item 13 Restaurant Range, Electric (Alternate Bid 2)
Quantity: One each
Manufacturer: Garland
Model: SS686*L043

1. Stainless steel finish
2. 17" high stainless steel back guard assembly with a slotted black enameled angle cap
3. Casters (two with brakes)
4. Seismic restraint cable
5. Dormont caster positioning plate
6. 208 volt/3 phase/72 amp

Item 14 Convection Oven, Electric (Existing)
Quantity: One each
Manufacturer: Southbend
Model: SLES-20SC
Notes: 1. 208 volt/3 phase

Item 15 Fire Suppression System
Quantity: One each
Manufacturer: Ansul
Model: R102*L043
Notes:

1. Wet chemical fire suppressant liquid
2. Chrome plated exposed piping
3. Micro-switch for electrical shunt trip breaker activation
4. Dual micro-switch for building fire system notification & fan shut-down
5. Remote activation station at the exit door
6. K-class hand held fire extinguisher, mounted at 34" AFF

Item 16 Milk Cooler (Alternate Bid 2)

Quantity: One each
Manufacturer: True Mfg
Model: TMC-58-SS*L043
Notes:
1. Stainless/white exterior finish with Holstein cow pattern
2. Stainless steel interior finish
3. Casters
4. Sixteen milk crate capacity
5. 120 volt with cord & plug

Item 17 Cashier Station (Alternate Bid 2)

Quantity: One each
Manufacturer: Duke Mfg
Model: TCS-30PG*L043
Notes:
1. Stainless steel construction
2. Tray slide, solid stainless steel with hinged brackets
3. Grommeted top cutout for POS unit power cord
4. Powder coat paint color (Owner/Architect to select from standard colors)
5. Casters, 5" polyurethane. NSF listed
6. Accessory electric outlet with an 8'-0" cord & NEMA 5-15 plug
7. 120 volt/20.0 amp

Item 18 Hot Food Station (Alternate Bid 2)

Quantity: One each
Manufacturer: Duke Mfg
Model: TEHF-60DPG*L043
Notes:
1. Stainless steel construction
2. Powder coat paint color (Owner/Architect to select from standard colors)
3. Casters, 5" polyurethane. NSF listed
4. TS530-60 breath guard with stainless steel shelf and black powder coat ends
5. Drain manifold with master drain valve
6. Rubber corner bumpers
7. 208 volt/1 phase with 8'-0" long cord & NEMA L6-30 plug

Item 19 Spare Number

Item 20 Roll Down Counter Door

Quantity: Two each
Note:
1. Provided and installed in another section.

Item 21 Pass Thru Counter Ledge
Quantity: One each
Manufacturer: Custom Fabrication
Model: Custom stainless steel fabrication
Notes: 1. Size and configuration per drawing
2. Stainless steel construction, 16 gauge
3. 34" long x 11" wide x 1.5" high
4. 3" overhang on kitchen side
5. Stainless steel support under-structure

Item 22 Transport Cabinet (Alternate Bid 2)
Quantity: Two each
Manufacturer: Cambro
Model: UPC1600F*L043
Notes: 1. Built-in Fahrenheit thermometer
2. Casters
3. Standard color (Owner/Architect to select plastic color)

Item 23 Garbage Disposal
Quantity: One each
Manufacturer: In-Sink-Erator
Model: SS-100-5-MSLV*L043
Notes: 1. Model MSLV electrical control
2. No. 5 sink flange mounting assembly
3. Stainless & chrome finish
4. Syphon breaker, flow control, solenoid valve accessory package
5. 208 volt/1 phase

Item 24 Three Compartment Sink
Quantity: One each
Manufacturer: Universal Stainless Inc
Model: 3N-2430-LD42-RD48*L043
Notes: 1. Stainless steel construction, 16 gauge
2. Stainless steel legs, cross-rails and adjustable feet
3. Fisher back splash mounted faucets model 84824 (one each)
4. Fisher back splash mounted spray rinse model 34460 (one each)
5. Fisher lever waste drains with overflow model 22322 (three each)
6. Lever waste handle support brackets (three each)
7. Flat back splash around building column
8. Custom angle configuration per drawing
9. Sound deadening under sink bowls and drainboards
10. Disposer control bracket
11. Sink bowl with disposal to be 10" deep

Item 25 Pot Rack (Alternate Bid 2)

Quantity: One each
Manufacturer: Universal Stainless Inc
Model: PR-WD-72-S*L043
Notes: 1. Stainless steel construction
2. Wall mounted
3. Mount top rail at 72" AFF

Item 26 Dishwasher, Undercounter, High Temp

Quantity: One each
Manufacturer: Hobart
Model: LXIH-4*L043
Notes: 1. 70º rise booster heater
2. Hot water sanitization
3. Detergent and rinse aid pumps
4. Dish racks (two each)
5. Stainless steel construction
6. 208 volt/1 phase/37.7 amps
7. Energy Star rated

Item 27 Preparation Counter with Sink

Quantity: One each
Manufacturer: Universal Stainless Inc
Model: 9SLS-48 modified*L043
Notes: 1. Stainless steel construction, 16 gauge
2. Stainless steel legs, cross-rails and adjustable feet
3. Stainless steel under shelf, 18 gauge
4. Fisher deck mounted faucet model 3315
5. Fisher lever waste drains with overflow model 22322
6. Lever waste handle support bracket
7. Stainless steel roller bearing drawer, 15"W x 20"L, with plastic insert
8. Double faced electrical outlet box (CHG model R58-1020) with GFI outlets and stainless steel cover plates

Item 28 Table Mounted Shelf

Quantity: One each
Manufacturer: Universal Stainless, Inc
Model: TSS-10724*L043
Notes: 1. Stainless steel construction, 16 gauge
2. Stainless steel legs
3. Mount and pre-wire 120volt/20 amp outlet to the underside of the over shelf
4. Pre-wire outlet to J-box under item 27 preparation counter

Item 29 Trash Can
Quantity: Two each
Note: 1. Provided & installed by owner.

Item 30 Convection Microwave (Alternate Bid 2)
Quantity: One each
Manufacturer: Sharp
Model: R-8000G*L043
Notes: 1. Stainless steel finish in/out
2. 13" diameter turntable
3. Digital display
4. 1.1 cubic feet capacity
5. Ten pre-programmable push buttons
6. 208 volt/1 phase/3.3 KW/16 amp with a cord & NEMA 6-20 plug

Item 31 Spare Number

Item 32 Washer/Dryer
Quantity: One each
Note: 1. Provided & installed by owner.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION OF EQUIPMENT

A. Supervision: An experienced, competent superintendent representing the Kitchen Equipment Contractor shall be present during progress of their work.

3.2 TEMPORARY FACILITIES AND HANDLING

A. It shall be the Kitchen Equipment Contractor's responsibility to coordinate with the prime contractor to furnish and provide temporary power and light, openings and storage space to permit scheduled delivery of equipment.

B. The Kitchen Equipment Contractor shall verify all pertinent dimensions of the building and examine conditions affecting proper installation of equipment. Evaluate access of door openings, passages and conditions at the building for moving equipment into the kitchen, and coordinate with prime contractor as necessary. KEC to be responsible for any special handling charges.

3.3 CONDITIONS AND PREPARATION

A. Inspect flooring and wall finishes. Verify existence of required mechanical and electrical rough in. Check walls, ceiling and floor and all related work of other trades for readiness to receive installation of kitchen equipment. Sweep clean all floor areas before setting equipment in place. Remove any spillage of foreign matter.

B. Coordinate with the prime contractor's project superintendent as to the proper sequence for installation of equipment. Report any unsafe conditions immediately project superintendent.

3.4 TRIMMING AND SEALING EQUIPMENT

A. All gaps, joints and seams between fixtures and walls, ceilings and/or floor shall be completely closed and sealed with stainless steel trim strips or angles, or silicone sealant (Dow Corning No. #782 or equal).

B. All exposed ends of back splashes shall be capped with stainless steel, welded, ground smooth and polished.

C. Ends of all fixtures, back splashes and shelves, shall be finished flush to walls or adjoining fixtures.

D. Anchor the flanged feet or pin the adjustable feet on the opposite corner legs of all island worktables as detailed in the SMACNA guidelines. Ends of all fixtures, back splashes and shelves shall be finished flush to walls or adjoining equipment. Attach all back splashes that abut the wall with wall clips.

3.5 CLEANING

A. All debris, crates and packages resulting from this work shall be removed from the premises or to an area designated by the prime contractor.

B. All food service equipment shall be cleaned and ready for use when the structure is turned over to the owner. Protection of completed and cleaned work shall be the responsibility of the Kitchen Equipment Contractor.

3.6 ADJUSTMENT OF EQUIPMENT AND DEMONSTRATION

A. Turn on all mechanical and electrical equipment to verify proper operation. Test for leaks, poor connections, inadequate or faulty performance and correct as necessary. Adjust all equipment for proper operation. All refrigeration equipment shall be operated for a sufficient length of time to show controls are functioning as intended.

B. At a time and date selected by the owner representative, the Kitchen Equipment Contractor shall arrange for a demonstration of the operation and basic maintenance of all mechanical and electrical equipment for the owner or his appointed representatives. A representative of the Kitchen Equipment Contractor must be in attendance at all demonstrations.

END OF SECTION 11400

SECTION 11450 - RESIDENTIAL EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Residential Kitchen appliances.

1.2 REFERENCE STANDARDS

A. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.3 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in City and Borough of Juneau & Juneau School District's name and registered with manufacturer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Electric Appliances: Listed and labeled by UL and complying with NEMA standards.

1.5 WARRANTY

A. See Section 01700 - Project Closeout, for additional warranty requirements.

B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

C. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.

PART 2 - PRODUCTS

2.1 KITCHEN APPLIANCES

A. All Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Refrigerator: bottom-mounted freezer, cycle-defrost.

1. Capacity: Total minimum storage of 20 cubic ft (0.56 cu m); minimum 15 percent freezer capacity.

2. Energy Usage: Minimum 50 percent more energy efficient than energy efficiency standards set by DOE.

3. Features: Include glass shelves.

4. Finish: Porcelain enameled steel, color white.

5. Basis of Design: Whirlpool W1TXEMMWQ

6. Quantity: 1 in locations indicated in plan.

7. Manufacturers:
   a. Frigidaire Home Products: www.frigidaire.com.
   b. GE Appliances: www.geappliances.com.
   c. Whirlpool Corp: www.whirlpool.com.
   d. Substitutions: See Section 01600 Materials and Equipment.

C. Microwave: Countertop.

1. Capacity: 0.7 cubic ft (0.019 cu m).

2. Power: 850 watts.

3. Features: Include turntable and 2-speed exhaust fan.

4. Finish: Black.

5. Basis of Design: GE Profile Spacemaker II

6. Quantity: 2 in locations indicated in plan.

7. Manufacturers:
   a. Frigidaire Home Products: www.frigidaire.com.
   b. GE Appliances: www.geappliances.com.
   c. Whirlpool Corp: www.whirlpool.com.
   d. Substitutions: See Section 01600 Materials and Equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify utility rough-ins are present and correctly located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.3 ADJUSTING

A. Adjust operating equipment to efficient operation.

3.4 CLEANING

A. Remove packing materials from equipment.

B. Wash and clean equipment.

END OF SECTION 11450

SECTION 12494 - CURTAIN TRACK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Extruded aluminum track.

B. Nylon carriers, cords, and accessories.

C. Drapery/Curtain material

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordinate location and installation of concealed blocking for support of tracks.

1.3 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide track profiles, shapes, acceptable load data, and finishes available.

C. Shop Drawings: Indicate end track location, width of window opening, location of blocking for anchors, appurtenances and interferences, adjacent construction, operating hardware, and support bracket details.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Tracks: Extruded aluminum, bi-parting operating traverse rods, regular duty channel track.

B. Track Brackets: Formed steel ceiling type, for surface/T-grid installation, with screws, clamps and inserts for attachment.

C. Carriers: Nylon roller 3 per foot (10 per m).

D. Control Wand: Extruded aluminum; square shape; non-removable type; length of opening height less 3 inches (75 mm).

E. Track Enclosure: Pre-finished, formed aluminum box; internally fitted with hardware for operation.

F. Drapery/Curtain material: Manufacturers standard healthcare type privacy drape; floor to ceiling height less 6", with hemmed edges. One curtain per track, full length of track.

2.2 FINISHES

A. Exposed Surfaces: Baked enamel, white.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that concealed anchors are in correct position.

3.2 INSTALLATION

A. Install curved drapery tracks and drapery in accordance with manufacturer's instructions.

END OF SECTION

SECTION 12495 - ROLLER SHADES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes roller shades and motorized shade operators.

B. Related Sections include the following:

1. Division 6 Section "Finish Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

2. Division 16 Sections for electrical service and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized shade operation.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

1. Motorized Shade Operators: Include operating instructions.

2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.

1. Motorized Shade Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.

2. Wiring Diagrams: Power, system, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension system members and attachment to building structure.

2. Ceiling-mounted or penetrating items including light fixtures, air outlets and inlets, speakers, sprinklers, recessed shades, and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.

3. Shade mounting assembly and attachment.

4. Size and location of access to shade operator, motor, and adjustable components.

5. Minimum Drawing Scale: 1/4 inch = 1 foot.

D. Samples for Verification:

1. Complete full-size operating unit not less than 16 inches wide for type of roller shade indicated.

2. For the following products:
   a. Shade Material: Not less than 12-inch- square section of fabric, from dye lot used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of material.
   b. If applicable, retain or revise subparagraph below if product Samples suit Project.
   c. Valance: Full-size unit, not less than 12 inches long.

E. Window Treatment Schedule: For roller shades. Use same designations indicated on Drawings.

F. Product Certificates: For each type of roller shade, signed by product manufacturer.

G. Qualification Data: For Installer.

H. Product Test Reports: For each type of roller shade.

I. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:

1. Methods for maintaining roller shades and finishes.

2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.

3. Operating hardware.

4. Motorized shade operator.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Source Limitations: Obtain roller shades through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Resistance Ratings: Passes NFPA 701.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Product Standard: Provide roller shades complying with WCMA A 100.1.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, lead-free designation, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 PRODUCTS

2.1 ROLLER SHADES (WINDOW ROLLER BLINDS)

A. Basis-of-Design Product: MechoShade Systems Inc., “Mecho/5” manual shades with fascia, and “Electro/2" with recessed ceiling pocket, motorized shades. Subject to compliance with

requirements of these specifications, provide these roller shade stems, or a comparable product by one of the following:

1. Am-Source International
2. BTX Window Automation, Inc.
3. Custom Laminations, Inc.
4. Draper Inc.
5. Hunter Douglas, Inc.; Hunter Douglas Window Fashions Division.
6. Levolor; Levolor-Kirsch Window Fashions; a Newell Rubbermaid Company.
7. Lutron Shading Solutions by VIMCO.
8. MechoShade Systems, Inc.
9. Nysan Shading Systems Ltd.
10. Shade Techniques, Inc.
11. Silent Gliss USA, Inc.
12. SMAutomatic, Inc.
13. Sol-R-Veil.
14. Verosol USA, Inc.; OEM Shades Inc.

B. Shade Band Material: Room darkening, non-pvc, non-offgassing, coated fabric. Basis of Design: "Roc-rol" by Rockland.

1. Fabric Width: As required to accommodate window types on drawings.
2. Pattern/Style: dense vertical weave
3. Colors: As selected by Architect from manufacturer's full range
4. Material Openness Factor: <3% open
5. Bottom Hem: Straight

C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with manufacturer's standard method for attaching shade material. Provide capacity for

one roller shade band(s) per roller, unless otherwise indicated.

D. Direction of Roll: Regular, from back of roller

E. Mounting Brackets: Fascia end caps, fabricated from steel finished to match fascia or headbox.

F. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length coordinated with length of shades provided for window type, removable design for access.

G. Bottom Bar: Steel or extruded aluminum, with plastic or metal capped ends. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.

H. Mounting: Outside mounting typical, permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

I. Shade Operation: Manual; with continuous-loop bead-chain, clutch, and cord tensioner and bracket typical, with cordless system lift operator at all classroom and office windows.

1. Position of Clutch Operator: Left side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated.

2. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.

3. Lift-Assist Mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades.

4. Loop Length: Length required to make operation convenient from floor level.

5. Bead Chain: Stainless steel

6. Cord Tensioner Mounting: Sill.

7. Shade Coupler System: Designed for simultaneously operating two and three shade rollers with a single Clutch. Provide system for each group of shades.

8. Operating Function: Stop and hold shade at any position in ascending or descending travel.

J. Shade Operation: Motorized operator. Power operators to be provided at Commons 50 windows (both clerestory and main level), the high window in the library on gridline C at Library 83).

2.2 ROLLER SHADE (BLIND) FABRICATION

A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.

B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

1. Lifting Mechanism: With permanently lubricated moving parts.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.

a. From Sheets A12.8 and A12.9: Types D.1, D.2, I, K, 05A, 05A, 05B, 06,07, 08.

2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

a. Motorized roller shade at commons 145 (high clerestory windows, type11), manual roller shade at rooms 144A, 144B and 125.

D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, headbox, roller, and operating hardware and for hardware position and shade mounting method indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

G. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range.

2.3 MOTORIZED ROLLER SHADE (BLIND) OPERATORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product provided or recommended by the basis-of-design roller shade manufacturer, or a comparable product by one of the following:

1. Manufacturer of roller shade (MechoShade Systems, Inc.)

2. Elero USA Inc.

3. SIMU US, Inc.

4. SOMFY Systems.

B. General: Provide factory-assembled motorized shade operation systems designed for lifting shades of type, size, weight, construction, use, and operation frequency indicated. Provide operation systems of size and capacity and with features, characteristics, and accessories suitable for Project conditions and recommended by shade manufacturer, complete with electric motors and factory-prewired motor controls, remote-control stations, remote-control devices, power disconnect switches, enclosures protecting controls and all operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.

C. Comply with NFPA 70.

D. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6 with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

E. Electric Motors: UL-approved or -recognized, totally enclosed, insulated motor, complying with NEMA MG 1, with thermal-overload protection, brake, permanently lubricated bearings, and limit switches; sized by shade manufacturer to start and operate size and weight of shade considering service factor or considering Project's service conditions without exceeding nameplate ratings.

1. Service Factor: According to NEMA MG 1, unless otherwise indicated.

2. Motor Characteristics: Single phase, 24V, 60 Hz.

3. Motor Mounting: Within manufacturer's standard roller enclosure.

F. Position of Motor and Electrical Connection: Left side of roller, as determined by hand of user facing shade from inside, unless otherwise conflicting with existing building conditions and wiring access.

G. Remote and Grouped Controls: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following devices for remote-control activation of shades:

1. Control Stations: Keyed, momentary-contact, three-position, switch-operated control station with open, close, and off functions. Provide two keys per station.
   a. Product: Subject to compliance with requirements, provide "Decora Plus" by Leviton Manufacturing Co. Inc. Ivory.

H. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop shade at fully raised and fully lowered positions.

I. Operating Function: Stop and hold shade at any position.

J. Operating Features: Include the following:

1. Group switching with integrated switch control; single face plate for multiple switch cut-outs.

2. Capable of accepting input from building automation control system.

3. Override switch.

4. Backup gear and crank operator for manual operation during power failures with detachable handle, length required to make operation possible from nearest access platform point.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

2. Coordinate blind width and height with window types indicated and existing window sizes at each indicated location. Note coordination with existing and new heating plumbing piping and pipe hangars - this will require coordination with plumbing contractor to ensure complete installation. Blind is to extend full width of each window opening in as few panels as is reasonably possible.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Connections: Connect motorized operators to building electrical system.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain roller shades. Refer to Division 1 Section Demonstration and Training."

END OF SECTION 12495

SECTION 13720 – ACCESS CONTROL SYSTEM

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes proximity card readers, motion detectors and associated components.

1.3 DEFINITIONS

A. ES: Electric door strike

B. PROX: Proximity

1.4 SYSTEM DESCRIPTION

A. The access control system's primary function shall be to regulate access through specific doors, during non-school hours.

B. The system is existing and is a Lenel system. Obtain the existing software from the owner. Update the software if required. Update the existing site controller if required to run the software.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product data, including installation instructions.

B. Operating and Maintenance Instructions: Submit manufacturer's operating and maintenance instructions..

C. Warranty: Submit manufacturer's standard warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Lenel Corporation.

B. Installer Qualifications:
   1. Trained/Certified in installation and service by at least one manufacturer of access control systems.
   2. Must have a minimum of 2 years experience with access control systems.

1.7 DELIVERY, STORAGE & HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials indoors, in a clean, dry area in accordance with manufacturer's instructions.

C. Handling: Protect materials and finishes during handling and installation to prevent damage.

PART 2- PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

   1. Lenel or Lenel Compatible Equipment.

2.2 EQUIPMENT

A. On-Line Electronic Access Control System: Lenel.
   1. System shall have capability to perform:
      a. Access control.
      b. Alarm monitoring.
      c. Identification badging.
      d. Mustering
      e. Scheduling actions
      f. Reports
      g. Programmable relay control.
      h. View events in real time.
      i. Print selected events in real time.
      j. Elevator control.
      k. Controlled by a computer
      l. UL 294 listed

B. Software Design:
   1. Use existing software. Purchase software upgrade if needed.

C. System Hardware:
   1. System shall be able to be configured from 1 to 20 access readers for each site control unit.
   2. Controllers shall have capacity of memory support, including real-time clock for a minimum of 24 hours, in case of AC loss of power and battery backup is exhausted.
   3. System shall use a fully-distributed architecture in which system alarms, access, relays, and elevator control shall continue to function in a normal mode without computer communications.
   4. Site controller shall be able to communicate to computer via a Site Ethernet Interface, via TCP/IP protocol.
   5. Site controller shall have a local relay to monitor status of communications with door control units. In case of device failure relay will open, providing a means of triggering an external monitoring device.
   6. Site, door, relay, and elevator controller features shall have capability to be field upgraded by a firmware change. Such firmware upgrades shall be offered as needed to registered users on an exchange basis, labor not included.
   7. Door controller shall support any Wiegand standard based readers in any bit format up to 50 total; bit patterns fully programmable within software.
   8. Door controller shall read Dallas touch chip format directly without use of accessory devices.
   9. Door controller shall have ability to read Marlok™ metal keys and key readers without use of interface devices.
   10. Example supported reader types include but are not limited to: Wiegand, Mag stripe, Bar Code, Proximity, Dallas Touchkey, Keypad, Biometrics, combination keypad with Wiegand/Proximity/Magnetic stripe.
   11. Door controller shall be able to be programmed for custom ABA formats from PC software, including ability to ignore user specified characters in format.
   12. Door controller shall be programmable to accept either normal or inverted strobe signals from ABA format readers.
   13. Same door controller shall be programmed for all access reader technologies as specified by means of PC software.
   14. Site controller shall buffer last 200 events from door controllers when computer communications has been lost or terminated.
   15. Each door controller shall buffer an additional 100 events when site controller buffer has filled.
   16. All system controllers shall have a built-in tamper alarm to detect when a cover to controller is removed.
   17. Door Controller:
      a. Request to Exit input.
      b. Single reader input configuration.
      c. Located within 10 feet (3 m) of access reader.
      d. Function at full capacity without communications to computer,

and buffer events up to a maximum of 2,000 during this period.

e. Continue to function on battery backup at a minimum of 9 V DC.

18. Door and relay controller shall have Form C dry contact configuration.
19. Door and relay controller shall have relays with a minimum current rating of 24 V DC at 2 A with solid-state automatically resettable over current protection for contacts.
20. Door controller shall have a relay that can be programmed by software for: Valid User, Auto Activate, First User Auto Activate, Any User, Rejected User, or Alarm Options.
21. Relay controller shall have relays that can be configured by software for Time Zone Activation, Timed Activation, Timed Released, First Event Activation, and First Event Released.
22. Relay on door controller shall have a programmable timer and settings in software for strike and magnetic lock operation.
23. Door and relay controller shall provide a dedicated tamper alarm to monitor opening of controller mounting boxes.
24. Site to door controller communication conform to EIA RS-485 for a recommended total cable length of 5,000 feet (1,524 m).
25. Power Supply:
    a. Battery backup capable of providing power for system during temporary AC power outage.

D. System Access Readers/Cards:

1. Reader: As specified on the plans. See sheet E4.7.

E. Reader Interface Module (Door controller):

1. Description:
    a. Designed to control a single access point.
    b. Contains a real-time clock and sufficient memory to provide access control independent of main PC.
    c. Transaction history shall be automatically buffered when not on line with PC.
    d. Priority event buffer assures alarms are annunciated in a timely manner even if history buffer is full.
2. Power: 9 to 14 V DC, supplied by central power supply; 80 to 110 mA, depending upon reader technology. 225 mA additional required during unlock of Marlok rotating cylinder (7 seconds maximum). Accessory relays require additional 20 mA each.
3. Power Protection: Reverse polarity, over voltage, transient.
4. Reader Technologies Supported: Marlok key, Wiegand card (any bit format up to 50), ABA/ISO Track 2, proximity, keypad, combination reader/keypad, Dallas TouchKey, biometrics.
5. Reader Interfaces Supported: Marlok, clock/data, clock/data inverted, Dallas touch, Wiegand.
6. History Buffer: 2,000 transactions.
7. Priority Event Buffer: 100 transactions.
8. On-Board Memory and Clock Backup: 24 hours minimum.
9. Maximum Users Stored in Memory: 10,000.

10. Alarm Input Points: 7 total, 2-wire supervised (EOL resistor) including built-in door contact monitoring.
11. Alarm Input Monitoring Circuit: Analog to digital conversion.
12. Tamper Alarm: On-board switch.
13. Output Relays: 2 each with Form C contacts rated 2 A, 30 V.
14. Output Relay Contact Protection: Solid-state polymeric resettable.
15. Connectors: 5 mm plug-on screw terminal.
16. Address Switches: Rotary, direct-reading 00 to 99.
17. Communications: Multi-drop RS-485, proprietary protocol.
18. Operating Environment:
    a. Between 14 degrees F and 104 degrees F (-10 degrees C and 40 degrees C).
    b. Less than 90 percent noncondensing humidity.
19. Dimensions, Mounted in Back Box: 10-1/2 inches high x 4-3/4 inches wide x 1-3/4 inches deep (267 mm high x 121 mm wide x 44 mm deep).
20. Weight, Mounted in Back Box: 5.0 pounds (2.3 kg).

F. Site Controller:
1. Reuse Existing Site Controller. Upgrade site controller as required.

G. Power Supply:
1. Power: [120 V AC, 60 Hz, 2 A, unswitched] .
2. Fuses: 2 A AC input slow-blow, 1 A AC input (export), 8 A (battery output protection).
3. Output: 13.8 V DC nominal, 5 A maximum.
4. Battery Backup: 2 gelled lead acid cell, 6 V DC, 8.0 Ah, supplied with power supply.
5. Alarm Outputs: Cover tamper switch and AC or power supply failure (dry contacts).

H. Site Ethernet Interface:
1. Description: Designed to provide communications between system software on a Windows PC and site control unit(s) by means of Ethernet networks utilizing TCP/IP protocol.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine conditions for compliance with requirements for installation tolerances, power characteristics, and other conditions affecting performance of transient voltage surge suppressors. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Install electronic access control system in accordance with manufacturer's instructions.

C. Install system at locations as indicated on the drawings.

D. Provide door hardware per Architecture specifications. Provide door switches, electric strikes, door operators, power supplies, readers, panic bars, and associated electrical, request to exit devices, and all other hardware that is required to provide an operational access control system as shown on the plans and described in the specifications. Provide all wiring between components. Provide all system set up and programming.

E. Install electrical wiring to on-line system components as specified in Section 16100.

F. Use manufacturer's supplied hardware.

G. Replace defective or damaged components.

3.2 GROUNDING

A. Connect transient voltage suppression circuit in line-to-neutral configuration if a neutral conductor is available.

B. Ground each transient voltage surge suppressor enclosure.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Test completed installation to verify each component of electronic access control system is properly installed and operating.

3.4 ADJUSTING

A. Adjust electronic access control system as required to perform properly.

B. Adjust locksets for smooth operation without binding.

3.5 CLEANING

A. Clean surfaces in accordance with manufacturer's instructions.

B. Use cleaners approved by manufacturer, as some cleaners may damage keylok/keyreaders.

C. Do not use abrasive cleaners.

3.6 DEMONSTRATION

A. Provide a maximum of 2 consecutive days of on-site service by manufacturer.

1. Demonstrate system to Owner's personnel.
2. Train Owner's personnel in proper operation and maintenance.

END OF SECTION

SECTION 13910 - FIRE PROTECTION BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe, fittings, valves, and connections for sprinkler systems.

1.2 RELATED REQUIREMENTS

A. Section 09900 - Paints and Coatings: Preparation and painting of fire protection piping systems.

B. Section 13915 - Identification for Fire Suppression Piping and Equipment: Piping identification.

C. Section 13925 - Fire Suppression Sprinklers: Sprinkler systems design.

D. Drawings and general provisions of the Contract, including General, Supplementary Conditions, and all Divisions Specification Sections, apply to this Section.

1.3 SUMMARY OF WORK

A. Provide a renovation to the existing sprinkler system in Project Area and where otherwise noted and required. Replace all upright and pendent sprinkler heads in the original building area; essentially plan west of grid B and plan north of grids 5 and 4. Modify sprinkler drop locations as required so heads are located in center of tile (in one direction only) and symmetrically according to new ceiling layout. In addition:

1. All areas without exposed structural ceilings shall have concealed sprinkler piping with upright heads and recessed heads.

2. Provide recessed heads in all finished ceilings. Upright and pendent heads are acceptable in exposed ceiling areas. Exposed piping and heads in Commons area shall be coordinated with architectural layout for minimum exposure of piping.

3. Coverage shall be provided for above and below ceiling for entire project area.

4. Contractor shall provide connections to the existing sprinkler system as required hereunder to maintain continuity for seasonal Work periods and for project completion.

5. The sprinkler system in existing areas located south of Grid 5 with no Work shown shall remain as is.

6. Sprinkler piping in corridors ceiling spaces shall be removed, consolidated, and replaced to accommodate the new ductwork, piping, and electrical systems.

7. Contractor shall flush clean entire sprinkler piping system which may be split into each

seasons Work. Flushing shall meet NFPA 25 Hydraulic Method requirements.

8. Contractor shall replace all test and drain valve assemblies in project area.

B. Provide modifications to the existing wet sprinkler systems serving the entire building as required for new layout and new ceilings and for coordination with ductwork, conduits, and piping installation. Coordinate with architectural floor and ceiling plans for extent of remodel work.

C. Contractor shall obtain water flow test data on-site from the nearest fire hydrant station from the City and Borough of Juneau, if available. Otherwise Contractor shall provide test and measurement flow data. All expenses obtaining the information shall be borne by the Contractor.

D. Demolition of Existing Material, Equipment, and Systems:

1. Concrete wall and floor penetrations required. Saw cut and core drill as required. Sleeve penetrations as specified in Hangers and Support Section in Piping Material.
2. Sprinkler Contractor shall be available during Abatement Work and Demolition Work for coordination and assistance for related Work.

1.4 REFERENCE STANDARDS

A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2007.

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; The American Society of Mechanical Engineers; 2005.

C. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).

D. ASME B16.4 - Gray Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).

E. ASME B16.5 - Pipe Flanges and Flanged Fittings; The American Society of Mechanical Engineers; 2009 (ANSI/ASME B16.5).

F. ASME B16.9 - Factory-made Wrought Steel Buttwelding Fittings; The American Society of Mechanical Engineers; 2007.

G. ASME B16.11 - Forged Steel Fittings, Socket-welding and Threaded; The American Society of Mechanical Engineers; 2009.

H. ASME B16.25 - Buttwelding Ends; The American Society of Mechanical Engineers; 2007.

I. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; The American Society of Mechanical Engineers; 2004.

J. ASTM A 47/A 47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2009).

K. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

L. ASTM A 135/A 135M - Standard Specification for Electric-Resistance Welded Steel Pipe; 2009.

M. ASTM A 234/A 234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2007.

N. ASTM A 795/A 795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2008.

O. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2010.

P. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association; 2010.

Q. NFPA 25 –Inspection, Testing and Maintenance of Water-Based Fire Protections Systems; National Fire Protection Association; 2010.

R. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.5 SUBMITTALS

A. General: Provide submittals according to Conditions of Contract, Division 1 Specifications Sections, and as required hereunder. Drawings and general provisions of the contract including General, Supplementary Conditions, and all Division 1 Specification Sections, apply to this Section. Approval of the data shall not eliminate responsibility for compliance with the Drawings or Specifications unless specific attention has been called in writing to proposed deviations at the time of transmittal of the data and such deviations have been approved, not shall it eliminate the responsibility for freedom of errors of any sort in the data. All Mechanical submittal data for Project construction is to be turned in for approval at the same time in order for an efficient review process. Partial submittals may be rejected until the full submittal is received.

B. See Section 01300 - Submittals, for submittal procedures.

C. Specific Products: Trade names and catalog numbers of manufactured products included herein are intended to indicate the type, size and grade of quality of equipment and materials required and such equipment and materials are approved for installation subject to full compliance with the Specifications. Except where single manufacture is specified for standardization, requires for approval of other manufacturers than those specified must be accompanied by complete descriptions including overall dimensions, performance data, and, if catalog material, identification of specific products or items proposed.

D. Shop Drawings:

1. Submit coordinated shop drawings of the sprinkler system including all existing system features and connections. Provide shop drawings of entire project area including all existing features, piping, bracing, and systems connections. Show sprinkler phasing connections for building occupation between construction seasons.

2. Indicate pipe material used, joint methods, supports, and floor and wall penetrations seals. Indicate installation, layout, heights, weights, mounting and support details, and piping connections. Show all related systems in light format for coordination such as ductwork, lights, etc. Show entire existing sprinkler system with modifications to it for the new layout.
3. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
4. Submit shop drawings to ARCHITECT and then approved shop drawings to authority having jurisdiction for code official approval.

E. Submittal Format: All data shall be submitted at one time in neatly bound loose-leaf three ring binders with pockets and tabulated in order of Specification Division 13. All data shall be typed, minimum 10 point font, not exceptions. Data submitted that is not conforming to these specification requirements will be returned without reviewing and will need to be resubmitted at Contractors sole complete cost.

1. Each binder shall have a set of separators with index tabs A to Z. Tabs are to be printed type. Slip in tabs not acceptable.
2. The first page shall be a cover sheet with project name, address, data, submittal product name, all applicable contractors and contact information, and all applicable consultants and contact information.
3. Second page shall be a submittal manual index of all project Specification sections with respective tab numbers, and respective book number, if applicable.
4. The first page of each manuals section shall be an index of the respective project Specification section and number with each product name, manufacturer name and model number.
5. Each manuals section shall be labeled and certified by mechanical Subcontractor that the data presented is in accordance with project Specifications. Index sheet in front of completed diner listing each piece of equipment or material submitted.
6. Product Data to be utilized shall be flagged and noted and all other data shall be crossed out or otherwise flagged that it is not in the project.
7. Data shall be inserted in binders in order of Specification number. Specification number shall be clearly labeled on the each submittal page.

F. As-Built Drawings: As-Built drawings shall be required at a minimum to two times during the project and at final submittal. Interim as-builts are to provide building maintenance staff updated information as to the systems. As-builts shall accurately show all changes for Contract Document for piping, ductwork, and equipment. As-Built drawings shall be updated daily and available for inspection on-site by the ARCHITECT.

G. Operation and Maintenance Data: See Division 1 for the number of sets of data to be provided for submittal and additional requirements. Separate and complete manuals are required for the two volumes of mechanical work. Provide a minimum of four (4) copies. The following data shall be provided to the ARCHITECT for approval 30 days prior to the request for Substantial completion inspection. Except for the valve directory and nameplate directory, the data shall be provided complete at one time. Partial or separate data will be returned for completion. The valve directory and nameplate directory may be provided for approval previous to the other data. The first section of the O&M Manual shall be as listed in the following subparagraphs in order presented hereunder. All of the following subparagraphs sections shall be furnished with permanent plastic see through covers. See requirements under 1.04 E for additional submittal and formatting requirements.

1. Cover and Index sheets as in 1.04 E above.
2. Description of systems and operating instructions: The Contractor shall prepare a brief written description of all new and modified systems, explaining how the systems operate and indicating the proper settings of controls and switches. The instructions are to include all information required for the proper operation of the systems. Technical knowledge on controls or adjustments requiring specialized technicians should not be included in the instructions.
3. Manufacturers' literature: Manufacturers' instructions for operation and maintenance of all mechanical equipment and specialties, including replacement parts lists, capacity curves or charts, equipment data sheets, manufacturers' literature on the equipment, and as-built wiring diagrams and control drawings, all suitable for side binding to 8-1/2 x 11 inch size. All data not applicable to the job is to be crossed out or deleted. Manuals turned in for review with non-applicable data not crossed out shall be returned to the Contractor.
4. Maintenance instructions: Typewritten instructions for the maintenance of the systems, listing each service required on all of the mechanical equipment, including inspections, lubrication, cleaning, checking, and all other operations required. The list is to include all types of bearings installed on the equipment and the type of lubricant required.
5. Maintenance schedule: List of each item of mechanical equipment requiring inspection, lubrication, cleaning, or service including the type of bearings and type of lubricating means for each piece of equipment. Each item of equipment is to be listed separately with the service required. List to include the times during the year when such inspection and maintenance shall be performed. The specific maintenance required shall be referenced back to the maintenance instructions.
6. Valve directory: Indicating valve number, size, location, function, and normal position for each numbered valve, existing and provided hereunder. Valve directory shall be complete for the entire sprinkler system. The directory shall be provided and approved before installation of the valve tags. A sample arrangement will be furnished upon request. Two copies required for the preliminary list. See Section 13915 - Identification For Fire Suppression Piping And Equipment.
7. Guide Documents: Sample operating and maintenance instructions and maintenance schedule may be obtained from the ARCHITECT upon request, to assist in properly setting up the data.
8. Instructions To Personnel: The sprinkler Subcontractor shall instruct operating personnel in the operation and maintenance of the systems before accepting the responsibility of operation and maintenance of the systems.
9. Qualification Data: For sprinkler pipe fitters.

H. Shop Drawings: Verify on-site as-built conditions during demolition of construction if required where system is concealed. Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections. Shop drawings shall be coordinated and corrected with all other disciplines for interference and location of existing and new conditions prior to submittal to ARCHITECT.

I. Submit prior to Substantial Completion Inspection and Final Inspection a detailed list of equipment and systems that will NOT be completed for the completion date. Include status and information of deficiencies from all previous inspection reports.

J. Submit prior to Re-inspections of Substantial Completion Inspections, if applicable, and the Final Inspection a marked copy of the previous Engineers Inspection Reports detailing all items that have been completed and all items that have not been completed with reasons thereof. Re-inspection or Final Inspection will not occur until receipt of this list.

1.6 COOPERATIVE WORK

A. The Work hereunder shall be coordinated between various mechanical sections and with the Work specified under other divisions or contracts toward rapid completion of the entire project. If any cooperative Work must be altered due to lack of proper supervision hereunder, or failure to make proper provisions in time, then the Work hereunder shall include all expense of such changes as are necessary to be made in the Work under other divisions and contracts, and such changes shall be directly supervised by the ARCHITECT and shall be made to the satisfaction of the ARCHITECT.

B. In general pitched piping and ductwork shall take preference in location within the project area. Coordination of all drain valves, duct access doors, and other equipment requiring access and maintenance procedures is required with all building components during construction for maximum accessibility and proper location as intended.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section documented experience. approved by manufacturer.

C. Conform to UL and FM requirements.

D. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.9 EXTRA MATERIALS

A. See Section 01600 – Materials and Equipment, for additional provisions.

PART 2 - PRODUCTS

2.1 FIRE PROTECTION SYSTEMS

A. Sprinkler Systems: Conform work to NFPA 13.

B. Welding Materials and Procedures: Conform to ASME Code.

2.2 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A 795 Schedule 10 for 2-1/2-inch and larger and ASTM A 53 Schedule 40 for 2-inch and smaller, black. Threaded or rolled groove joints.

1. Steel Fittings: ASME B16.9, wrought steel, buttwelded.
2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
3. Malleable Iron Fittings: ASME B16.3, threaded fittings.
4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.3 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Vertical Support: Steel riser clamp.

E. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.4 BALL VALVES

A. Up to and including 2 inches:

1. Manufacturers:

a. Nibco.
b. Grinnell
c. Substitutions: See Section 01600 - Materials and Equipment.

2. Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle and balancing stops, threaded ends with union.

2.5 DRAIN VALVES

A. Ball Valve:

1. Bronze with hose thread nipple and cap.
2. Brass with cap and chain, 3/4 inch hose thread.

2.6 VALVE TAMPER SWITCH

A. Manufacturers:

1. Potter
2. ADTC
3. Grinnell

B. All-metal construction with switch housing and holder secured to valve with anchor bolts. Arranged to sense if valve is closed. Electrical connection furnished under Division 16.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Flush entire piping system of foreign matter. Contractor shall flush clean entire sprinkler piping system which may be split into each seasons Work. Flushing shall meet NFPA 25 Hydraulic Method requirements.

3.2 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Sleeve pipes passing through partitions, walls, and floors.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Pipe Hangers and Supports:

1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
2. Place hangers within 12 inches of each horizontal elbow.
3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

I. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding. Refer to Section 09900.

J. Do not penetrate building structural members unless indicated.

K. Provide sleeves when penetrating footings, floors, and walls. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

M. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

N. Install valves with stems upright or horizontal, not inverted. Remove protective coatings prior to installation.

O. Install Valve Tamper Switches on both isolating valves at the backflow preventer at the sprinkler header. Coordinate fire alarm connection with electrical division.

P. Provide drain valves at main shut-off valves, low points of piping and apparatus.

Q. Replace all drain valve and inspector test assemblies in the building.

END OF SECTION

SECTION 13915 - IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Markers.

1.2 RELATED REQUIREMENTS

A. Section 09900 - Paints and Coatings: Identification painting.

B. Drawings and general provisions of the Contract, including General, Supplementary Conditions, and all Divisions Specification Sections, apply to this Section.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

B. ASTM D 709 - Standard Specification for Laminated Thermosetting Materials; 2001 (Reapproved 2007).

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide manufacturers catalog literature for each product required.

C. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

D. Project Record Documents: Record actual locations of tagged valves.

PART 2 - PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Control Panels: Nameplates.

B. Pumps: Nameplates.

C. Small-sized Equipment: Tags.

D. Valves: Nameplates and ceiling tacks where above lay-in ceilings.

2.2 NAMEPLATES

A. Manufacturers:

1. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
2. Seton Identification Products: www.seton.com.
3. Substitutions: See Section 01600 - Product Requirements.

B. Description: Laminated three-layer plastic with engraved letters.

1. Letter Color: White.
2. Letter Height: 1/4 inch.
3. Background Color: Black.
4. Thickness: 1/8 inch.

2.3 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
2. Brady Corporation: www.bradycorp.com.
3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
4. Seton Identification Products: www.seton.com.
5. Substitutions: See Section 01600 - Product Requirements.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.
2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
3. MIFAB, Inc.: www.mifab.com.
4. Seton Identification Products: www.seton.com.
5. Substitutions: See Section 01600 - Product Requirements.

B. Color: Conform to ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.5 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows: Sprinkler Valves – red.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Identify all existing and new piping, valves, and equipment. Use tags on piping 3/4 inch diameter and smaller.

1. Identify service.
2. Install in clear view and align with axis of piping.
3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

F. Locate ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment. Locate all valves in the facility, existing and new.

END OF SECTION

SECTION 13925 - FIRE SUPPRESSION SPRINKLERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

1.2 RELATED REQUIREMENTS

A. The sprinkler mechanical work is governed by the entirety of the Specification Divisions not only Division 13 and 15. The entire specification must be examined for requirements related to the Work hereunder. The Work covered by this and all other Mechanical Subsections consists of furnishing labor, equipment, and materials in accordance with the specifications and drawings, together with any incidental items not shown or specified which can be reasonably inferred or taken as belonging to the Work and necessary in good practice to provide a complete and operating system described or shown as intended.

B. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

C. Section 13910 - Fire Protection Basic Materials and Methods: Pipe, fittings, and valves.

D. Section 13915 - Identification for Fire Suppression Piping and Equipment.

E. Drawings and general provisions of the Contract, including General, Supplementary Conditions, and all Divisions Specification Sections, apply to this Section.

1.3 REFERENCE STANDARDS

A. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

B. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

C. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association; 2010.

D. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Pre-Construction As-Built: An on-site pre-construction as-built of the entire sprinkler system is required for design of system and production of shop drawings. Incorporate the existing system as-built features into the submittal shop drawings. Shop drawings of existing sprinkler systems are available for the Multipurpose/Gym area but all other areas do not have shop drawings and are the responsibility of the Contractor to locate and identify all existing features. The construction documents show original construction drawing locations for sprinkler piping and heads but have not been verified.

D. Shop Drawings:

1. Scale drawings to indicate layout of finished ceiling areas indicating sprinkler locations, lights, diffusers, and all obstructions coordinated with ceiling installation. Indicate detailed pipe layout, header layout diagram, hangers and supports, sprinklers, components and accessories. Indicate system controls. Indicate all test valves. Show existing sprinkler piping throughout the entire building. An on-sire as-built of the entire sprinkler system is required prior to design of system and prior to design of system and production of shop drawings. Work is to be done in two seasons/phases so provide phased shop drawings showing all interconnections as applicable.
2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.

E. Product Data: Submit data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections. Unless approved by the Engineer all equipment shall be the same manufacturer for compatibility purposes.

F. Fire Marshal Submittal: Submit Engineer Approved drawings, product data, and calculations to Fire Marshal for approval. Data a drawings shall not be submitted until approved by reviewing Engineer.

G. Design Data: Submit design calculations signed and sealed by State of Alaska licensed Professional Engineer of Alaska Certified Sprinkler Design.

1.5 CLOSEOUT SUBMITTAL

A. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

B. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

C. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.

1. See Section 01600 – Materials and Equipment, for additional provisions.
2. Extra Sprinklers: Type and size matching those installed, in quantity required by

referenced NFPA design and installation standard.

3. Sprinkler Wrenches: For each sprinkler type.
4. Supply metal storage cabinet located adjacent to alarm valve.

1.6 QUALITY ASSURANCE

A. Peform Work in accordance with NFPA 13 and State of Alaska Requirements.

B. Maintain one copy of referenced design and installation standard on site.

C. Conform to UL requirements.

D. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in Juneau, Alaska.

E. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

F. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience approved by manufacturer.

G. Design system under direct supervision of a Professional Engineer or Certified Sprinkler Designer experienced in design of this Work, minimum of 3 years related experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 - PRODUCTS

2.1 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building:

B. Occupancy: Light hazard; comply with NFPA 13.

C. Water Supply: Determine volume and pressure from water flow test data.

D. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.3 SPRINKLERS

A. Manufacturers:

1. TYCO.
2. Central Systems
3. Grinnell Corp.
4. Reliable Sprinkler Corp.

5. Star Sprinkler Corp.

B. Suspended Ceiling Type: Recessed pendant type with matching push on escutcheon plate.

1. Finish: Brass.
2. Escutcheon Plate Finish: Brass.
3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

C. Exposed Area Type: Standard upright type with guard.

1. Finish: Brass.
2. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

D. Sidewall Type: Standard horizontal sidewall type with matching push on escutcheon plate and guard.

1. Finish: Brass.
2. Escutcheon Plate Finish: Brass.
3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Place pipe runs to minimize obstruction to other work.

D. Place piping in concealed spaces above finished ceilings.

E. Center sprinklers in one direction only in ceiling tile with location in other direction variable, dependent upon spacing and coordination with ceiling elements. Modify branch piping as required for new head location in all areas.

F. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

G. Hydrostatically test entire system.

H. Require test be witnessed by Fire Marshal and ARCHITECT.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 15010 - GENERAL MECHANICAL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The Mechanical Work is governed by the entire Specifications and not just Division 15. The entire Specifications must be examined for requirements relating to the Work hereunder. The Work covered by this and all other Mechanical sections consists of furnishing labor, equipment, and materials in accordance with the Specifications or Drawings, or both, together with any incidental items not shown or specified which can be reasonably inferred or taken as belonging to the Work and necessary in good practice to provide a complete system described or shown as intended.

B. Coordinate shutdown of systems with Juneau School District Maintenance Personnel. Contact name and phone number will be available through ARCHITECT.

C. Continuity of Mechanical Systems for the Building: Continuity of Mechanical systems for building sprinkler, plumbing, heating, and ventilation systems during demolition and new work shall be the responsibility of the CONTRACTOR. Building sprinkler, plumbing, heating, and ventilation systems shall be operational during occupied periods when school is in session. Shutdown of systems shall not affect Occupied portions of the building except when coordinated with the School District and the ARCHITECT. Sprinkler, plumbing, heating, and ventilation systems shall be active at all times in Occupied areas. Shutdown to Occupied portions of the building to occur after school hours upon approval of the School District. See paragraph 1.5D. Cooperative Work this Section. Temporary mechanical systems and connections, provided by the CONTRACTOR, shall be necessary during project phasing, demolition, and new Work as required to provide continuity of sprinkler, plumbing, heating, and ventilation systems. All temporary mechanical systems shall be the responsibility of the Contractor. All temporary equipment, ductwork, piping, and related appurtenances shall be removed prior to substantial complete.

D. Phasing of Work: The Work shall be constructed in phases (construction seasons). Coordinate the respective Work with all Work required in each phase. See phasing plans for detailed information. Phasing plans show work that must be completed in a specific phase or the conclusion at the end of seasonal Work; however, Mechanical Work in areas outside of the current phase limits will be required in order to have an operational system at the end of the phase.

E. Demolition of and Connection to Existing Material, Equipment, and Systems:

1. Mechanical drawings (M1.01 through M1.04) show reported as-built and contract document locations of underground piping taken from past project drawings. Contractor to determine actual existing locations of underground piping as needed without additional cost to the Owner. Contractor to utilize pipe location devices as needed. Contact ARCHITECT if actual piping locations are different than shown. Excavation shall be required to locate piping, remove piping, install piping, and connect to existing piping.

2. Where select piping and ductwork systems are shown to be partially removed for connection, prepare and protect the connection points appropriately to ensure later continuity of Work. CONTRACTOR shall provide all temporary supports as required and completely replace material and equipment that are not suitably protected during construction and becomes damaged.
3. CONTRACTOR shall provide all temporary caps for ductwork and piping as required. CONTRACTOR shall provide all temporary partitions such as air-tight air plenum separations as required to maintain continuity of systems and to not contaminate existing systems or finishes. CONTRACTOR shall remove all temporary provisions when the phase of Work is completed or earlier if required.
4. All material and equipment that are to be removed for relocation is the CONTRACTORS responsibility to suitably protect and store in a location that protects from damage. CONTRACTOR shall completely replace all relocated material and equipment that are damaged from storage and other misuse between demolition and reinstallation.
5. Where items are shown to be removed such as piping or ductwork it is to be assumed that this includes the removal of the respective system including but not limited to pipe and duct hangers, supports, conduit, wiring, valves, and other related trim and appurtenances. Piping to be removed through a floor assumes that the piping is to be capped below floor and the floor finished smooth.
6. Mechanical Contractor shall be available during Abatement Work and Demolition Work for coordination and assistance for related Work. Mechanical Contractor shall locate, isolate, and drain piping systems to be removed.
7. Concrete wall and floor penetrations required. Saw cut or core drill as required. Sleeve penetrations as specified in Section 15060. Coordinate with Architect for structural beam penetration approvals.
8. All plumbing fixtures and trim located in the respective Work phase area is to be cleaned thoroughly prior to occupancy by Owner.
9. CONTRACTOR shall submit a schedule of system work, description of Work, and phasing plan showing all material and equipment that is to be connected or maintained either temporarily or permanently for each phase of Work for approval by ARCHITECT. All mechanical systems are to be covered and accounted for in the plan and shall be submitted during the initial submittal process. Schedule shall be submitted for approval not later than 35 days after initial Work notice to proceed date.
10. Work for completion of a current phase may require work in occupied spaces adjacent, below, or above phased Work area. It is the CONTRACTOR'S responsibility to perform WORK in earlier phase or during current phase during unoccupied periods such as nights/weekends. Work in occupied areas must be coordinated and approved by the ARCHITECT.

1.2 WORDING OF THE SPECIFICATIONS

A. These Specifications are of the abbreviated or streamlined type and frequently include incomplete sentences. However, periods are used for clarity. Words such as "shall", "shall be", "the CONTRACTOR shall", and similar mandatory phrases shall be supplied by inference in the same manner, as they are required for the notes on the drawings.

1.3 CODES AND REGULATIONS

A. All Work hereunder shall be strictly in conformance with applicable codes and regulations. All Work shall be in accordance with the 2006 Uniform Plumbing Code, 2006 International Mechanical Code, 2006 International Building Code, 2006 International Fire Code, the most

recent edition of NFPA, City & Borough of Juneau and State of Alaska code modifications insofar as minimum requirements are concerned, but the Drawings and Specifications shall govern in case the minimum requirements are exceeded. All electrical equipment shall bear the UL label.

1.4 SUBMITTALS

A. General: Provide submittals according to Conditions of Contract, Division 1 Specifications Sections, and as required hereunder. Drawings and general provisions of the Contract, including General, Supplementary Conditions, and all Division 1 Specification Sections, apply to this Section. Approval of the data shall not eliminate responsibility for compliance with the Drawings or Specifications unless specific attention has been called in writing to proposed deviations at the time of transmittal of the data and such deviations have been approved, nor shall it eliminate the responsibility for freedom of errors of any sort in the data. All Mechanical submittal data for Project construction is to be turned in for approval at the same time in order for an efficient review process. Partial submittals may be rejected until the full submittal is received.

B. Specified Products: Trade names and catalog numbers of manufactured products included herein are intended to indicate the type, size, and grade of quality of equipment and materials required and such equipment and materials are approved for installation, subject to full compliance with the Specifications. Except where single manufacture is specified for standardization, requests for approval of other manufacturers than those specified must be accompanied by complete descriptions including overall dimensions, performance data, and, if catalog material, identification of specific products or items proposed.

C. Submittal Format: All data shall be submitted at one time in neatly bound loose-leaf three ring binders with pockets and tabulated in the same order of Specification Division 15000 section. All data shall be typed, minimum 10 point font, no exceptions. Data submitted that is not conforming to these specification requirements will be returned without reviewing and will need to be resubmitted at Contractors sole complete cost.

1. Each binder shall have a set of separators with index tabs A to Z. Tabs are to be printed type. Slip-in tabs not acceptable.
2. The first page shall be a cover sheet with project name, address, date, submittal product name, all applicable contractors and contact information, and all applicable consultants and contact information.
3. Second page shall be a submittal manual index of all project Specification sections with respective tab numbers, and respective book number, if applicable.
4. The first page of each manuals section shall be an index of that respective project Specification section and number with each product name, manufacturer name and model number.
5. Each manuals section shall be labeled and certified by mechanical Subcontractor that the data presented is in accordance with project Specifications. Index sheet in front of completed binder listing each piece of equipment or material submitted.
6. Product Data to be utilized shall be flagged and noted and all other data shall be crossed out or otherwise flagged that it is not in the project.
7. Data shall be inserted in binders in order of Specification number. Specification number shall be clearly labeled on each submittal page.

D. As-built Drawings: As-built drawings shall be required from all Mechanical Subcontractors and shall accurately show all changes from Contract Documents for all piping, ductwork, and equipment. As-built drawings shall show all underground piping whether changed or not, dimensioned from building lines. As-built drawings shall be updated daily and available for inspection on-site by the ARCHITECT.

E. Operating and Maintenance Data: See Division 1 for the number of sets of data to be provided for submittal and additional requirements. Provide a minimum of four (4) copies. The following data shall be provided to the ARCHITECT for approval 30 days prior to the request for Commissioning or Substantial Completion inspection, whichever comes first. Except for the valve directory and nameplate directory, the data shall be provided complete at one time. Partial or separate data will be returned for completion. The valve directory and nameplate directory may be provided for approval previous to the other data. The first section of the O&M manual shall be as listed in the following subparagraphs in order presented hereunder. All of the following subparagraphs sections shall be furnished with permanent plastic see through covers. See requirements under 1.4.C for additional submittal and formatting requirements.

1. Cover and Index sheets as in 1.4.C. above.
2. Description of systems and operating instructions: The Contractor shall prepare a brief type written description of all new and modified systems, explaining how the systems operate and indicating the proper settings of controls and switches. The instructions are to include all information required for the proper settings of controls and switches. The instructions are to include all information required for the proper operation of the systems. Technical knowledge on controls or adjustments requiring specialized technicians should not be included in the instructions.
3. Nameplate directory: List of all new boilers, air handlers, fans, water heaters, expansion tanks, thermostatic mixing valves, pumps, unit heaters, cabinet unit heaters, air conditioning units, and other equipment nameplates, giving manufacturer's nameplate data, nameplate designation, location of equipment, area served, switch location, and normal position of the switch. Motor data must include the horsepower, voltage, full load amperage, phase, etc. See Section 15075 - Mechanical Identification.
4. Manufacturers' literature: Manufacturers' instructions for operation and maintenance of all mechanical equipment and specialties, including replacement parts lists, capacity curves or charts, equipment data sheets, manufacturers' literature on the equipment, and as-built wiring diagrams and control drawings, all suitable for side binding to 8-1/2 x 11 inch size. All data not applicable to the job is to be crossed out or deleted. Manuals turned in for review with non-applicable data not crossed out shall be returned to the Contractor.
5. Maintenance instructions: Typewritten instructions for the maintenance of the systems, listing each service required on all of the mechanical equipment, including inspections, lubrication, cleaning, checking, and all other operations required. The list is to include all types of bearings installed on the equipment and the type of lubricant required.
6. Maintenance schedule: List of each item of mechanical equipment requiring inspection, lubrication, cleaning, or service including the type of bearings and type of lubricating means for each piece of equipment. Each item of equipment is to be listed separately with the service required. List to include the times during the year when such inspection and maintenance shall be performed. The specific maintenance required shall be referenced back to the maintenance instructions.
7. Valve directory: Indicating valve number, size, location, function, and normal position for each numbered valve. The directory shall be provided and approved before installation of the valve tags. A sample arrangement will be furnished upon request. Two copies required for the preliminary list. See Section 15075 - Mechanical Identification.

F. Guide Documents: Sample operating and maintenance instructions and maintenance schedule may be obtained from the ARCHITECT upon request, to assist in properly setting up the data.

G. Instructions To Personnel and Training: The mechanical Subcontractor shall instruct operating personnel in the operation and maintenance of the systems before accepting the responsibility of operation and maintenance of the systems. Each training session shall be signed off by Project Manager.

H. Qualification Data: For sheet metal installers. For pipe fitters.

I. Submit prior to Substantial Completion Inspection and Final Inspection a detailed list of equipment and systems that will not be completed for the completion date. Include status and information of deficiencies from all previous inspection reports.

J. Submit prior to Re-inspections of Substantial Completion Inspections, if applicable, and the Final Inspection a marked copy of the previous Engineers Inspection Reports detailing all items that have been completed and all items that have not been completed with reasons thereof. Re-inspection or Final Inspection will not occur until receipt of this list.

1.5 COOPERATIVE WORK

A. The Work hereunder shall be coordinated between various mechanical Sections and with the Work specified under other divisions or contracts toward rapid completion of the entire Project. If any cooperative Work must be altered due to lack of proper supervision hereunder, or failure to make proper provisions in time, then the Work hereunder shall include all expense of such changes as are necessary to be made in the Work under other divisions and contracts, and such changes shall be directly supervised by the ARCHITECT and shall be made to the satisfaction of the ARCHITECT.

B. In general pitched piping and ductwork shall take preference in location within the Project area. Coordination of all drain valves, duct access doors, and other equipment requiring access and maintenance procedures is required with all building components during construction for maximum accessibility and proper location as intended. In many portions of the building, piping mains, piping branches, and sprinkler piping, as well as some duct branches will need to be installed in the joist space to allow for installation of duct mains. Coordinate closely with all other Contractors.

C. Protection of existing mechanical material and equipment during selective demolition shall be the responsibility of the CONTRACTOR and coordinated with the respective Contractors. The CONTRACTOR shall provide temporary supports for all material and equipment. The CONTRACTOR at no cost to the Owner shall replace any existing material or equipment damaged during selective demolition due to insufficient protection. Coordination with all disciplines is required.

D. Temporary Utilities: In additon to requirements hereunder see Division 1, "Construction Facilities/Temporary Controls". Continuity of Mechanical systems for building sprinkler, plumbing, heating, and ventilation systems during demolition and new Work shall be the responsibility of the CONTRACTOR. The CONTRACTOR shall be responsible for providing and maintaining the Mechanical Systems serving occupied areas of the building throughout Construction. Routine maintenance of the existing Boilers and existing Air Handling Units shall be provided by the School District. Shutdown of systems shall not affect Occupied portions of the building except when coordinated with Juneau School District (JSD) and JSD

Maintenance. Sprinkler, plumbing, heating, and ventilation systems shall be active at all times in Occupied areas.

1. School District air handling units may not be utilized for ventilating or heating portions of teh building where Construction Work is in progress. All unused ducts are be sealed air tight into Construction Area. Any duct found dirty will be cleaned immediately at eh expense of the CONTRACTOR including removal and replacement of sound lined ducts.
2. Protection of existing mechanical material and equipment during selective demolition shall be the responsibility of the CONTRACTOR and coordinated with the respective Sub Contractor. The CONTRACTOR shall provide temporary supports for all material and equipment. The CONTRACTOR at no cost to Owner shall replace any existing materials or equipment damaged during selective demolition due to insufficient protection. Coordinate with all disciplines and phasing plans are required.
3. The CONTRACTOR shall be responsible for providing and maintaining the Mechanical Systems serving occupied areas of the building installed or modified under this Project throughout the Construction period including during the School Year.

1.6 QUALITY ASSURANCE

A. Perform Work in conformance with all applicable codes, regulations, local ordinances, contract documents, and generally accepted good practice. If discrepancies exist between Specifications and Contract Drawings then the solution that provides the Owner with the highest quality of product or installation shall be deemed as intended by the Contract Documents.

B. All sheet metal workers shall have a minimum documented sheet metal fabrication and installation experience in commercial or industrial facilities of 3 years or be enrolled in an Alaska Department of Labor approved Sheet Metal Apprentice program. The ratio of on-site workers shall not exceed 3 apprentices or sheet metal workers for every one foreman. A foreman is defined as a sheet metal worker with minimum 3 years experience as detailed above or is an approved Journeyman.

C. All Plumbers and Pipe Fitters shall have a minimum documented installation experience in commercial or industrial facilities of 3 years or be enrolled in an Alaska Department of Labor approved Plumbers and Pipe Fitters Apprentice program. The ratio of on-site workers shall not exceed 2 apprentices or pipe fitters for every one Journeyman.

1.7 FIELD MEASUREMENTS

A. See Division 1 for specific requirements.

B. Verifications: All measurements shall be verified at the site and prior to fabrications of equipment and systems. The existing conditions shall be fully observed before beginning the Work hereunder, and the Work hereunder executed in full coordination with the existing conditions observed. All hazardous material including asbestos materials that are discovered during the course of construction shall be immediately brought to the attention of the ARCHITECT for action. All Work performed with hazardous materials not approved by the Owner shall be at the full responsibility of the contractor and not the Owner.

C. Changes: Variations apparently necessary due to existing conditions shall be made only on approval in writing by the ARCHITECT.

1.8 WARRANTY

A. See Division 1 for specific requirements regarding: Product warranties and product Bonds.

B. The contractor shall provide continuous and generally trouble-free operation of the mechanical systems for the time period listed in Division 1 or for one year after Substantial Completion whichever time period is longer. The operation and maintenance of systems other than incidental operations such as room thermostat settings or changing of air filters, shall be the sole responsibility of the contractor and shall be addressed by the contractor immediately if deficiencies are present. Leaking of valves, flanges, or air vents shall be addressed immediately by the contractor during the warranty period. Control settings, noise problems, and other deficiencies resulting in unsatisfactory environmental conditions shall be addressed immediately.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 15072 - VIBRATION ISOLATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Vibration isolators.

B. Seismic restraints.

1.2 RELATED REQUIREMENTS

A. Section 03300 - Cast-in-Place Concrete.

1.3 PERFORMANCE REQUIREMENTS

A. Scope of Work

1. AHU Fans: Provide restrained internal vibration isolators for the fan and motor. Provide continuous neoprene pads under the fan support channels for the floor mounted AHU.
2. Exhaust Fan (EF): Provide restrained spring type vibration isolators.

B. Provide isolators designed for absorption of 90 percent of frequency of the lowest rotor speed involved with a minimum static deflection as indicated.

1. All installations:

a. Under 400 rpm: 4-inches
b. 400-600 rpm: 3.5-inches
c. 600-800 rpm: 2-inches
d. 800-1000 rpm: 1-inch
e. 1000-1500 rpm: 0.5-inch
f. Over 1500 rpm: 0.2-inch

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Isolation Technology, Inc: www.isolationtech.com.

B. Kinetics Noise Control, Inc: www.kineticsnoise.com.

C. Mason Industries: www.mason-ind.com.

D. Substitutions: See Section 01600 – Materials and Equipment.

2.2 VIBRATION ISOLATORS

A. Restrained Open Spring Isolators:

1. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
2. Spring Mounts: Provide with leveling devices, minimum 0.25 inch thick neoprene sound pads, and zinc chromate plated hardware.
3. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
4. Restraint: Provide heavy mounting frame and limit stops.

B. Restrained Closed Spring Isolators:

1. Type : Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection. Color code springs for load carrying capacity.
3. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25 inch clearance and limit stops.

C. Neoprene Pad Isolators:

1. Rubber or neoprene waffle pads.

    a. Hardness: 30 durometer.
    b. Thickness: Minimum 1/2 inch.
    c. Maximum Loading: 50 psi.
    d. Rib Height: Maximum 0.7 times width.

2. Configuration: 1/2 inch thick waffle pads bonded each side of 1/4 inch thick steel plate.

D. Rubber Mount or Hanger: Molded rubber designed for 0.4 inch deflection with threaded insert.

E. Seismic Snubbers:

1. Type: Non-directional and double acting unit consisting of interlocking steel members restrained by neoprene elements.
2. Elements: Replaceable neoprene, minimum of 0.75 inch thick with minimum 1/8 inch air gap.
3. Capacity: 4 times load assigned to mount groupings at 0.4 inch deflection.
4. Attachment Points and Fasteners: Capable of withstanding 3 times rated load capacity of seismic snubber.

PART 3 - EXECUTION

3.1 EXAMINATION

A. See Division 1 for specific requirements regarding: Coordination and project conditions.

B. Verify that all equipment, ductwork, and piping that is installed before work in this section begins is as shown on the Project drawings. Verify all required inspections of systems have been performed and deficiencies corrected prior to beginning of Work in this section.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

C. Provide seismic snubbers for all equipment, piping, and ductwork mounted on isolators. Each inertia base shall have minimum of four seismic snubbers located close to isolators. Snub equipment designated for post-disaster use to 0.05 inch maximum clearance. Other snubbers shall have clearance between 0.15 inch and 0.25 inch.

D. Support piping connections to equipment mounted on isolators using isolators or resilient hangers for scheduled distance.

1. Up to 4 Inches Pipe Size: First three points of support.
4. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

END OF SECTION

SECTION 15075 - MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Markers.

1.2 RELATED REQUIREMENTS

A. Section 09900 - Paints and Coatings: Identification painting.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

B. ASTM D 709 - Standard Specification for Laminated Thermosetting Materials; 2001 (Reapproved 2007).

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide manufacturers catalog literature for each product required.

C. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

D. Project Record Documents: Record actual locations of tagged valves.

PART 2 - PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Automatic Controls: Tags. Key to control schematic.

C. Control Panels: Nameplates.

D. Dampers: Ceiling tacks, where located above lay-in ceiling.

E. Tanks: Nameplates.

F. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2 NAMEPLATES

A. Manufacturers:

1. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
2. Seton Identification Products: www.seton.com.
3. Substitutions: See Section 01600 – Materials and Equipment.

B. Description: Laminated three-layer plastic with engraved letters.

1. Letter Color: White.
2. Letter Height: 1/4 inch.
3. Background Color: Black.
4. Plastic: Conform to ASTM D 709.

2.3 TAGS

A. Manufacturers:

1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
2. Brady Corporation: www.bradycorp.com.
3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
4. Seton Identification Products: www.seton.com.
5. Substitutions: See Section 01600 - Materials and Equipment.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.4 PIPE MARKERS

A. Manufacturers:

1. Brady Corporation: www.bradycorp.com.
2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
3. MIFAB, Inc.: www.mifab.com.
4. Seton Identification Products; www.seton.com.
5. Substitutions: See Section 01600 - Materials and Equipment.

B. Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.5 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:

1. HVAC Equipment: Yellow.
2. Plumbing Valves: Green.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09900 for stencil painting.

3.2 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 15082 - PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Section includes thermal insulation for piping systems including vapor retarders, jackets, and accessories. All new piping is to be insulated as specified.

1.2 RELATED REQUIREMENTS

A. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

B. Section 15145 - Plumbing Piping: Placement of hangers and hanger inserts.

C. Section 15182 - Hydronic Piping: Placement of hangers and hanger inserts.

D. Section 15186 - Refrigerant Piping and Specialties: Placement of inserts.

1.3 REFERENCE STANDARDS

A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

B. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2007.

C. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2004.

D. ASTM C 449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007.

E. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2004.

F. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation; 2007.

G. ASTM C 585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System); 2009.

H. ASTM C 795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008.

I. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

J. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

K. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

L. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.7 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.2 GLASS FIBER

A. Manufacturers:

1. Knauf Insulation: www.knaufusa.com.
2. Johns Manville Corporation: www.jm.com.
3. Owens Corning Corp: www.owenscorning.com.
4. CertainTeed Corporation;: www.certainteed.com.

B. Insulation: ASTM C 547 and ASTM C 795; rigid molded, noncombustible.

1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
2. Maximum service temperature: 850 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.

C. Insulation: ASTM C 547 and ASTM C 795; semi-rigid, noncombustible, end grain adhered to jacket.

1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
2. Maximum service temperature: 650 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.

D. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E 96/E 96M of 0.02 perm-inches.

E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

2.3 GLASS FIBER, FLEXIBLE BLANKET OR BATTS

A. Manufacturers:

1. Owens Corning
2. Knauf
3. Certain Teed

B. Insulation: ASTM C553; Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications. Type I, 850 lb. density.

C. Vapor Retarder Jacket: ASTM 1136, Type II Flexible and Low Permeance Vapor Retarders for Thermal Insulation.

1. For systems operating at temperatures below ambient, close and secure seams and joints. If outward clinching staples are used, then the staple penetrations must also be sealed.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Retarder Lap Adhesive:

1. Manufacturers:

a. DuroDyne
b. Knauf

c. Vimasco

2. Compatible with insulation.

2.4 JACKETS

A. PVC Plastic.

1. Manufacturers:

a. Johns Manville Corporation; www.jm.com.
b. Substitutions: See Section 01600 – Materials and Equipment.

2. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: 0 degrees F.
b. Maximum Service Temperature: 150 degrees F.
c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E 96/E 96M.
d. Thickness: 10 mil.
e. Connections: Brush on welding adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

H. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I. Inserts and Shields:

1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert location: Between support shield and piping and under the finish jacket.
4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07840.

K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 7 feet above finished floor): Finish with PVC jacket sized for finish painting.

L. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.3 SCHEDULES

A. Plumbing Systems:

1. Domestic Hot and Cold Water Supply and Hot Water recirculation: Mineral fiber pipe insulation, 1 inch thick. 1/2-inch thick may be used on plumbing piping branches 3/4-inch and smaller diameter when located inside walls.
2. Rain Leaders (Including Overflow Rain Leaders): Mineral fiber pipe insulation, 1 inch thick. Insulate entire length.
3. Plumbing Vents Within 10 feet of the Vent Through Roof: Mineral fiber pipe insulation, 1 inch thick.

B. Heating Systems; Heating Supply and Return:

1. Pipe Size Range: Up to and including 1-1/2" pipe diameter; thickness of 1 inch.
2. Pipe Size Range: 2” to 2-1/2” pipe diameter, thickness of 1-1/2 inch.
3. Pipe Size Range: 3 inch and up pipe diameter, thickness of 2-inch.

C. Other Systems:

1. Plenum Drains: Mineral fiber pipe insulation, 1-inch thick.
2. Air Separators and Expansion Tanks: 2-inch thick mineral fiber with PVC cover.
3. Roof Drain Bodies: Mineral Fiber Blanket Insulation 1-1/2 inches thick, See 15086.

END OF SECTION

SECTION 15086 - DUCT INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Duct insulation.

B. Duct Liner.

1.2 RELATED REQUIREMENTS

A. Section 15075 - Mechanical Identification.

B. Section 15810 - Ducts: Glass fiber ducts.

1.3 REFERENCE STANDARDS

A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2004.

C. ASTM C 553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2008.

D. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2009.

E. ASTM C 1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2005.

F. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

G. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

H. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

I. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.2 GLASS FIBER, FLEXIBLE

A. Manufacturer:

1. Knauf Insulation: www.knaufusa.com.
2. Johns Manville Corporation: www.jm.com.
3. Owens Corning Corp: www.owenscorning.com.
4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: ASTM C 553; flexible, noncombustible blanket.

1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C 518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Sorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E 96/E 96M.
3. Secure with pressure sensitive tape.

2.3 GLASS FIBER, RIGID

A. Manufacturer:

1. Knauf Insulation.
2. Johns Manville Corporation;.
3. Owens Corning Corp.
4. CertainTeed Corporation;.

B. Insulation: ASTM C 612; rigid, noncombustible blanket.

1. 'K' ('Ksi') value: 0.24 at 75 degrees F, when tested in accordance with ASTM C 518.
2. Maximum service temperature: 450 degrees F.
3. Maximum Water Vapor Sorption: 5.0 percent.
4. Maximum Density: 8.0 lb/cu ft.

C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E 96/E 96M.
3. Secure with pressure sensitive tape.

2.4 DUCT LINER

A. Manufacturers:

1. Knauf Insulation: www.knaufusa.com.
2. Johns Manville Corporation: www.jm.com.
3. Owens Corning Corp: www.owenscorning.com.
4. CertainTeed Corporation: www.certainteed.com.

B. Insulation: Incombustible glass fiber complying with ASTM C 1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, or acrylic polymer shown to be fungus and bacteria resistant by testing to ASTM G 21.

1. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
2. Service Temperature: Up to 250 degrees F.

3. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
4. Minimum Noise Reduction Coefficients:

    a. 1/2 inch Thickness: 0.30.
    b. 1 inch Thickness: 0.45.
    c. 1-1/2 inches Thickness: 0.60.
    d. 2 inch Thickness: 0.70.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air above ambient temperature:

1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. Duct and Plenum Liner Application:

1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

A. Ductwork:

1. Louvers and Dampers Connected to Louvers: Rigid Mineral Fiber Duct Board Insulation: 2 inches thick. Cover with canvas.
2. Ducts Connected to Louvers and plenums located in Mechanical Rooms: Rigid Mineral Fiber Duct Board Insulation, 2 inches thick. Cover with canvas.

    a. Exhaust Air: Insulate duct from edge of louver to the exhaust air damper.
    b. Outside Air: Insulate duct from edge of cap or louver to fan inlet connection.

3. Outside air intake and exhaust air plenums: Rigid Mineral Fiber Duct Board Insulation, 2 inches thick. Insulate unused portions of louvers. Cover with canvas.
4. Return Duct Plenums and Grille connections: 1-inch thick duct liner.
5. Combustion Air Duct: Rigid Mineral Fiber Duct Board Insulation, 2 inches thick. Cover with canvas.

END OF SECTION

SECTION 15128 - GAGES AND METERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pressure gages and pressure gage taps.

B. Thermometers and thermometer wells.

C. Static pressure gages.

1.2 RELATED REQUIREMENTS

A. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

B. Section 15182 - Hydronic Piping.

C. Section 15926 – Building Automation System.

1.3 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers; 2005.

B. ASTM E 1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2007.

C. ASTM E 77 - Standard Test Method for Inspection and Verification of Thermometers; 2007.

D. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

C. Project Record Documents: Record actual locations of components and instrumentation.

1.5 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 - PRODUCTS

2.1 PRESSURE GAGES

A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com.
2. Moeller Instrument Co., Inc: www.moellerinstrument.com.
3. Omega Engineering, Inc: www.omega.com.

B. Pressure Gages: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

1. Case: Steel with brass bourdon tube.
2. Size: 6 inch diameter.
3. Mid-Scale Accuracy: One percent.
4. Scale: Psi and KPa.

2.2 PRESSURE GAGE TAPPINGS

A. Gage Cock: Tee or lever handle, brass for maximum 150 psi.

2.3 STEM TYPE THERMOMETERS

A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com.
2. Omega Engineering, Inc: www.omega.com.
3. Weksler Glass Thermometer Corp: www.wekslerglass.com.
4. Substitutions: See Section 01600 - Product Requirements.

B. Stem type Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E 1; lens front tube, cast aluminum case with enamel finish.

1. Size: 9 inch scale.
2. Window: Clear Lexan.
3. Stem: 3/4 inch brass.
4. Accuracy: 2 percent, per ASTM E 77.
5. Calibration: Degrees F and Degree C.

C. Thermometers - Adjustable Angle: digital solar powered thermometer, with positive locking device.

1. Stem: 3/4 inch NPT, 3-1/2 inch long.
2. Accuracy: 2 percent.
3. Calibration: Degrees F and Degrees C.

2.4 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.5 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F.

B. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gages, one gage adapters with 1/8 inch probes, two 1 inch dial thermometers.

2.6 STATIC PRESSURE GAGES

A. Manufacturers:

1. Dwyer Instruments, Inc: www.dwyer-inst.com.
2. Omega Engineering, Inc: www.omega.com.
3. Weksler Glass Thermometer Corp: www.wekslerglass.com.
4. Substitutions: See Section 01600 - Product Requirements.

B. 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

C. Install thermometers in air duct systems on flanges.

D. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets. Refer to Section 15926. Where thermometers are provided on local panels, duct or pipe mounted thermometers are provided on local panels, duct or pipe mounted thermometers are not required.

E. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.

F. Coil and conceal excess capillary on remote element instruments.

G. Provide instruments with scale ranges selected according to service with largest appropriate scale.

H. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

I. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

J. Locate test plugs adjacent thermometers and thermometer sockets.

END OF SECTION

SECTION 15145 - PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.

1. Sanitary sewer.
2. Domestic water.
3. Storm water.

1.2 RELATED REQUIREMENTS

A. Section 02300 - Earthwork.

B. Section 07840 - Firestopping.

C. Section 08310 - Access Doors and Panels.

D. Section 09900 - Paints and Coatings.

E. Section 15075 - Mechanical Identification.

F. Section 15082 - Piping Insulation.

G. Drawings and general provisions of the Contract, including General, Supplementary Conditions, and all Divisions Specification Sections, apply to this Section.

1.3 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 1999, and addenda A&B (R2004).

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005) (ANSI B16.18).

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005).

D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers; 2002.

E. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; The American Society of Mechanical Engineers; 2006.

F. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings -

DWV; The American Society of Mechanical Engineers; 2007.

G. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers; 2007 (ANSI/ASME B31.1).

H. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2008 (ANSI/ASME B31.9).

I. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers; 2007.

J. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2007.

K. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

L. ASTM A 74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2009.

M. ASTM B 32 - Standard Specification for Solder Metal; 2008.

N. ASTM B 42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2002.

O. ASTM B 68 - Standard Specification for Seamless Copper Tube, Bright Annealed; 2002.

P. ASTM B 75 - Standard Specification for Seamless Copper Tube; 2002.

Q. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; 2009.

R. ASTM B 280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2008.

S. ASTM B 302 - Standard Specification for Threadless Copper Pipe, Standard Sizes; 2007.

T. ASTM B 306 - Standard Specification for Copper Drainage Tube (DWV); 2009.

U. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2009a.

V. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; 2007 (ANSI/AWWA C111/A21.11).

W. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water; American Water Works Association; 2009 (ANSI/AWWA C151/A21.51).

X. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).

Y. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2005.

Z. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil

Pipe Institute; 2004.

AA. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.

AB. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.

AC. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2006.

AD. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2005.

AE. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2008.

AF. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.

AG. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 1996.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Project Record Documents: Record actual locations of valves.

D. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.

1. See Section 01600 – Materials and Equipment, for additional provisions.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State of Alaska, standards.
1. Maintain one copy on project site.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.6 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State of Alaska plumbing code.

B. Conform to applicable code for installation of backflow prevention devices.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Particular care shall be taken in storage and handling of such materials to maintain its clean condition. Provide temporary end caps and closures on piping and fittings until ready for immediate use. Maintain in place until installation. Store piping and equipment in clean, enclosed from weather, location at all times. Materials are not to be stored in direct contact with dirty surfaces or on dirt floor. If piping, equipment, and components are found to be improperly stored they shall be removed from the project immediately and new, clean materials shall be used.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.8 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 - PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A 74 extra heavy weight.

1. Fittings: Cast iron.
2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C 564 neoprene gaskets or lead and oakum.

2.2 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.
2. Joints (Under 3-inch size): CISPI 301, neoprene gaskets and stainless steel clamp-and-shield assemblies. Standard duty.
3. Joints (3-inch and larger): CISPI 301, neoprene gaskets and stainless steel clamp-and-shield assemblies. Heavy Duty Coupling Assembly; Clamp-All or Anoco Husky Series 4000 couplings. No substitutions.

B. Copper Tube: ASTM B306, type DWV. Acceptable only on 2-inch and under horizontal waste and vent piping located inside plumbing walls.

1. Fittings: ASME B123, cast bronze, or ASME B129, wrought copper.
2. Joints: ASTM B32, solder, Grade 50B.

2.3 EQUIPMENT DRAINAGE – EQUIPMENT DRAINS, PLENUM DRAINS, AND RELIEF VALVE DRAINAGE.

A. Copper Tube: ASTM B306, type DWV.

1. Fittings: ASME B123, cast bronze, or ASME B129, wrought copper.
2. Joints: ASTM B32, solder, Grade 50B.

2.4 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B 42, hard drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
2. Joints: ASTM B 32, alloy Sn95 solder.

B. Ductile Iron Pipe: AWWA C151/A21.51.

1. Fittings: Ductile or gray iron, standard thickness.
2. Joints: AWWA C111/A21.11, rubber gasket with 3/4 inch diameter rods.

2.5 WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B 88 (ASTM B 88M), Type K (A), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B 32, alloy Sn95 solder.

2.6 STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A 74 extra heavy weight.

1. Fittings: Cast iron.
2. Joint Seals: ASTM C 564 neoprene gaskets, or lead and oakum.

2.7 STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
1. Joints (3-inch and larger): CISPI 301, neoprene gaskets and stainless steel clamp-and-shield assemblies. Heavy Duty Coupling Assembly; Clamp-All or Anoco Husky Series 4000 couplings. No substitutions.
2.

2.8 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:

1. Ferrous pipe: Class 150 malleable iron threaded unions.
2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:

1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.9 PIPE HANGERS AND SUPPORTS

A. Plumbing Piping - Drain, Waste, and Vent:

1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

B. Plumbing Piping - Water:

1. Conform to ASME B31.9.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
7. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
8. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
9. Vertical Support: Steel riser clamp.
10. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
11. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut,

nipple, floor flange, and concrete pier or steel support.

12. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.10 GATE VALVES

A. Manufacturers:

1. Tyco Flow Control: www.tycoflowcontrol.com.
2. Conbraco Industries: www.conbraco.com.
3. Nibco, Inc: www.nibco.com.
4. Milwaukee Valve Company: www.milwaukeevalve.com.
5. Substitutions: See Section 01600 - Product Requirements.

B. Up To and Including 3 Inches:

1. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder ends.

C. 2 Inches and Larger:

1. MSS SP-70, Class 125, iron body, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.11 BALL VALVES

A. Manufacturers:

1. Tyco Flow Control: www.tycoflowcontrol.com.
2. Conbraco Industries: www.conbraco.com.
3. Nibco, Inc: www.nibco.com.
4. Milwaukee Valve Company: www.milwaukeevalve.com.
5. Substitutions: See Section 01600 – Materials and Equipment.

B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, full port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder ends with union.

2.12 SWING CHECK VALVES

A. Manufacturers:

1. Tyco Flow Control: www.tycoflowcontrol.com.
2. Hammond Valve: www.hammondvalve.com.
3. Nibco, Inc: www.nibco.com.
4. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Up to 2 Inches:

1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder

ends.

C. Over 2 Inches:

1. MSS SP-71, Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged or grooved ends.

2.13 SPRING LOADED CHECK VALVES

A. Manufacturers:

1. Tyco Flow Control: www.tycoflowcontrol.com.
2. Hammond Valve: www.hammondvalve.com.
3. Crane Co.: www.cranevalve.com.
4. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

2.14 RELIEF VALVES

A. Pressure Relief:

1. Manufacturers:

a. Tyco Flow Control: www.tycoflowcontrol.com.
b. Cla-Val Co: www.cla-val.com.
c. Henry Technologies: www.henrytech.com.
d. Watts Regulator Company: www.wattsregulator.com.

2. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Temperature and Pressure Relief:

1. Manufacturers:

a. Cla-Val Co: www.cla-val.com.
b. Henry Technologies: www.henrytech.com.
c. Watts Regulator Company: www.wattsregulator.com.

2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.

2.15 STRAINERS

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com.

2. Green Country Filtration: greencountryfiltration.com.
3. WEAMCO: www.weamco.com.

B. Size 2 inch and Under:

1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

C. Size 1-1/2 inch to 4 inch:

1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15082.

H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08310.

I. Establish elevations of buried piping outside the building to ensure not less than 5 ft of cover.

J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

L. Provide support for utility meters in accordance with requirements of utility companies.

M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09900.

N. Excavate in accordance with Section 02300.

O. Backfill in accordance with Section 02300.

P. Install bell and spigot pipe with bell end upstream.

Q. Install valves with stems upright or horizontal, not inverted.

R. Install water piping to ASME B31.9.

S. Sleeve pipes passing through partitions, walls and floors.

T. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. Prime coat exposed steel hangers and supports. Refer to Section 09900. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Support cast iron drainage piping at every joint.

3.4 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install ball valves for throttling, bypass, or manual flow control services.

D. Provide spring loaded check valves on discharge of water pumps.

E. Provide flow controls in water recirculating systems where indicated.

3.5 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

B. Water Piping: Slope at minimum of 1/4 inch per foot and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with Section 02515.

B. Prior to starting work, verify system is complete, flushed and clean.

C. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

F. Maintain disinfectant in system for 24 hours.

G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.7 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:

a. Pipe size: 1/2 inches to 1-1/4 inches:

1) Maximum hanger spacing: 6.5 ft.
2) Hanger rod diameter: 3/8 inches.

b. Pipe size: 1-1/2 inches to 2 inches:

1) Maximum hanger spacing: 10 ft.
2) Hanger rod diameter: 3/8 inch.

c. Pipe size: 2-1/2 inches to 3 inches:

1) Maximum hanger spacing: 10 ft.
2) Hanger rod diameter: 1/2 inch.

d. Pipe size: 4 inches to 6 inches:

1) Maximum hanger spacing: 10 ft.
2) Hanger rod diameter: 5/8 inch.

END OF SECTION

SECTION 15146 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Roof, floor, and area drains.

B. Cleanouts.

C. Hose bibbs.

D. Hydrants.

E. Backflow preventers.

F. Water hammer arrestors.

G. Thermostatic mixing valves.

1.2 RELATED REQUIREMENTS

A. Drawings and General provisions of the Contract, including General, Supplementary Conditions, and all Division Specifications Section, apply to this section.

B. Section 15145 - Plumbing Piping.

C. Section 15410 - Plumbing Fixtures.

1.3 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers; 2001 (R2007).

B. ASSE 1011 - Hose Connection Vacuum Breakers; American Society of Sanitary Engineering; 2004 (ANSI/ASSE 1011).

C. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent; American Society of Sanitary Engineering; 2002 (ANSI/ASSE 1012).

D. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers; American Society of Sanitary Engineering; 2005.

E. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering; 2004, and Errata 2005 (ANSI/ASSE 1019).

F. PDI-WH 201 - Water Hammer Arresters; Plumbing and Drainage Institute; 2006.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

D. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.

E. Operation Data: Indicate frequency of treatment required for interceptors.

F. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

G. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.

1. See Section 01600 - Product Requirements, for additional provisions.
2. Extra Loose Keys for Outside Hose Bibbs: One.
3. Extra Hose End Vacuum Breakers for Hose Bibbs: One.
4. Service Kits for hydrants: One.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 - PRODUCTS

2.1 DRAINS

A. Manufacturers:

1. Josam Company: www.josam.com.
2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
3. Zurn Industries, Inc: www.zurn.com.
4. Substitutions: See Section 01600 – Materials and Equipment.

B. Roof Drains:

1. Assembly: ASME A112.6.4.
2. Body: Lacquered cast iron with sump.
3. Strainer: Removable polyethylene dome with vandal proof screws.

4. Accessories: Coordinate with roofing type

    a. Membrane flange and membrane clamp with integral gravel stop.
    b. Adjustable under deck clamp.
    c. Roof sump receiver.
    d. Controlled flow weir.
    e. Leveling frame.
    f. Adjustable extension sleeve for roof insulation.

C. Roof Overflow Drains:

1. Lacquered cast iron body and clamp collar and bottom clamp ring; pipe extended to 2 inches above flood elevation.

D. Downspout Nozzles:

1. Bronze round with straight bottom section.

E. Floor Drain (FD-1):

1. ASME A112.6.3; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

F. Floor Drain (FD-2):

1. ASME A112.6.3; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable round nickel bronze strainer with removable perforated sediment bucket.

G. Floor Drain (SD-1):

1. ASME A112.6.3; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer with polished bronze funnel or anti-splash rim.

H. Area Drain (AD-1)

1. ASME A112.6.3; galvanized cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable round nickel bronze strainer with removable perforated sediment bucket.

I. Floor Sink (FS-1):

1. Nominal dimensions; 12” x 6” x 8” deep. White acid-resisting porcelain enamel interior galvanized cast iron body with aluminum interior dome strainer and seepage flange. 1/2 loose set grate with square openings unless otherwise shown. 2 or 3-inch drain (see drawings for sizes). With priming line connections.

2.2 CLEANOUTS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Josam Company: www.josam.com.
3. Zurn Industries, Inc: www.zurn.com.
4. Substitutions: See Section 01600 – Materials and Equipment.

B. Cleanouts at Exterior Surfaced Areas (YCO-1):

1. Round cast nickel bronze access frame and non-skid cover.

C. Cleanouts at Interior Finished Floor Areas (FCO-1):

1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

D. Cleanouts at Interior Finished Wall Areas (WCO-1):

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

E. Cleanouts at Interior Unfinished Accessible Areas (CO-1): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.3 HOSE BIBBS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Watts Regulator Company: www.wattsregulator.com.
3. Zurn Industries, Inc: www.zurn.com.
4. Woodford
5. Substitutions: See Section 01600 – Materials and Equipment.

B. Interior Hose Bibbs:

1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, with lockshield and removable key, integral vacuum breaker in conformance with ASSE 1011.

2.4 HYDRANTS

A. Manufacturers:

1. Arrowhead Brass Company: www.arrowheadbrass.com.
2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.

3. Zurn Industries, Inc: www.zurn.com.
4. Woodford
5. Substitutions: See Section 01600 – Materials and Equipment.

B. Wall Hydrants:

1. ASSE 1019; freeze resistant, self-draining type with polished bronze lockable recessed box hose thread spout, lockshield and removable key, and integral vacuum breaker. Coordinate length of freeze length with actual location.

2.5 WASHING MACHINE BOXES AND VALVES

A. Box Manufacturers:

1. IPS Corporation/Water-Tite: www.ipscorp.com.
2. Oatey: www.oatey.com.
3. Guy Gray
4. Substitutions: See Section 01600 – Materials and Equipment.

B. Valve Manufacturers:

1. IPS Corporation/Water-Tite: www.ipscorp.com.
2. Zurn Industries, Inc: www.zurn.com.
3. Substitutions: See Section 01600 - Materials and Equipment.

C. Description: Plastic preformed rough-in box with brass long shank valves with wheel handles, socket for 2 inch waste, slip in finishing cover.

2.6 REFRIGERATOR VALVE AND RECESSED BOX

A. Box Manufacturers:

1. IPS Corporation/Water-Tite: www.ipscorp.com.
2. Oatey: www.oatey.com.
3. Guy Gray
4. Substitutions: See Section 01600 - Materials and Equipment.

B. Valve Manufacturers:

1. IPS Corporation/Water-Tite: www.ipscorp.com.
2. Zurn Industries, Inc: www.zurn.com.
3. Substitutions: See Section 01600 - Materials and Equipment.

C. Description: Plastic preformed rough-in box with brass valves with wheel handle, slip in finishing cover.

2.7 BACKFLOW PREVENTERS

A. Manufacturers:

1. Conbraco Industries: www.conbraco.com.
2. Watts Regulator Company; www.wattsregulator.com.
3. Zurn Industries, Inc: www.zurn.com.

B. Reduced Pressure Backflow Preventers:

1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.8 WATER HAMMER ARRESTORS

A. Manufacturers:

1. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
2. Watts Regulator Company: www.wattsregulator.com.
3. Zurn Industries, Inc: www.zurn.com.

B. Water Hammer Arrestors:

1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

2.9 MIXING VALVES

A. Thermostatic Mixing Valves:

1. Manufacturers:

a. POWERS
b. Leonard Valve Company
c. Honeywell Water Controls

2. Valve: Cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment. Thermostatic water mixing valve.
3. Capacity:

a. Main Building HW: 7 gpm at 20 psi drop. Set at 120 Degree F.
b. Emergency Shower Eye Wash: Sized for emergency shower/eyewash. Set at 80 Degrees F.

4. Accessories:

a. Check valve on inlets.
b. Volume control shut-off valve on outlet.
c. Stem thermometer on outlet.
d. Strainer stop checks on inlets.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories sinks washing machine outlets.

H. Install trap primers fully accessible behind access doors if applicable with unions at all connections. Install isolating valve on the supply side. Label access door.

END OF SECTION

SECTION 15182 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe and pipe fittings for:

1. Heating water piping system.
2. Glycol water piping system.
3. Equipment drains and overflows.
4. Glycol fill unit.

B. Valves:

1. Gate valves.
2. Ball valves.
3. Check valves.

1.2 RELATED REQUIREMENTS

A. Section 08310 - Access Doors and Panels.

B. Section 09900 - Paints and Coatings.

C. Section 15072 - Vibration Isolation.

D. Section 15075 - Mechanical Identification.

E. Section 15082 - Piping Insulation.

F. Section 15183 - Hydronic Specialties.

G. Section 15189 - Chemical Water Treatment: Pipe cleaning.

H. Drawings and general provisions of the Contract, including General, Supplementary Conditions, and all Divisions Specification Sections, apply to this Section.

1.3 REFERENCE STANDARDS

A. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2007.

B. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of

Mechanical Engineers; 2001 (R2005) (ANSI B16.18).

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005).

E. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; The American Society of Mechanical Engineers; 2006.

F. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2008 (ANSI/ASME B31.9).

G. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

H. ASTM A 234/A 234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2007.

I. ASTM B 32 - Standard Specification for Solder Metal; 2008.

J. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; 2009.

K. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric); 2005.

L. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2004 and errata.

M. AWWA C606 - Standard Specification for Grooved and Shouldered Joints; American Water Works Association; 2006.

N. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.

O. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.

P. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Include data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

D. Project Record Documents: Record actual locations of valves.

E. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

F. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.

1. See Section 01600 – Materials and Equipment, for additional provisions.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.1 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:

1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
3. Grooved mechanical joints may be used in accessible locations only.

    a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, and as approved by Murray & Associates PC-Mechanical Engineers.
    b. Use rigid joints unless otherwise indicated.
    c. Use flexible joints at Pumps.

4. Provide pipe hangers and supports in accordance with ASME B31.9 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated and as follows:

1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.
2. For throttling, bypass, or manual flow control services, use globe, ball, or butterfly valves.
3. In heating water systems, butterfly valves may be used interchangeably with gate and globe valves.
4. For shut-off and to isolate parts of systems or vertical risers, use gate or ball valves.
5. For throttling service, use plug cocks. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.

2.2 HEATING WATER AND GLYCOL PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A 53/A 53M, Schedule 40, black, using one of the following joint types:

1. Welded Joints: ASTM A 234/A 234M, wrought steel welding type fittings; AWS D1.1 welded.
2. Threaded Joints: ASTM B 16.3, malleable iron fittings.
3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

B. Copper Tube: ASTM B 88 (ASTM B 88M), Type K (A), drawn, using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.

a. Solder: ASTM B 32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
b. Braze: AWS A5.8/A5.8M BCuP copper/silver alloy.

2. Grooved Joints: AWWA C606 grooved tube, fittings of same material, and copper-tube-dimension mechanical couplings.
3. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

2.3 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B 88 (ASTM B 88M), Type K (A), drawn; using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B 32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
2. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

2.4 PIPE HANGERS AND SUPPORTS

A. Conform to ASME B31.9.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.

C. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

D. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.

E. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

F. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

G. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

H. Vertical Support: Steel riser clamp.

I. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

J. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

K. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

L. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.5 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 2 Inches and Under:

1. Ferrous Piping: 150 psig malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe Over 2 Inches:

1. Ferrous Piping: 150 psig forged steel, slip-on.
2. Copper Piping: Bronze.
3. Gaskets: 1/16 inch thick preformed neoprene.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.

1. Dimensions and Testing: In accordance with AWWA C606.
2. Housing Material: Malleable iron or ductile iron, galvanized.
3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

2.6 GATE VALVES

A. Manufacturers:

1. Tyco Flow Control: www.tycoflowcontrol.com.
2. Conbraco Industries: www.conbraco.com.
3. Nibco, Inc: www.nibco.com.
4. Milwaukee Valve Company: www.milwaukeevalve.com.

B. Up To and Including 2 Inches:

1. Bronze body, bronze trim, screwed bonnet, non-rising stem, lockshield stem, inside screw with backseating stem, solid wedge disc, alloy seat rings, solder ends.

C. Over 2 Inches:

1. Iron body, bronze trim, bolted bonnet, rising stem, handwheel, outside screw and yoke, solid wedge disc with bronze seat rings, flanged ends.

2.7 BALL VALVES

A. Manufacturers:

1. Tyco Flow Control: www.tycoflowcontrol.com.
2. Conbraco Industries: www.conbraco.com.
3. Nibco, Inc: www.nibco.com.
4. Milwaukee Valve Company: www.milwaukeevalve.com.
5. Victaulic Company: www.victaulic.com.

B. Up To and Including 2 Inches:

1. Bronze one piece body, chrome plated brass ball, fullport, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.

C. Over 2 Inches:

1. Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, flanged.

2.8 SWING CHECK VALVES

A. Manufacturers:

1. Tyco Flow Control: www.tycoflowcontrol.com.
2. Hammond Valve: www.hammondvalve.com.
3. Nibco, Inc: www.nibco.com.
4. Milwaukee Valve Company: www.milwaukeevalve.com.
5. Victaulic Company: www.victaulic.com.

B. Up To and Including 2 Inches:

1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.

C. Over 2 Inches:

1. Iron body, bronze trim, bronze or bronze faced rotating swing disc, renewable disc and seat, flanged ends.

2.9 SPRING LOADED CHECK VALVES

A. Manufacturers:

1. Tyco Flow Control: www.tycoflowcontrol.com.
2. Hammond Valve: www.hammondvalve.com.
3. Crane Co.: www.cranevalve.com.
4. Milwaukee Valve Company: www.milwaukeevalve.com.
5. Victaulic Company: www.victaulic.com.

B. Iron body, bronze trim, split plate, hinged with stainless steel spring, resilient seal bonded to body, wafer or threaded lug ends.

2.10 FLOWSETTERS

A. Manufacturers:

1. Bell & Gossett Circuit Setter.
2. Armstrong CBV.
3. Taco Accuflo.

B. Angle or straight pattern, inside screw globe or ball valve for 125 psig working pressure, with bronze body and integral union for screwed connections, renewable composition disc, plastic wheel handle for shut-off service, and lock-shield key cap and set screw memory bonnet for balancing service. 1/2 inch or 3/4 inch may be sweat type. Valve bodies to have differential read-out ports and caps. Provide three probe adapters for meter reading. Provide two spare read-out port caps.

2.11 GLYCOL FILL UNIT

A. Vertical unit wide mouth top and bottom drain. For introduction of glycol into a closed loop water system. Complete unit with isolation valves and inlet and outlet, air purge and drain connections, funnel, and hand pump. Working pressure to 250 psi. Capacities: 5 gallon.

B. Provide glycol testing kit in waterproof case with a minimum of five years of materials of semiannual testing.

2.12 FIRE STOP SYSTEM

A. Manufacturers:

1. Hilti
2. Dow Corning
3. Fyre Putty

B. General Purpose Fire Stopping Sealant: Water based, non-slumping, premixed sealant with intumescent properties, rated for 3 hours per ASTM E814 and UL 1479.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare piping connections to equipment using jointing system specified.

E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

F. After completion, fill, clean, and treat systems. Refer to Section 15189 for additional requirements.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install heating water, glycol, condenser water, and engine exhaust piping to ASME B31.9 requirements. Install chilled water piping to ASME B31.5 requirements.

C. Route piping in orderly manner, parallel to building structure, and maintain gradient.

D. Install piping to conserve building space and to avoid interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Sleeve pipe passing through partitions, walls and floors.

G. Slope piping and arrange to drain at low points.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

I. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

J. Pipe Hangers and Supports:

1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
2. Place hangers within 12 inches of each horizontal elbow.
3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
6. Provide copper plated hangers and supports for copper piping.
7. Prime coat exposed steel hangers and supports. Refer to Section 09900. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

K. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 15082.

L. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08310.

M. Use eccentric reducers to maintain top of pipe level.

N. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

O. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting. Refer to Section 09900.

P. Install valves with stems upright or horizontal, not inverted.

Q. Where piping penetrates ceiling and walls, close off space between pipe and adjacent Work with fire stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration. Install sleeve in accordance with UL listing of assembly.

END OF SECTION

SECTION 15183 - HYDRONIC SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Expansion tanks.

B. Air vents.

C. Air separators.

D. Strainers.

E. Pump suction fittings.

F. Flow indicators, controls, meters.

G. Relief valves.

H. Glycol specialties.

I. Glycol system maintenance.

1.2 RELATED REQUIREMENTS

A. Section 15146 - Plumbing Specialties: Backflow Preventers.

B. Section 15182 - Hydronic Piping.

1.3 REFERENCE STANDARDS

A. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers; 2007.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, model and dimensions.

C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

D. Project Record Documents: Record actual locations of flow controls.

E. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

F. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.

1. Extra Glycol Solution: 20 gallons.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 - PRODUCTS

2.1 DIAPHRAGM-TYPE EXPANSION TANKS

A. Manufacturers:

1. Amtrol Inc: www.amtrol.com.
2. ITT Bell & Gossett: www.bellgossett.com.
3. Taco, Inc: www.taco-hvac.com.

B. Construction: Welded steel, tested and stamped in accordance with ASME (BPV VIII, 1); supplied with National Board Form U-1, rated for working pressure of 125 psi, with flexible EPDM diaphragm sealed into tank, and steel support stand.

C. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psi.

D. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check back flow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

E. Size: As scheduled.

2.2 AIR VENTS

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com.

2. ITT Bell & Gossett: www.bellgossett.com.
3. Taco, Inc: www.taco-hvac.com.

B. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

C. Float Type:

1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

2.3 AIR SEPARATORS

A. Combination Air Separators/Strainers:

1. Manufacturers:

a. Armstrong International, Inc: www.armstronginternational.com.
b. ITT Bell & Gossett: www.bellgossett.com.
c. Taco, Inc: www.taco-hvac.com.
d. Substitutions: See Section 01600 – Materials and Equipment.

2. Steel, tested and stamped in accordance with ASME (BPV VIII, 1); for 125 psi operating pressure, with integral bronze strainer, tangential inlet and outlet connections, and internal stainless steel air collector tube.

2.4 STRAINERS

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com.
2. Green Country Filtration: greencountryfiltration.com.
3. WEAMCO: www.weamco.com.

B. Size 2 inch and Under:

1. Screwed brass or iron body for 175 psi working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

C. Size 2-1/2 inch to 4 inch:

1. Flanged iron body for 175 psi working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

2.5 SUCTION DIFFUSERS

A. Manufacturers:

1. ITT Bell & Gossett: www.bellgossett.com.
2. Anvil International, Inc: www.anvilintl.com.

3. Victaulic Company of America: www.victaulic.com.

B. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psi working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable fine mesh strainer to fit over cylinder strainer, and permanent magnet located in flow stream and removable for cleaning.

2.6 FLOW CONTROLS

A. Manufacturers:

1. Tyco Flow Control: www.tycoflowcontrol.com.
2. Amtrol Inc: www.amtrol.com.
3. ITT Bell & Gossett: www.bellgossett.com.
4. Cla-Val Co: www.cla-val.com.
5. Substitutions: See Section 01600 - Product Requirements.

B. Construction: Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet with blowdown/backflush drain.

C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

D. Control Mechanism: Stainless steel or nickel plated brass piston or regulator cup, operating against stainless steel helical or wave formed spring.

E. Accessories: In-line strainer on inlet and ball valve on outlet.

2.7 RELIEF VALVES

A. Manufacturers:

1. Tyco Flow Control: www.tycoflowcontrol.com.
2. Armstrong International, Inc: www.armstronginternational.com.
3. ITT Bell & Gossett: www.bellgossett.com.
4. Conbraco Industries, Inc: www.conbraco.com.

B. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.8 CHEMICAL FEED UNITS

A. Manual Shot Feeders: Vertical unit wide mouth top and bottom drain. For introduction of batch chemicals and glycol into a closed loop water system. Complete unit with isolation valves on inlet and outlet, air purge and drain connections, funnel. Working pressure up to 250 psi. Capacities: 5 gallon.

B. Provide propylene glycol for refill of heating water system, approximately 50 gallons of propylene glycol required. Verify quantity on-site.

C. Provide testing kit in waterproof case with minimum of five years of materials of semi annual testing.

2.9 GLYCOL SYSTEM

A. Volume: 55 gallon steel drum with fittings suitable for filling and hand pump for charging, rubber hose for connection of hand pump to system.

B. Glycol Solution:

1. Inhibited propylene glycol and water solution mixed 40 percent glycol - 60 percent water, suitable for operating temperatures from -40 degrees F to 250 degrees F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions.

B. Where large air quantities can accumulate, provide enlarged air collection standpipes.

C. Provide manual air vents at system high points and as indicated.

D. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

E. Provide air separator on suction side of system circulation pump and connect to expansion tank.

F. Provide valved drain and hose connection on strainer blow down connection.

G. Provide pump suction fitting on suction side of base mounted centrifugal pumps where indicated. Remove temporary strainers after cleaning systems.

H. Support pump fittings with floor mounted pipe and flange supports.

I. Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.

J. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

K. Pipe relief valve outlet to nearest floor drain.

L. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

M. Clean and flush glycol system before adding glycol solution.

N. Feed glycol solution to system through make-up line with pressure regulator, venting system high points.

O. Feed glycol solution to system through make-up line with pressure regulator, venting system high points. Set to fill at 12 psi.

P. Perform tests determining strength of glycol and water solution and submit written test results.

3.2 MAINTENANCE

A. See Section 01700 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide service and maintenance of glycol system for one year from date of Substantial Completion at no extra charge to City and Borough of Juneau.

C. Perform monthly visit to make glycol fluid concentration analysis on site with refractive index measurement instrument. Report findings in detail in writing, including analysis and amounts of glycol or water added.

D. Explain corrective actions to City and Borough of Juneau's School District maintenance personnel in person.

END OF SECTION

SECTION 15186 - REFRIGERANT PIPING AND SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Valves.

D. Strainers.

E. Check valves.

F. Pressure relief valves.

G. Flexible connections.

1.2 RELATED REQUIREMENTS

A. Section 08310 - Access Doors and Panels.

B. Section 09900 - Paints and Coatings.

C. Section 15082 - Piping Insulation.

D. Section 15730 – Air Conditioning Equipment

1.3 REFERENCE STANDARDS

A. ARI 730 - Flow-Capacity Rating and Application of Suction-Line Filters and Filter Driers; Air-Conditioning and Refrigeration Institute; 2005.

B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2007.

C. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2007.

D. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers; 2007.

E. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2007.

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005).

G. ASME B16.26 - Cast Copper Alloy Fittings For Flared Copper Tubes; The American Society of Mechanical Engineers; 2006.

H. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; The American Society of Mechanical Engineers; 2006.

I. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2008 (ANSI/ASME B31.9).

J. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; 2009.

K. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric); 2005.

L. ASTM B 280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2008.

M. ASTM F 708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).

N. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2004 and errata.

O. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.

P. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.

Q. MSS SP-89 - Pipe Hangers and Supports - Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2003.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

C. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

D. Test Reports: Indicate results of leak test, acid test.

E. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: Design piping system under direct supervision of a Professional Engineer experienced in design of this type of work.

B. Installer Qualifications: Company specializing in performing the type of work specified in this

section, with minimum 3 years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

PART 2 - PRODUCTS

2.1 PIPING

A. Copper Tube: ASTM B 280, H58 hard drawn or O60 soft annealed.

1. Fittings: ASME B16.22 wrought copper.
2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy.

B. Copper Tube to 7/8 inch OD: ASTM B 88 (ASTM B 88M), Type K (A), annealed.

1. Fittings: ASME B16.26 cast copper.
2. Joints: Flared.

C. Pipe Supports and Anchors:

1. Conform to ASME B31.5.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Vertical Support: Steel riser clamp.
7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
9. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
10. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.2 VALVES

A. Manufacturers:

1. Hansen Technologies Corporation
2. Henry Technologies
3. Danfoss Flomatic

B. Diaphragm Packless Valves:

1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and

stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

C. Ball Valves:

1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.

D. Service Valves:

1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

2.3 STRAINERS

A. Straight Line or Angle Line Type:

1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient. Install piping to conserve building space and avoid interference with use of space. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

C. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.5.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

4. Place hangers within 12 inches of each horizontal elbow.
5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
7. Provide copper plated hangers and supports for copper piping.

E. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

F. Provide clearance for installation of insulation and access to valves and fittings.

G. Provide access to concealed valves and fittings. Coordinate size and location of access doors with Section 08310.

H. Flood piping system with nitrogen when brazing.

I. Insulate piping and equipment; refer to Section 15082.

J. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

K. Where piping penetrates ceiling and walls, close off space between pipe and adjacent Work with fire stopping insulation and caulk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration. Install sleeve in accordance with UL listing of assembly.

3.3 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

B. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using halide torch. Test to no leakage.

END OF SECTION

SECTION 15188 - HVAC PUMPS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. In-line circulators.

B. Base mounted pumps.

1.2 RELATED REQUIREMENTS

A. Section 03300 - Cast-in-Place Concrete.

B. Section 15065 - Motors for Mechanical Equipment.

C. Section 15072 - Vibration Isolation.

D. Section 15082 - Piping Insulation.

E. Section 15182 - Hydronic Piping.

F. Section 15183 - Hydronic Specialties.

G. Section 16140 – Wiring Devices: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2007.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

C. UL 778 - Standard for Motor-Operated Water Pumps; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate hanging and support requirements and recommendations.

D. Millwright's Certificate: Certify that base mounted pumps have been aligned.

E. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

F. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.

1. See Section 01600 – Materials and Equipment, for additional provisions.
2. Extra Pump Seals: One set for each type and size of pump.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture, assembly, and field performance of pumps, with minimum three years of documented experience.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Armstrong Pumps Inc: www.armstrongpumps.com.

B. ITT Bell & Gossett: www.bellgossett.com.

C. Sterling Fluid Systems: www.sterlingfluid.com.

D. Taco HVAC.

2.2 HVAC PUMPS - GENERAL

A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Minimum Quality Standard: UL 778.

C. Base Mounted Pumps: Aligned by qualified millwright.

D. Products Requiring Electrical Connection: Listed and classified by UL or testing agency acceptable to authority having jurisdiction as suitable for the purpose specified and indicated.

2.3 SYSTEM LUBRICATED CIRCULATORS (HWRP-1)

A. Type: Horizontal shaft, single stage, direct connected with multiple speed wet rotor motor for in-line mounting, for 140 psi maximum working pressure, 230 degrees F maximum water temperature.

B. Casing: Bronze with flanged pump connections.

C. Impeller, Shaft, Rotor: Stainless Steel.

D. Bearings: Metal Impregnated carbon (graphite) and ceramic.

E. Motor: Impedance protected, multiple speed, with external speed selector.

F. Performance: Scheduled.

G. Electrical Characteristics: Scheduled.

2.4 IN-LINE CIRCULATORS (P-2, P-3)

A. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in-line mounting, oil lubricated, for 175 psi maximum working pressure.

B. Casing: Cast iron, with flanged pump connections.

C. Impeller: Non-ferrous keyed to shaft.

D. Bearings: Permanently-lubricated ball bearings.

E. Shaft: Alloy steel with bronze sleeve, integral thrust collar.

F. Seal: Mechanical seal , 275 degrees F maximum continuous operating temperature.

G. Performance:

1. Flow Capacity: See Schedule on M0.2.

2.5 CLOSE COUPLED BOOSTER PUMPS (P-4, P-5)

A. Type: Horizontal shaft, single stage, close coupled, radially split casing, for 125 psi maximum working pressure.

B. Casing: Cast iron, with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.

C. Impeller: Bronze, fully enclosed, keyed to motor shaft extension.

D. Shaft: Stainless steel.

E. Seal: Carbon rotating against a stationary ceramic seat, 225 degrees F maximum continuous operating temperature.

F. Seal: Packing gland with minimum four rings graphite impregnated packing and bronze lantern rings, 230 degrees F maximum continuous operating temperature.

G. Performance:

1. Flow Capacity: See Schedule on M0.2
2. Head: See Schedule on M0.2.

2.6 BASE MOUNTED PUMPS (P-1A, P-1B)

A. Type: Horizontal shaft, single stage, direct connected, radially split casing, for 125 psi maximum working pressure.

B. Casing: Cast iron, with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.

C. Impeller: Bronze, fully enclosed, keyed to shaft.

D. Bearings: Permanently lubricated roller or ball bearings. Bearing suitable for use with Variable Frequency Drives.

E. Shaft: Alloy steel with stainless steel shaft sleeve.

F. Seal: Carbon rotating against a stationary ceramic seat, 225 degrees F maximum continuous operating temperature.

G. Drive: Flexible coupling with coupling guard.

H. Baseplate: Cast iron or fabricated steel with integral drain rim.

I. Warranty: 3 years.

J. Performance:

1. Flow Capacity: See Schedule on M0.2.
2. Head: See Schedule on M0.2.

K. Electrical Characteristics:

1. Refer to Section 16140.
2. Motor: 1750 rpm unless specified otherwise.
3. Motor suitable for use with variable frequency drives. Motor bearings insulated.
4. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install long radius reducing elbows or reducers between pimp and piping. Support piping adjacent to pump such that no weight is carried on pump casings. For close coupled or base mounted pumps, provide supports under elbows on pump suction and discharge lines sizes 4 inch and over.

C. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

D. Provide line sized shut-off valve and pump suction fitting on pump suction, and line sized soft seat check valve and balancing valve on pump discharge.

E. Check, align, and certify alignment of base mounted pumps prior to start-up.

F. Install base mounted pumps on concrete housekeeping base, with anchor bolts, set and level, and grout in place. Refer to Section 03300.

G. Lubricate pumps before start-up.

3.3 COORDINATION

A. Coordinate this work with the Work of other trades, and make arrangements for the complete and proper accomplishment of all related work. Coordinate required control interlocks with automatic control contractor.

B. Pump P-1A and P-1B are controlled by Variable Frequency Drives provided by automatic control contractor. Coordinate and assist control contractor as required for a full operational system.

END OF SECTION

SECTION 15191 - FUEL OIL PIPING SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe and pipe fittings.

B. Valves.

C. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 15075 - Mechanical Identification.

1.3 REFERENCE STANDARDS

A. API RP 1615 - Installation of Underground Petroleum Storage Systems; American Petroleum Institute; 1996 (Reapproved 2001).

B. ASME (BPV) - Boiler and Pressure Vessel Code; The American Society of Mechanical Engineers; 2007.

C. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2007.

D. ASME B16.3 - Malleable Iron Threaded Fittings; The American Society of Mechanical Engineers; 1998 (R2006).

E. ASME B16.18 - Cast Copper Alloy Solder-Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005) (ANSI B16.18).

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005).

G. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; The American Society of Mechanical Engineers; 2006.

H. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers; 2007 (ANSI/ASME B31.1).

I. ASME B31.4 - Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids; The American Society of Mechanical Engineers; 2006.

J. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2008 (ANSI/ASME B31.9).

K. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; The American Society of Mechanical Engineers; 2004.

L. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

M. ASTM A 234/A 234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2007.

N. ASTM B 32 - Standard Specification for Solder Metal; 2008.

O. ASTM B 88 - Standard Specification for Seamless Copper Water Tube; 2009.

P. ASTM B 88M - Standard Specification for Seamless Copper Water Tube (Metric); 2005.

Q. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2004 and errata.

R. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2008.

S. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 1996.

T. NACE SP0169 - Control of External Corrosion on Underground or Submerged Metallic Piping Systems; NACE International; 2007.

U. NFPA 30 - Flammable and Combustible Liquids Code; National Fire Protection Association; 2008.

V. NFPA 31 - Standard for the Installation of Oil Burning Equipment; National Fire Protection Association; 2006.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Project Record Documents: Record actual locations of piping system, storage tanks, and system components.

D. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of experience and approved by manufacturer.

C. Valves: Manufacturer's name and pressure rating marked on valve body.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable regulations for installation of fuel oil system.

B. Conform to ASME B31.1 for installation of fuel oil piping.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation.

PART 2 - PRODUCTS

2.1 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A 53/A 53M or ASME B36.10M, Schedule 40 black.

1. Fittings: ASME B16.3, malleable iron, or ASTM A 234/A 234M, wrought carbon steel or alloy steel welding type.
2. Joints: NFPA 30, threaded or welded to ASME B31.1.

2.2 PIPE HANGERS AND SUPPORTS

A. Conform to NFPA 31.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.

C. Vertical Support: Steel riser clamp.

D. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.3 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 Inches and Under: Ferrous pipe. 150 psi malleable iron threaded unions.

2.4 GATE VALVES

A. Manufacturers:

1. Conbraco Industries: www.conbraco.com.
2. Nibco, Inc: www.nibco.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid

wedge disc, solder ends.

2.5 BALL VALVES

A. Manufacturers:

1. Conbraco Industries: www.conbraco.com.
2. Nibco, Inc: www.nibco.com.
3. Milwaukee Valve Company: www.milwaukeevalve.com.

B. MSS SP-110, Class 150, 400 psi CWP, bronze, two piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder.

2.6 STRAINERS

A. Manufacturers:

1. Armstrong International, Inc: www.armstronginternational.com.
2. Green Country Filtration: greencountryfiltration.com.
3. WEAMCO: www.weamco.com.
4. Substitutions: See Section 01600 - Product Requirements.

B. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

2.7 FUSIBLE VALVES

A. Manufacturers:

1. Firomatic.

B. Nonferrous body, with wheel handle and fusible element to close the valve automatically above 165F. Suitable for manual operation. UL Listed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, are dry, and have not been over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 PIPING INSTALLATION

A. Install in accordance with manufacturer's instructions and AP1 RP 1615.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals. Install to NACE RP0169.

C. Route piping in orderly manner and maintain gradient.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance for installation of insulation and access to valves and fittings.

G. Where pipe support members are welded to structural building framing, scrape, brush clean, weld, and apply one coat of zinc rich primer.

H. Install valves with stems upright or horizontal, not inverted.

I. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

END OF SECTION

SECTION 15410 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Water closets.

B. Dual flush water closets.

C. Urinals.

D. Lavatories.

E. Sinks.

F. Service sinks.

G. Drinking fountains.

H. Showers.

I. Wash fountains.

J. Eye and face wash fountains.

K. Emergency showers.

1.2 RELATED REQUIREMENTS

A. Section 01100 - Summary: Product requirements for City and Borough of Juneau furnished fixtures .

B. Section 06410 - Custom Cabinets: Preparation of counters for sinks; lavatory tops.

C. Section 07900 - Joint Sealers: Seal fixtures to walls and floors.

D. Section 11400 - Food Service Equipment.

E. Section 15145 - Plumbing Piping.

F. Section 15146 - Plumbing Specialties.

G. Section 15430 - Plumbing Equipment.

H. Section 16140 – Wiring Devices: Electrical characteristics and wiring connections.

I. Drawings and general provisions of the Contract, including General, Supplementary Conditions, and all Divisions Specification Sections, apply to this Section.

1.3 REFERENCE STANDARDS

A. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2004.

B. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers; 1997 (Reaffirmed 2002).

C. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers; 2005.

D. ASME A112.19.1M - Enameled Cast Iron Plumbing Fixtures; The American Society of Mechanical Engineers; 1994 (R2004).

E. ASME A112.19.2 - Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals; The American Society of Mechanical Engineers; 2008.

F. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers; 2008.

G. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals; The American Society of Mechanical Engineers; 2005.

H. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in City and Borough of Juneau's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.

1. See Section 01600 – Materials and Equipment, for additional provisions.
2. Extra Faucet Washers: Two sets of each type and size.
3. Extra Sink, Double Sink, and Lavatory Supply Fittings: Two sets of each type and size.
4. Extra Shower Heads: One of each type and size.
5. Extra Toilet Seats: Two of each type and size.
6. Flush Valve Service Kits: Two for each type and size.
7. Two complete flush valve assemblies for water closets.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.8 WARRANTY

A. See Section 01780 – Contract Closeout, for additional warranty requirements.

PART 2 - PRODUCTS

2.1 FLUSH VALVE WATER CLOSETS (WC-1, WC-2, WC-3)

A. Water Closets: Vitreous china, ASME A112.19.2, elongated rim, wall hung, siphon jet flush action, china bolt caps.WC-1 at standard height, WC-2 at ADA height, WC-3 at Primary Height.

1. Flush Volume: 1.6 gallon, maximum.
2. Flush Valve: Exposed (top spud).
3. Flush Operation: Manual, oscillating handle.
4. Supply Size: 1-1/2 inches.
5. Outlet Size: 4 inches.
6. Manufacturers:

    a. American Standard Inc: www.americanstandard.com.
    b. Kohler Company: www.kohler.com.
    c. Zurn industries, Inc: www.zurn.com.

B. Exposed Manual Dual Flush Valve: ASME A112.19.2; exposed polished chrome, diaphgram type, screwdriver stop and vacuum breaker; maximum 1.6 gallon flush volume. Dual Flush type with 1.1 gallon (up position) and 1.6 gallon (down position) flush option. Similar to Slaon Uppercut WES-111. Coordinate left hand/right hand handle location with ADA requirements. Provide and install adhesive metal wall plates with instructions.

C. Seats:

1. Manufacturers:

a. Bemis Manufacturing Company: www.bemismfg.com.
b. Church Seat Company: www.churchseats.com.
c. Olsonite: www.olsonite.com.
d. Zurn industries, Inc: www.zurn.com.

2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

D. Water Closet Carriers:

1. Manufacturers:

a. JOSAM Company: www.josam.com.
b. Zurn Industries, Inc: www.zurn.com.
c. Substitutions: See Section 01600 – Materials and Equipment.

2. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.2 WALL HUNG URINALS

A. Wall Hung Urinal Manufacturers:

1. American Standard Inc: www.americanstandard.com.
2. Kohler Company: www.kohler.com.
3. Zurn Industries, Inc: www.zurn.com.

B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.

1. Flush Volume: 1.0 gallon, maximum.
2. Flush Valve: Exposed (top spud).
3. Flush Operation: Manual, oscillating handle.
4. Trap: Integral.
5. Removable stainless steel strainer.
6. Supply Size: 1 inch.
7. Outlet Size: 2 inches.

C. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.

1. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
2. Manufacturers:

a. Coyne & Delany Co: www.coynedelany.com.
b. Sloan Valve Company: www.sloanvalve.com.
c. Zurn Industries, Inc: www.zurn.com.

D. Carriers:

1. Manufacturers:

a. JOSAM Company: www.josam.com.
b. Zurn Industries, Inc: www.zurn.com.

2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.3 LAVATORIES

A. Lavatory Manufacturers:

1. American Standard Inc: www.americanstandard.com.
2. Kohler Company: www.kohler.com.
3. Zurn industries, Inc: www.zurn.com.

B. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, 20 by 18 inch minimum, with 4 inch high back, rectangular basin with splash lip, front overflow, and soap depression.

1. Drilling Centers: 4 inch.

C. Supply Faucet Manufacturers:

1. American Standard Inc: www.americanstandard.com.
2. Kohler Company: www.kohler.com.
3. Zurn industries, Inc: www.zurn.com.

D. Supply Faucet: ASME A112.18.1; chrome plated combination supply fitting with open grid strainer, water economy aerator with maximum flow of 2.2 gallons per minute, indexed handles.

E. Accessories:

1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
2. Offset waste with perforated open strainer.
3. Wheel handle stops.
4. Rigid supplies.
5. Insulation shields on plumbing piping for ADA compliance where exposed.
6. Carrier:

a. Manufacturers:

1) JOSAM Company: www.josam.com.
2) Zurn Industries, Inc: www.zurn.com.

b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.4 SINKS

A. Sink Manufacturers:

1. American Standard Inc: www.americanstandard.com.
2. Kohler Company: www.kohler.com.
3. Elkay
4. Just

B. Single Compartment Bowl (S-1): ASME A112.19.3; 20 by 22" by 6-1/2" inch outside dimensions 18 gage thick, Type 302 or 304 stainless steel, all corners rounded and all welds ground and polished, self rimming and undercoated, with ledge back drilled for faucet and bubbler trim.

1. Drain: 3-1/2 inch crumb cup and tailpiece.

C. Trim for sinks: ASME A112.18.1; concealed chrome plated brass supply with swivel gooseneck faucet (5-1/2 inch reach, 9-inch deck to aerator) and water economy softflow aerator with maximum 2.0 gpm flow, indexed 4 inch wrist blade handles. 8 inch centers. Quarter turn cartridges, rigid supplies and quarter turn ball valve stops with threaded connections.

D. Chrome plated 17 gauge brass P-trap with clean out plug and arm with escutcheon. ADA offset. Insulation shields on plumbing piping for ADA compliance where exposed.

E. Bubbler (Classrooms Sinks): ADA compliant deck mounted chrome plated bubbler with flexible shield. Provide 1/2 inch connection to sink cold water piping. Include loose key stops.

F. Single Compartment Bowl (S-2-ADA Sink): ASME A112.19.3; 20" by 22" by 6-1/2" inch outside dimensions 18 gage thick, Type 302 or 304 stainless steel, all corners rounded and all welds ground and polished, self rimming and undercoated, with ledge back drilled for trim.

1. Insulation shields on plumbing piping for ADA compliance where exposed
2. Drain: 3-1/2 inch crumb cup and tailpiece.

G. Utility Sink (S-3): Bowl Floor Mounted: 23 x 21.5 x 13 inch high white molded stone, with one inch wide shoulders, stainless steel strainer, Floor mounted support legs.

1. Trim: Deck mounted mixing faucet.

H. Double Compartment Bowl(DS-1): ASME A112.19.3; 19 by 33 by 6-1/2 inch outside dimensions 20 gage thick, Type 302 or 304 stainless steel, all corners rounded and all welds ground and polished, self rimming and undercoated, with ledge back drilled for trim.

1. Trim for sinks: ASME A112.18.1; concealed chrome plated brass supply with high rise swing spout (8-3/4 inch reach, 6-1/8-inch deck to aerator) and water economy softflow aerator with maximum 2.0 gpm flow, indexed 4 inch wrist blade handles. Spray hose. 8 inch centers. Quarter turn cartridges, rigid supplies and quarter turn ball valve stops with threaded connections.
2. ADA Offset: Waste outlet offset connection for ADA compatibility where required. Insulation shields on plumbing piping for ADA compliance where exposed.
3. Drain: 3-1/2 inch crumb cup and tailpiece.

2.5 SHOWERS

A. Shower Manufacturers:

1. Chicago
2. Delta
3. Kohler Company: www.kohler.com.

B. See Architectural for shower unit. Mechanical shall provide and install trim and accessories only.

C. Trim: ASME A112.18.1; concealed shower supply with pressure balanced and temperature limiting mixing valves, integral service stops, bent shower arm with flow control and adjustable spray ball joint shower head with maximum flow, and escutcheon.

D. Shower Head:

1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 2.5 gpm flow control.

E. Adjustable slide bar shower head.

F. Low-Flow Shower Head:

1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 1.5 gpm flow control.

2.6 DRINKING FOUNTAINS

A. Drinking Fountain Manufacturers:

1. Elkay Manufacturing Company: www.elkay.com.
2. Halsey Taylor: www.halseytaylor.com.
3. Haws Corporation: www.hawsco.com.

B. Drinking Fountain DF: Two level drinking fountain for handicapped and general public. Round bowls.

1. Wall hung, 18 gage, 304 stainless steel unit with stop valves and trap accessible through bottom cover plate. Round shape bowls. Integral wall plate.
2. Chrome plated brass bubbler with flexible shields.
3. ADA approved self-closing, frontal push pad for fountain.
4. Integral P-trap and drain. Integral 3/8 inch in line stop valve.
5. Inlet strainer.
6. ADA stainless steel skirt for upper unit
7. Bottom plate
8. Mounting frame.
9. Reverse bi level where required. See architectural elevations.

2.7 WASH FOUNTAINS (WF-1 FLOOR MOUNTED, WF-2 WALL MOUNTED AT PRIMARY HEIGHT)

A. Wash Fountain Manufacturers:

1. Acorn Engineering Company: www.acorneng.com.
2. Bradley Corporation: www.bradleycorp.com.
3. Intersan Manufacturing Company: www.intersanus.com.

B. Bowl: Semi-Circular, 36 inch diameter, precast stone.

C. Accessories: Sensor operated solenoid valve, self-closing valve, three station spray heads, liquid soap dispenser, thermostatic mixing valve, supporting tube, spud and strainer, operating mechanism, combination stop, strainer and check valves.

2.8 SERVICE SINKS

A. Service Sink Manufacturers:

1. Commercial Enameling Company: www.cecosinks.com.
2. Elkay Manufacturing Company: www.elkay.com.
3. Gerber Plumbing Fixtures LLC; www.gerberonline.com.
4. Just Manufacturing Company: www.justmfg.com.
5. Zurn industries, Inc: www.zurn.com.
6. Substitutions: See Section 01600 - Product Requirements.

B. SS-1: Bowl: ASME A112.19.1M; 28 by 28 by 8 inch deep, porcelain enamelled (inside only) cast iron roll-rim sink, with 13 inch high back, concealed hanger, chrome plated strainer, stainless steel rim guard, cast iron P-trap with adjustable floor flange.

C. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

D. Accessories:

1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
2. Hose clamp hanger.
3. Mop hanger.

2.9 EMERGENCY EYE AND FACE WASH (EW-1)

A. Emergency Wash Manufacturers:

1. Haws Corporation: www.hawsco.com.
2. Therm-Omega-Tech, Inc: www.thermomegatech.com.
3. Bradley

B. Emergency Wash: ANSI Z358.1; wall-mounted, flush mounted in wall, pull down, self-cleaning, non-clogging eye and face wash with quick opening, full-flow valves, stainless steel eye and face wash receptor, twin eye wash heads and face spray ring, copper alloy control valve

and fittings. Optional bottom fed thermostatic mixing valve. Drains though back of unit in wall. Similar to Bradley S19-292.

2.10 EMERGENCY COMBINATION EYEWASH & SHOWERS (EWSH-1)

A. Emergency Shower Manufacturers:

1. Haws Corporation: www.hawsco.com.
2. Therm-Omega-Tech, Inc: www.thermomegatech.com.

B. Emergency Shower: ANSI Z358.1; free standing, self- cleaning, non-clogging 8 inch diameter stainless steel deluge shower head with elbow, with integral eyewash one inch full flow valve with pull chain and 8 inch diameter ring, one inch interconnecting fittings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with screwdriver stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07900, color to match fixture.

F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.4 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

B. Verify in writing that emergency showers and eyewashes discharges have been adjusted to acceptable temperatures.

3.6 CLEANING

A. Clean plumbing fixtures and equipment.

3.7 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 15480 - DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes electric water heaters.

B. Related Sections:

1. See Section 16120 - Conductors and Cables: Execution requirements for electric connections specified by this section.
2. See Section 16140 – Wiring Devices; Execution requirements for electrical connections specified by this section.

1.2 SUBMITTALS

A. See Division 1 for specific requirements regarding: CONTRACTOR Submittals: Submittal procedures.

B. Shop Drawings: Indicate size of taps, and performance data. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, taps, and drains.

C. Product Data: Submit dimensioned drawings of water heaters indicating components and connections to other equipment and piping. Provide electrical characteristics and connection.

D. Manufacturer's literature or shop drawing showing details, size, number, and arrangement of tubes, and capacity calculations. Manufacturer's data report for un-fired pressure vessels, as required by ASME, provided for approval. Data required on mounting arrangement or construction of stand.

E. Manufacturer's Installation Instructions: Submit mounting and support requirements.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.3 CLOSEOUT SUBMITTALS

A. See Division 1 for specific requirements regarding: Project Close-out: Closeout procedures.

B. Operation and Maintenance Data: Submit replacement part numbers and availability.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum three years

documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept water heaters on site in original labeled cartons. Inspect for damage.

B. Protect tanks with temporary inlet and outlet caps. Maintain caps in place until installation.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.7 WARRANTY

A. Provide three-year manufacturer warranty for electric water heater, HWH-1.

1.8 EXTRA MATERIALS

A. Provide 2 spare magnesium anode sets for HWH-1.

PART 2 - PRODUCTS

2.1 COMMERCIAL ELECTRIC WATER HEATERS (HWH-1)

A. Manufacturers:

1. PVI
2. American Water Heater Group.
3. Broan Manufacturing Co. Inc.
4. Patterson-Kelley Co.
5. Type: Factory-assembled and wired, electric, vertical storage.
6. Performance:

    a. Storage capacity: 120 gal.
    b. Total wattage: 30 kW.
    c. Number of Elements: 6.
    d. Steps: 6 steps at 5 KW each. Each step with individual thermostat and sequencing control.
    e. Minimum recovery rate: 120 gph with 100 degrees F temperature rise.
    f. Maximum working pressure: 150 psig.

7. Electrical Characteristics:

    a. 208 volts, three phase, 60 Hz.

8. Tank: Glass lined welded steel; thermally insulated with minimum 2 inches polyurethane encased in corrosion-resistant steel jacket; baked-on enamel finish. ASME. “Self-

cleaning" cold water inlet tube.

9. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 140 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat. Stage sequencing control to anticipate heating demand and individually activate 6 separate stages as needed to maintain water heater temperature. Elements and immersion heaters to alternate staging priority. Panel to include door safety disconnect and circuit breaker.
10. Accessories: Brass water connections and dip tube, drain valve, magnesium anode, and ASME rated temperature and pressure relief valve.
11. Design Manufacturer: PVI

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install water heaters in accordance with UL requirements.

B. Coordinate with plumbing piping and related electrical Work to achieve operating system.

C. Secure tanks to concrete pad and wall structure in accordance with Seismic Zone 3 requirements.

D. Clean and flush tanks prior to after installation. Seal until pipe connections are made.

E. Demonstration and training

1. Demonstrate operation and maintenance procedures.
2. Provide minimum 1 hour water heater training.

END OF SECTION

SECTION 15512 - CAST-IRON BOILERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Boilers.

B. Controls and boiler trim.

C. Hot water connections.

D. Fuel connection.

E. Collector, draft hood, and chimney connection.

1.2 RELATED REQUIREMENTS

A. Section 03300 - Cast-in-Place Concrete.

B. Section 15183 - Hydronic Specialties.

C. Section 15550 - Breechings, Chimneys, and Stacks.

D. Section 16140 – Wiring Devices: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. ANSI Z21.13 - American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers; 2010.

B. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers; 2007.

C. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers; 2007.

D. HI BTS-2000 - Testing Standard, Method to Determine Heating Efficiency of Commercial Space Heating Boilers; The Hydronics Institute of AHRI; 2007.

E. NFPA 31 - Standard for the Installation of Oil Burning Equipment; National Fire Protection Association; 2006.

F. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2009.

G. NFPA 58 - Liquefied Petroleum Gas Code; National Fire Protection Association; 2008.

H. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.

I. UL 726 - Oil-Fired Boiler Assemblies; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 PERFORMANCE REQUIREMENTS

A. Performance rating shall be in accordance with Hydronics Institute BTS-2000.

1.5 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data indicating general layout, dimensions, and size and location of water, fuel oil, and vent connections, and electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Submit manufacturers complete installation instructions.

D. Manufacturer's Field Reports: Indicate condition of equipment after start-up including control settings and performance chart of control system. Combustion test reports.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in City and Borough of Juneau's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code code for internal wiring of factory wired equipment.

B. Conform to ASME (BPV IV) and (BPV VIII, 1) for boiler construction.

C. Units: AGA certified.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect units before, during, and after installation from damage to casing by leaving factory shipping packaging in place until immediately prior to final acceptance.

1.9 WARRANTY

A. See Section 01780 – Contract Closeout, for additional warranty requirements.

B. Provide a ten year pro-rated warranty for cast iron boiler sections.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Burnham.

B. Weil-McLain/SPX Corporation: www.weil-mclain.com.

2.2 MANUFACTURED UNITS

A. Hot Water Boilers: Suitable for forced draft with insulated jacket, sectional cast iron heat exchanger, fuel oil burning system, refractory, controls, and boiler trim.

B. Provide water wall design consisting of water backed combustion area with water circulating around firebox.

2.3 FABRICATION

A. Assembly: Cast iron sections with 30 psig water ASME Boilers and Pressure Vessels Code rating, assembled with push nipples or gaskets and draw rods.

B. Access: To flue passages for cleaning and flame observation ports.

C. Jacket: Glass fiber insulated steel jacket, finished with factory applied baked enamel.

2.4 HOT WATER BOILER TRIM

A. ASME rated pressure relief valve, 30 psig.

B. Water pressure gage. Combination pressure and temperature gage not acceptable. Scale on pressure gage shall be graduated from 1-1/2 to 3 times the pressure relief valve set pressure. 4-inch diameter stainless steel ring and case, bronze tube, brass or bronze movement, brass socket. Front calibration. One percent accuracy. 0-60 psi.

C. Temperature gage.

D. Burner pressure gage. 4 inch diameter stainless steel ring and case, bronze tuve, brass or bronze movement, brass socket. Front calibration. One percent accuracy. 0-400 psi.

E. Float type Low water cut-off to prevent burner operation when boiler water falls below safe level. McDonnell Miller 63M or equal. Provide with McDonnell Miller TC4 test-n-check

assembly.

F. Operating temperature controller with high and low temperature set point to maintain boiler water temperature. Set to fire at 180F and shut off at 200F.

G. High limit temperature controller with manual reset for burner to prevent boiler water temperature from exceeding safe system temperature. Set at 210F. Honeywell L4006 Series or equal.

H. Extra high limit temperature controller with manual reset for burner to prevent boiler water temperature from exceeding safe system temperature. Set at 225F. Honeywell L4006 Series or equal.

2.5 FUEL BURNING SYSTEM

A. Burner Operation: Full modulating with low fire position for ignition. Proportional motor drives fuel metering valve and combustion air damper. Design Manufacturer: Gordon Piatt.

B. Oil Burner: High pressure atomizing type for No. 1 or No. 2 fuel oil with combustion air blower, fuel pump, hinged flame inspection port, cadmium sulphide flame sensor, electrodes, ignition transformer, and oil nozzle.

C. Oil Burner Safety Controls: Energize burner motor and electric ignition, limit time for establishment of main flame, monitor flame continuously during burner operation and stop burner on flame failure with manual reset necessary, solenoid oil delay valve opens after burner motor energized and closes when de-energized.

D. Fuel Filter: Filter to be renewable. General 2A-700 or equal.

E. Controls: Pre-wired, factory assembled electronic controls in control cabinet with flame scanner or detector, programming control, relays, and switches. Provide pre-purge and post-purge ignition and shut-down of burner in event of ignition pilot and main flame failure with manual reset.

F. Boiler Control: Automatic control by BAS Contractor. Operating and high limit aquastats, low water cut off, and other safeties by Boiler Manufacturer and installed by Mechanical Contractor. Manual/Auto Switch provided and installed by Automatic Control Contractor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install boiler on concrete housekeeping base, sized minimum 3-1/2 inches high and 6 inches larger than boiler base. Refer to Section 03300.

C. Provide connection to fuel oil supply in accordance with requirements of NFPA 31.

D. Provide piping connections and accessories as indicated; refer to Section 15183.

E. Pipe relief valves to nearest floor drain.

F. Install burner pressure gage with gage cocks.

G. Test, adjust, and measure combustion requirements per manufacturing instructions.

3.2 CLOSEOUT ACTIVITIES

A. Train operating personnel in operation and maintenance of units.

B. Provide the services of the manufacturer's field representative to conduct training.

C. Provide a minimum of 2 hours on boiler/burner training.

END OF SECTION

SECTION 15550 - BREECHINGS, CHIMNEYS, AND STACKS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fabricated breechings.

B. Manufactured double wall chimneys for fuel fired equipment.

1.2 RELATED REQUIREMENTS

A. Section 15084 - Equipment Insulation.

B. Section 16140 – Wiring Devices: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.

B. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2003.

C. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low Alloy, High-Strength Low-Alloy With Improved Formability, and Ultra-High Strength; 2009b.

D. NFPA 31 - Standard for the Installation of Oil Burning Equipment; National Fire Protection Association; 2006.

E. NFPA 82 - Standard on Incinerators and Waste and Linen Handling Systems and Equipment; National Fire Protection Association; 2009.

F. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; National Fire Protection Association; 2010.

G. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

H. UL 103 - Factory-Built Chimneys for Residential Type and Building Heating Appliances; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 DEFINITIONS

A. Breeching: Vent Connector.

B. Chimney: Primarily vertical shaft enclosing at least one vent for conducting flue gases outdoors.

C. Vent: That portion of a venting system designed to convey flue gases directly outdoors from a vent connector or from an appliance when a vent connector is not used.

D. Vent Connector: That part of a venting system that conducts the flue gases from the flue collar of an appliance to a chimney or vent, and may include a draft control device.

1.5 DESIGN REQUIREMENTS

A. Factory built vents and chimneys used for venting natural draft appliances shall comply with NFPA 211 and be UL listed and labeled. Designed and specific project by Factory Engineer. Site construction, existing conditions, and measurements provided to Factory Engineer by Contractor.

1.6 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data indicating dimensional details of components, dimensions and weights, and connection requirements.

C. Shop Drawings: Indicate general construction, dimensions, weights, support and layout of breechings.

D. Manufacturer's Instructions: Include installation instructions, and indicate assembly, support details, and connection requirements.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of documented experience and approved by manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. AMPCO by Commercial Products Group of Hart & Cooley, Inc: www.commercialproductsgroup.com.

B. Industrial Chimney Company

C. Schebler

D. Metal-Fab, Inc: www.mtlfab.com.

E. Selkirk by Commercial Products Group of Hart & Cooley, Inc: www.selkirkinc.com.

2.2 CHIMNEY BREECHINGS

A. Provide double wall metal breeching, tested to UL 103 and UL listed, for use with building heating equipment, in compliance with NFPA 211.

B. Fabricate with 1 inch minimum air space between walls. Construct inner jacket of 20 gage ASTM A 666, Type 304 or Type 316 stainless steel. Construct outer jacket of aluminum coated steel 24 gage for sizes 10 inches to 24 inches and 20 gage for sizes 28 inches to 48 inches.

C. Accessories, UL labeled, fabricated of same materials as chimney:

1. Support System
2. Cleanout cap: Manifold Tee, Reducer, 90 degree elbow.
3. 45 degree entry tee for boiler #2.
4. Thimble for penetration vertical concrete chimney. Steel closure at concrete wall
5. Wall guide assemblies, wall support assemblies.
6. Expansion joints where necessary.
7. Appurtenances as require to install system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install breechings with minimum of joints. Align accurately at connections, with internal surfaces smooth.

C. Support breechings from building structure, rigidly with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for equivalent duct support configuration and size.

D. Pitch breechings with positive slope up from fuel-fired equipment to chimney or stack.

END OF SECTION

SECTION 15720-AIR HANDLING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes all modular factory fabricated air-handling units and accessories including flow measurement stations and motors.

B. Related Sections:

1. Section 15082 - Piping Insulation: Product requirements for insulation for placement by this section.
2. Section 15183 - Hydronic Specialties: Product requirements for meters, gages and steam traps for placement by this section.
3. Section 15158182 - Hydronic Piping: Product requirements for drains, piping, fittings for placement by this section.
4. Section 15820 - Duct Accessories: Product requirements for flexible duct connections for placement by this section.
5. Section 15950 - Testing, Adjusting, and Balancing: Execution requirements for balancing specified by this section.
6. See Section 16120 - Conductors and Cables: Execution requirements for electric connections specified by this section.
7. See Division 16 - Electrical: Product requirements for electric motors for placement by this section.
8. Drawings and general provisions of the Contract, including General, Supplementary Conditions, and all Divisions Specification Sections, apply to this Section.

C. REFERENCES

1. ABMA STD 9 (American Boiler Manufacturers Association) - Load Ratings and Fatigue Life for Ball Bearings.
2. ABMA STD 11 (American Boiler Manufacturers Association) - Load Ratings and Fatigue Life for Roller Bearings.
3. AMCA 99 (Air Movement and Control Association) - Standards Handbook.
4. AMCA 210 (Air Movement and Control Association) - Laboratory Methods of Testing Fans for Rating.
5. AMCA 300 (Air Movement and Control Association) - Reverberant Room Method for Sound Testing of Fans.
6. AMCA 301 (Air Movement and Control Association) - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
7. AMCA 500 (Air Movement and Control Association) - Test Methods for Louvers, Dampers and Shutters.
8. ARI 410 (Air-Conditioning and Refrigeration Institute) - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils.
9. ARI 430 (Air-Conditioning and Refrigeration Institute) - Standard for Central-Station Air-Handling Units.
10. ARI Guideline D (Air-Conditioning and Refrigeration Institute) - Application and Installation of Central Station Air-Handling Units.
11. ARI 610 (Air-Conditioning and Refrigeration Institute) - Central System Humidifiers.

12. NEMA MG1 (National Electrical Manufacturers Association) - Motors and Generators.
13. SMACNA (Sheet Metal and Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards - Metal and Flexible.
14. UL 900 (Underwriters Laboratories, Inc.) - Standard for Air Filter Units.
15. UL (Underwriters Laboratories, Inc.) - Fire Resistance Directory.

D. SUBMITTALS

1. See Division 1 for specific requirements regarding: Contractor Submittals: Submittal procedures.
2. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements. Requirements for Seismic Zone 3 installations.
3. Product Data, Submit:

    a. Published Literature: Indicate capacities, ratings, gages and finishes of materials, and electrical characteristics and connection requirements.
    b. Filters: Data for filter media, filter performance data, filter assembly, and filter frames.
    c. Fans: Performance and fan curves with specified operating point clearly plotted, power, RPM.
    d. Casing: Provide specific factory certification of leakage and deflection requirements.
    e. Motor: Manufacturers data indicating compliance with rated capacity, efficiency, and power factor requirements.
    f. Sound Power Level Data: Fan outlet and casing radiation at rated capacity.
    g. Electrical Requirements: Power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

        1) Manufacturer's Installation Instructions: Submit.
        2) Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. CLOSEOUT SUBMITTALS

1. Operation and Maintenance Data: Submit instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

F. QUALIFICATIONS

1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
2. Installer: Company specializing in performing WORK of this section with minimum three years documented experience.

G. DELIVERY, STORAGE, AND HANDLING

1. Accept units and components on site in factory protective containers, with factory shipping skids and lifting lugs. Inspect for damage
2. Protect units from weather and construction traffic by storing in a dry, roofed location.

H. ENVIRONMENTAL REQUIREMENTS

1. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and

fan has been test run under observation. Do not operate units until all construction debris and dust has been removed from site.

I. FIELD MEASUREMENTS

1. Verify field measurements prior to fabrication.

J. EXTRA MATERIALS

1. Supply four spare sets of pre-filters, plus a set for installation prior to balancing for each unit. Five total complete sets of filters to be supplied for each unit.
2. Supply one set fan belts for each fan unit.

PART 2 - PRODUCTS

2.1 AIR HANDLING UNIT (AHU-1, AHU-2, AHU-3)

A. Manufacturers:

1. Scott Springfield Mfg. (Design Manufacturer)
2. Haakon.
3. Huntair.

B. Configuration

1. AHU-1 Configuration:

a. Return Section Configuration:

1) Return air inlet section with (2) return air inlets. Inlets with bellmouths. See drawings for sizes and locations.
2) Return air filters.
3) Inlet plenum with air measuring station at fan inlet.
4) Return/Exhaust Fan: Plenum/Plug type, SWSI, (2) outlets (one to supply side with RAD, other to plate type heat exchanger).
5) Heat Exchanger Section.
6) Exhaust air outlet section with side outlet discharge opening to wall louver. EAD at unit side outlet sized for 12,600 CFM.

b. Supply Section Configuration:

1) Outdoor air inlet section. Top inlet with outdoor air damper. OAD sized for 15,200 CFM maximum.
2) Filter Section: 2-inch flat filter.
3) Air Measuring Station – Ebtron probe type
4) Heat Recovery Pre-Heating Coil Section, HRC-1b.
5) Heat Exchanger - Outdoor Air Side with Face and Bypass Dampers.
6) Adjustable Mixing Baffle to prevent air stratification.
7) Economizer Section. Side return air inlet with return air damper and lockable manual adjustment damper. Return air damper sized for maximum 12600 CFM.
8) Heating Coil, HC-1a and HC-1b. Heating coils offset (half width, full height)

that can be disassembled from within the cabinet and removed from the end of the fan unit. Piping extended to exterior of unit with unions as needed for removal of coils on inside of unit.

9) Inlet plenum with air measuring station at fan inlet.
10) Supply Fan (SF) Plenum/Plug type, SWSI, (2) outlets through bottom. Outlets with bellmouths. See drawings for sizes and locations.

2. AHU-2 Configuration:

   a. Economizer Section. Modulating outdoor air damper.
   b. Filter Section: 2-inch flat filter.
   c. Heat Recovery Coil (HRC-2b)
   d. Blank section – for coil access
   e. Heating Coil (HC-2)
   f. Supply Fan (SF): Centrifugal, top horizontal discharge, forward curved blades; DWDI.

3. AHU-3 Configuration:

   a. Inlet section with top inlet and top outdoor air damper.
   b. Filter Section: 2-inch flat filter.
   c. Heating Coil, HC-3, with face and bypass dampers.
   d. Inlet plenum
   e. Supply Fan (SF) Section with Plenum/Plyg type, SWSI. (1) outlet through bottom. See plans. Outlet with bellmouth connection.

4. Performance Base: Sea level pressure or altitude. Provide specific factory certification of leakage and deflection requirements.
5. Fabrication: Conform to AMCA 99 and ARI 430.
6. Size of cabinet/casing: See Plans.

   a. AHU-1 Maximum Dimensions: 7’-10” height (including base), 30’-0” length, 13’-9” width. See Plans. Unit shall be designed to be shipped in split sections with maximum split section length of ten feet.
   b. AHU-2 Maximum Dimensions: 54” height (including base), 10’-0 length, 54” width. See Plans.
   c. See Plans for complete requirements and required clearances.

7. Casing

   a. Channel base of welded steel. Assemble sections with gaskets and bolts.
   b. Outside Casing: Galvanized Steel: 0.0516 inch.
   c. Inside Casing: Galvanized Steel: Solid, 0.0276 inch thick.
   d. Floor Plate: Galvanized Steel: 16 gage welded floor with integral water dam
   e. Insulation: Neoprene coated, glass fiber, applied to internal surfaces with adhesive and weld pins with exposed edges of insulation coated with adhesive. Leading exposed edges secured with aluminum or steel nosing strips along entire edge to hold insulation in place.
      1) 'K' factor at 75 degrees F: Maximum 0.26 Btuh inch/sq ft/degrees F.
      2) Density: 2 inch thick, 3 lbs/cu ft.
   f. Finish: Baked enamel
   g. Access Doors: Minimum 24 x 48 inch installed on inlet section, mixing box, and fan

sections. Galvanized steel insulated sandwich construction, for flush mounting, with hinges, gasket, heavy machined handle latch and handle assemblies.

h. Light switch located on casing adjacent to door.
i. Interior lights located within air handling unit cabinets with GFI wired to casing switch.
j. Air Leakage: Completed casing constructed for maximum 1% air volume leakage at 10-inch wg pressurization.
k. Strength: Provide structure to brace casings for suction pressure of 2.5-inch wg, with maximum deflection of 1 in 200.

8. Fans

a. Wheel and inlet

1) AHU-1 Supply Fan: Class II fan. Plenum/Plug Fan, steel, SWSI. Aluminum inlet bell. Steel construction with smooth curved inlet flange, heavy back plate, blades welded or riveted to back plate, hub riveted to back plate and keyed to shaft with set screws.
2) AHU-1 Return Fan: Plenum/Plug Fan, steel, SWSI. Aluminum inlet bell. Steel construction with smooth curved inlet flange, heavy back plate, blades welded or riveted to back plate, hub riveted to back plate and keyed to shaft with set screws.
3) AHU-2 Supply Fan: Centrifugal, DWDI, top horizontal discharge, forward curved.
4) AHU-3 Supply Fan: Plenum/Plug Fan, steel, SWSI. Aluminum inlet bell. Steel construction with smooth curved inlet flange, heavy back plate, blades welded or riveted to back plate, hub riveted to back plate and keyed to shaft with set screws.

b. Performance Ratings: Conform to AMCA 210 and label with AMCA Certified Rating Seal.
c. Sound Ratings: AMCA 301, tested to AMCA 300 and label with AMCA Certified Sound Rating Seal.
d. Bearings: Self-aligning, grease lubricated, ball or roller bearings with lubrication fittings. Lubrication fittings mounted inside unit but immediately accessible at fan access door.
e. Mounting: Locate fan and motor internally on welded steel base coated with corrosion resistant paint. Factory mount motor on slide rails. Provide access to motor, drive, and bearings through access doors. Mount base on vibration isolators.
f. Fan Performance: See Fan Schedule for capacities and for additional information. Sea level pressure.

1) Filter Static Pressures: Use 0.35" w.g. in calculating internal static pressures for 30% efficient filters.
2) AHU-1 SF: Max 1375 fan rpm. 20.0 hp motor minimum. 208 volt, three phase.
3) AHU-1 RF: Max 1150 fan rpm. 15 hp motor minimum. 208 volt, three phase.
4) AHU-2 SF: Max 1250 fan rpm. 5 hp motor minimum. 208 volt, three phase.
5) AHU-3: Max 1400 fan rpm. 1 hp motor minimum. 208 volt, three phase.

9. Bearings and Drives

a. Bearings: Pillow block type, self-aligning, grease-lubricated ball bearings, with ABMA 9 L-10 life at 200,000 hours or roller bearings with ABMA 11, L-10 life at 200,000 hours.

b. Shafts: Solid, hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.
c. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts, and keyed. Variable and adjustable pitch sheaves for motors 15 hp and under selected so required rpm is obtained with sheaves set at mid-position; Drive rated for 1.5 times nameplate rating of the motor.

10. Heating Coil Sections

a. Casing with access to both sides of coils. Enclose coils with headers and return bends exposed outside casing. Slide coils into casing through removable end panel with blank off sheets and sealing collars at connection penetrations.
b. Tubes: 5/8-inch OD seamless copper expanded into fins, brazed joints.
c. Fins: Aluminum. Maximum 8 fins per inch.
d. Casing: Die formed channel frame of galvanized steel.
e. Water Heating Coils:

1) Headers: Cast iron, seamless copper tube, or prime coated steel pipe with brazed joints. Supply and return connections on same side.
2) Configuration: Drainable, with threaded plugs for drain and vent; serpentine type with return bends on smaller sizes and return headers on larger sizes.

f. Hot Water Heating Coil (HC) capacity: ARI Certified and rated in Accordance with ARI 410. See schedules for capacities. 100% water.
g. Heat Recovery Pre-Heat Coil (PHC) Capacity. ARI Certified and rated in Accordance with ARI 410. See schedules for capacities. 40% propylene glycol.
h. AHU-1 Heating Coils: Coils arranged side by side in staggered arrangement. In order for coils to be removed from interior of air handling unit, coils must be installed staggered with piping extended to AHU cabinet exterior. Unions installed for ability to remove coil from inside of unit and take out of AHU through end access doors. See fan room plan.

11. Heat Exchanger (AHU-1)

a. Description: Crossflow plate air-to-air type. No moving parts or secondary heat transfer surfaces.
b. Construction: Aluminum plates, 0.008 inch thick. Plate corners sealed with silicon and plate edges sealed both mechanically and with sealant. Designed to withstand 10 inch pressure differential. Folded rib plate separators shall be spaced at 2 inch intervals the full length of the plate. Plates shall be housed in a full aluminum tube frame. No steel parts allowed. Clog resistant design with no dimples, corrugations, or other raised surfaces.
c. Drains provided on both supply and exhaust sides.
d. Inspection: Entire transfer surface shall be visible for inspection and cleaning without removing the exchanger.
e. Performance: 96.1% sensible temperature effectiveness (supply air side).
f. Capacities and pressure drops: See Below. Total static pressure listed is approximate and may vary with manufacturer. Coordinate motor size differences with electrical contractor and specific requirements therein.
g. Plate type heat exchanger. Size heat exchanger for maximum 10,000 CFM OSA air through heat exchanger, 6860 CFM exhaust air through heat exchanger. Maximum 1.00” pressure drop OSA, 0.7” pressure drop EA. Provide face and bypass dampers

on the OSA. Use 15F DB and 50% RH for OSA, 75F and 45%RH for RA.

1) Face Area: 22.3 Sq ft – Supply side; 22.3 Sq ft – Exhaust side, 48-inch height.
2) Sensible Effectiveness – 96.1%
3) Capacity – 427,674 Btu/hr
4) Leaving Exhaust Air: 36.1 DB F
5) Leaving Supply Air: 54.6 DB F.
6) Maximum face velocity: Supply – 450 fpm; Return – 310 fpm.

h. Design Manufacturer: Hoval model NV-170/R-121.9

12. Filter Box: Section with filter guides, access doors from both sides, for side loading with gaskets and blank-off plates. Provide blank-off plates to prevent air bypassing filters.

a. Filter Media:

1) Filter Section: UL 900 listed, Class II, rated at ASHRAE 52-76 at 30% dust spot efficiency with an arrestance of 90%, maximum velocity of 400 fpm per square foot of filter. Flat 2 inches deep disposable slide in panel filters. Farr 30/30

b. Filter Gauges: 3-1/2 inch diameter diaphragm actuated dial in metal case, with static pressure tips.

13. Dampers

a. Mixing Boxes: Section with factory mounted outside and return air dampers of galvanized steel with vinyl bulb edging and edge seals in galvanized frame, with galvanized steel axles in self-lubricating nylon or brass bearings, in opposed blade arrangement. See above for minimum and modulating outdoor air damper air volume requirements. External linkage. Airfoil blades.
b. Face and Bypass Dampers: Factory mount in casing with access doors, of galvanized steel blades, with vinyl bulb edging and edge seals, galvanized steel frame, and axles in self-lubricating nylon bearings. Arrange to match coil face with top bypass, blank-off and division sheets, internal linkage, access doors, and adjustable resistance plate. Area of bypass dampers not less than 30 percent of face dampers. Air foil blades. Provide static pressure baffle or manual adjustment dampers in bypass section if necessary to match coil pressure drop. Provide calculations detailing static pressure drop through bypass section is equivalent to coil air pressure drop.
c. Damper Leakage: Maximum 2 percent at 4-inch wg differential pressure when sized for 2000 fpm face velocity.
d. Face and Bypass Damper for Heat Exchanger (HX): Damper and modulating actuator arranged to match heat exchanger face with top or bottom bypass, blank-off and division sheets, internal linkage, and resistance plate. Factory mount in casing with access doors, of galvanized steel blades, with vinyl bulb edging and edge seals, galvanized steel frame, and axles in self-lubricating nylon bearings. Air foil blades. Provide static pressure baffle or manual adjustment dampers in bypass section if necessary to match HX pressure drop. Provide calculations detailing static pressure drop through bypass section is equivalent to HX air pressure drop.

14. Sound Level Requirements.

a. Maximum bare fan at design flow rate: AMCA Standard No. 300 Sound Power Levels

dB.

Fan	Octave Band	125	250	500	1000	
AHU-1	Outlet	88	98	89	81	
AHU-1	Inlet		84	95	82	74
AHU-2	Outlet	83	88	83	73	
AHU-2	Inlet		77	88	76	69
AHU-3	Outlet	84	77	74	71	
AHU-3	Inlet		72	72	67	64

15. Electrical Characteristics and Components

    a. See Fan Schedules.
    b. Motors must meet CEE Premium Efficiency Criteria. See 2.2.C. Below.

C. MOTORS

1. Manufacturers:

    a. Baldor
    b. General Electric
    c. Reliance
    d. Constructed and rated in accordance with current NEMA standards. The frame size, enclosures, and all appurtenances shall be suited to the application. 1.15 Service factor. Class F insulation.

        1) Single phase motors: NEMA Design N for fractional horsepower
        2) Three phase motors: NEMA Design B. Motors listed in schedules as 208 volt shall be 200 or 208 volt, not 208-230/460.

    e. Electrical Requirements: At a minimum, motors must meet the following premium efficiency criteria as defined by (CEE) Consortium for Energy Efficiency for motors 1 hp and above.

HP	EFFICIENCY (1200 RPM)	EFFICIENCY (1800 RPM)
1	82.5	85.5
1.5	86.5	86.5
2	87.5	86.5
3	88.5	89.5
5	89.5	89.5
7.5	90.2	91.0
10	91.7	91.7
15	91.7	93
20	92.4	93

PART 3 - EXECUTION

2.1 INSTALLATION

A. Install in accordance with ARI 430.

B. Install flexible connections between unit and inlet and discharge ductwork. Ensure metal bands of connectors are parallel with minimum 1-inch flex between ductwork and fan while running.

C. Install assembled units with vibration isolators. Install isolated fans with resilient mountings and flexible electrical leads.

D. Install floor mounted units on concrete floor or concrete housekeeping pads at least 3 inches high and 6 inches wider than unit.

E. Provide sheaves required for final air balance.

F. Motors: Ensure proper alignment and rotation.

G. Verify power requirements on-site.

H. Make connections to coils with unions or flanges.

I. Hydronic Coils:

1. Hydronic Coils: Connect water supply to leaving airside of coil (counterflow arrangement).
2. Locate water supply at bottom of supply header and return water connection at top.
3. Ensure water coils are drainable and provide drain connection at low points.
4. FIELD QUALITY CONTROL

    a. Section 15950 - Testing, Adjusting and Balancing. Coordinate adjustment of mixing baffle with balancing contractor to prevent stratification.

5. PROTECTION OF INSTALLED CONSTRUCTION

    a. Do not permit unit operation without air filters. If unit is operated without a complete set filters the Contractor shall be responsible for all cleaning of fan systems subject to approval of ARCHITECT.

2.2 COORDINATION

A. Coordinate this work with the work of other trades, and make arrangements for the complete and proper accomplishment of all related work.

END OF SECTION

SECTION 15730 - AIR-CONDITIONING (AC) EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes packaged unitary air conditioners and controls.

B. Related Sections:

1. Drawings and general provisions of the Contract, including General, Supplementary Conditions, and all Division Specification Sections, apply to this Section.
2. Section 15186 - Refrigerant Piping and Specialties: Execution requirements for drain piping specified by this section.

1.2 REFERENCES

A. ARI 210 (Air-Conditioning and Refrigeration Institute) - Unitary Air-Conditioning Equipment.

B. ARI 240 (Air-Conditioning and Refrigeration Institute) - Air Source Unitary Heat Pump Equipment.

C. ARI 270 (Air-Conditioning and Refrigeration Institute) - Sound Rating of Outdoor Unitary Equipment.

1.3 SUBMITTALS

A. General: Provide submittal procedures according to Conditions of Contract and Division 1 Specifications Sections.

B. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

C. Product Data: Submit data indicating dimensions, rough-in connections, and electrical characteristics and connection requirements. Provide capacity and dimensions of manufactured products and assemblies required for this Project. Indicate electrical service with electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.

1.4 CLOSEOUT SUBMITTALS

A. See Division 1 for specific requirements regarding: Closeout procedures.

B. Project Record Documents: Record actual locations of controls that are separate from units.

C. Operation and Maintenance Data: Submit.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. See Division 1 for specific requirements regarding: Product storage and handling requirements.

B. Accept equipment on site in factory packaging. Inspect for damage.

C. Protect equipment from damage by providing temporary covers until construction is complete in adjacent space.

1.7 WARRANTY

A. See Division 1 for specific requirements regarding: Product warranties and product bonds.

1.8 MAINTENANCE SERVICE

A. See Division 1 for specific requirements regarding: Maintenance service.

1.9 EXTRA MATERIALS

A. See Division 1 for specific requirements regarding: Spare parts and maintenance products.

PART 2 - PRODUCTS

2.1 AIR-CONDITIONING UNITS (AC-1/CC-1)

A. Manufacturers:

1. Mitsubishi Electric.
2. Friedrich
3. Description: Packaged, self-contained split system, factory assembled, pre-wired unit, consisting of internal ductless fan-coil unit, suspended type, and compressor/condenser unit and controls; fully charged with refrigerant. Lift up drain assembly for condensate drainage. Utilize equipment and refrigerant for non CFC refrigerant systems.
4. Cabinet: Galvanized steel with baked enamel finish.

5. Capacity: See Schedules. Indoor unit and outdoor unit 208/230 volt single phase.
6. Controls: Wall mounted programmable module thermostat.
7. Electrical Requirements:

    a. Division 16: Requirements for electrical characteristics.
    b. Division 16: Requirements for motors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. See Division 1 for specific requirements regarding: Coordination and project conditions.

B. INSTALLATION

1. Utilize equipment and refrigerant for non CFC refrigerant systems. Hang indoor units from structure using beam clamps with retainer straps. Install compressor-condenser unit in Fan Room 203 on concrete pad as shown. Brace units as required.
2. Install room thermostat module four feet above floor.

C. DEMONSTRATION AND TRAINING

1. Demonstrate unit operation and maintenance.

END OF SECTION

SECTION 15762 - TERMINAL HEAT TRANSFER UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Finned tube radiation.

B. Convectors.

C. Cabinet unit heaters.

1.2 RELATED REQUIREMENTS

A. Section 15182 - Hydronic Piping.

B. Section 15183 - Hydronic Specialties.

C. Section 15926 – Building Automation System and Automatic Controls.

D. Section 16140 – Wiring Devices: Electrical characteristics and wiring connections. Installation of room thermostats. Electrical supply to units.

1.3 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide typical catalog of information including arrangements.

C. Manufacturer's Instructions: Indicate installation instructions and recommendations.

D. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.

E. Operation and Maintenance Data: Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

F. Warranty: Submit manufacturer's warranty and ensure forms have been completed in City and Borough of Juneau's name and registered with manufacturer.

G. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.

1. See Section 01600 – Materials and Equipment, for additional provisions.
2. Extra Filters: One set of each type and size.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.5 WARRANTY

A. See Section 01780 – Contract Closeout, for additional warranty requirements.

B. Provide five year manufacturer's warranty for fan-coil unit.

PART 2 - PRODUCTS

2.1 FINNED TUBE RADIATION

A. Manufacturers:

1. Slant/Fin Corporation: www.slantfin.com.
2. Marley Engineered Products: www.marleymeh.com.
3. Trane Inc: www.trane.com.
4. Rittling.

B. Heating Elements: 1 inch ID seamless copper tubing, mechanically expanded into evenly spaced aluminum fins sized 4-1/4 x 4-1/4, suitable for soldered fittings.

C. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

D. FP-1 to be bare element in architectural cabinet.

E. FP-2: Enclosures: 0.0478 inch steel up to 18 inches in height, 0.0598 inch steel over 18 inches in height or aluminum as detailed, with easily jointed components for wall to wall installation.

1. Support rigidly, on wall or floor mounted brackets.
2. Support rigidly, on wall or floor mounted brackets at least 3 feet on center maximum.

F. Finish: Factory applied baked enamel of color as selected.

G. Access Doors: For otherwise inaccessible valves, provide factory-made permanently hinged access doors, 6 x 7 inch minimum size, integral with cabinet.

H. Capacity: As scheduled, based on 65 degree F entering air temperature, 180 degree F average water temperature.

2.2 CONVECTORS

A. Manufacturers:

1. Slant/Fin Corporation: www.slantfin.com.
2. Sterling Hydronics/Mestek Technology, Inc: www.sterlingheat.com.
3. Trane Inc: www.trane.com.

B. Heating Elements: Seamless copper tubing mechanically expanded into evenly spaced aluminum fins and cast iron headers, steel side plates and supports, factory air pressure tested at 100 psi under water, with means of adjusting pitch of element.

C. Cabinet: 0.0598 inch steel front and top, 0.0478 inch steel back and ends; exposed corners rounded; easily secured removable front panels, adequately braced and reinforced for stiffness.

D. Finish: Factory applied baked enamel of color as selected.

E. Access Doors: For otherwise inaccessible valves, provide factory-made permanently hinged access doors, 6 x 7 inch minimum size, integral with cabinet.

F. Capacity: As scheduled, based on 65 degree F entering air temperature, 180 degree F average water temperature.

2.3 CABINET UNIT HEATERS

A. Manufacturers:

1. Slant/Fin Corporation: www.slantfin.com.
2. Sterling Hydronics/Mestek Technology, Inc: www.sterlingheat.com.
3. Trane Inc: www.trane.com.

B. Coils: Evenly spaced aluminum fins mechanically bonded to copper tubes, designed for 100 psi and 220 degrees F.

C. Cabinet: 0.0598 inch steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation and integral air outlet.

D. Finish: Factory applied baked enamel of color as selected on visible surfaces of enclosure or cabinet.

E. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

F. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

G. Control: Multiple speed switch, factory wired, located in cabinet.

H. Filter: Easily removed 1 inch thick permanent washable type, located to filter air before coil.

I. Capacity: As Scheduled, based on 65 degree F entering air temperature, 180 degree F average water temperature.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Do not damage equipment or finishes.

C. Protection: Provide finished cabinet units with protective covers during balance of construction.

D. Finned Tube Radiation: Locate on outside walls and run cover wall-to-wall unless otherwise indicated. Center elements under windows. Install wall angles where units butt against walls.

E. Convectors: Install where indicated. Coordinate to assure correct recess size for recessed convectors.

F. Cabinet Unit Heaters: Install as indicated. Coordinate to assure correct recess size for recessed units.

3.2 CLEANING

A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

C. Install new filters.

END OF SECTION

SECTION 15765 - AIR COILS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Water heating coils.

B. Heat Recovery Glycol coils.

1.2 RELATED REQUIREMENTS

A. Section 15082 - Piping Insulation.

B. Section 15183 - Hydronic Specialties.

C. Section 15810 - Ducts: Installation of duct coils.

D. Section 16140 – Wiring Devices: Electrical characteristics and wiring connections.

E. Drawings and general provisions of the Contract, including General, Supplementary Conditions, and all Divisions Specification Sections, apply to this Section.

1.3 REFERENCE STANDARDS

A. ARI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils; Air-Conditioning and Refrigeration Institute; 2001 (R2002) .

B. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

C. Shop Drawings: Indicate coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

D. Warranty: Submit manufacturer's warranty and ensure forms have been completed in City and Borough of Juneau's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.

B. Protect coils from entry of dirt and debris with pipe caps or plugs.

1.7 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Aerofin Corporation: www.aerofin.com.

B. Luvata: www.luvata.com.

C. Trane Inc: www.trane.com.

D. McQuay.

2.2 DUCT MOUNTED WATER HEATING COILS (BC)

A. Tubes: 5/8 inch OD seamless copper or brass arranged in parallel or staggered pattern, expanded into fins, silver brazed joints.

B. Fins: Aluminum or copper continuous plate type with full fin collars.

C. Casing: Die formed channel frame of 16 gage galvanized steel with mounting holes on 3 inch centers. Provide tube supports for coils longer than 36 inches.

D. Headers: Cast iron with tubes expanded into header.

E. Testing: Air test under water to 200 psi for working pressure of 200 psi and 220 degrees F.

F. Configuration: Drainable, with threaded plugs for drain and vent.

G. Fin Spacing: 8 fins per inch.

2.3 DUCT MOUNTED GLYCOL HEAT RECOVERY COILS (HRC)

A. Manufacturers:

1. Aerofin Corporation: www.aerofin.com.
2. Luvata: www.luvata.com.
3. Trane Inc: www.trane.com.
4. USA Coil.
5. McQuay

B. For 40/60 glycol/water. Serpentine flow, with even number of rows. With supply and return on same end. Nonferrous tubes secured to header to form permanently tight joints. Brazed joints. Nonferrous fin surface extending at right angles to the tubes, and mechanically secured at uniform pitch. Maximum of 8 fins per inch. Without water turbulating means. With removable plugs or headers. Complete with 16-gage galvanized steel channel frame for duct mounting. Coil completely drainable through single opening by gravity. Guaranteed working pressure of 100 psi; tested with 200 psi air pressure underwater.

C. Heat recovery heating coil capacity: ARI Certified and rated in Accordance with ARI 410. See schedules on drawings for performance and capacity.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturers written instructions.

B. Install in ducts and casings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

1. Support coil sections independent of piping on steel channel or double angle frames and secure to casings.
2. Provide frames for maximum three coil sections.
3. Arrange supports to avoid piercing drain pans.
4. Provide airtight seal between coil and duct or casing.
5. Refer to Section 15810.

C. Protect coils to prevent damage to fins and flanges. Comb out bent fins.

D. Install coils level.

E. Make connections to coils with unions and flanges.

F. Hydronic Coils:

1. Hydronic Coils: Connect water supply to leaving air side of coil (counterflow arrangement).
2. Provide shut-off valve on supply line and lockshield balancing valve with memory stop on return line.
3. Locate water supply at bottom of supply header and return water connection at top.
4. Provide manual air vents at high points complete with stop valve.
5. Ensure water coils are drainable and provide drain connection at low points.

END OF SECTION

SECTION 15810 - DUCTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Metal ductwork.

B. Casing and plenums.

C. Kitchen hood ductwork.

1.2 RELATED REQUIREMENTS

A. Section 11400 - Food Service Equipment: Supply of kitchen range hoods for placement by this Section.

B. Section 15086 - Duct Insulation: External insulation and duct liner.

C. Section 15820 - Duct Accessories.

D. Section 15850 - Air Outlets and Inlets.

E. Section 15950 - Testing, Adjusting, and Balancing.

1.3 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2005.

B. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2008.

C. ASTM A 240/A 240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and General Applications; 2009c.

D. ASTM A 480/A 480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2009b.

E. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.

F. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2010.

G. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

H. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2009.

I. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2006.

J. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2010.

K. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2009.

L. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.

M. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2009.

N. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association; 2008.

O. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 1985, First Edition.

P. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

Q. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication & Installation Guidelines; 2001.

R. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.5 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data for duct materials.

C. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for kitchen hood exhaust systems.

D. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual.

E. Manufacturer's Installation Instructions: Indicate special procedures for glass fiber ducts.

F. Manufacturer's Certificate: Certify that installation of glass fiber ductwork meet or exceed specified requirements.

G. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of documented experience.

C. All sheet metal workers shall have a minimum documented sheet metal fabrication and installation experience in commercial or industrial facilities of 3 years or be enrolled in and Alaska Department of Labor approved Sheet Metal Apprentice program. The ratio of on-site workers shall not exceed 3 apprentices or sheet metal workers for every one foreman. A foreman is defined as a sheet metal worker with a minimum of 3 years experience as detailed above or is an approved Journeyman.

1.7 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A standards.

PART 2 - PRODUCTS

2.1 DUCT ASSEMBLIES

A. All Ducts: Galvanized steel, unless otherwise indicated.

B. Low Pressure Supply (Heating Systems): 1/2 inch w.g. pressure class, galvanized steel.

C. Medium and High Pressure Supply: 1/2 inch w.g. pressure class, galvanized steel.

D. Return and Relief: 1/2 inch w.g. pressure class, galvanized steel.

E. General Exhaust: 1/2 inch w.g. pressure class, galvanized steel.

F. Grease Exhaust: 1/2 inch w.g. pressure class, stainless steel.

1. Manufactured double-wall duct with 16 gage un-galvanized steel outer wall.

G. Outside Air Intake: 1/2 inch w.g. pressure class, galvanized steel.

H. Combustion Air: 1/2 inch w.g. pressure class, galvanized steel.

2.2 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M FS Type B, with G60/Z180 coating.

B. Stainless Steel for Ducts: ASTM A 240/A 240M, Type 304.

C. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
2. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E 84.

D. Hanger Rod: ASTM A 36/A 36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

E. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Concrete Adhesive Type Achors: Compying with ICC-ES AC308.
6. Other Types: As required.

F. Insulated Flexible Ducts:

1. Two ply vinyl film supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.

a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
b. Maximum Velocity: 4000 fpm.
c. Temperature Range: -10 degrees F to 160 degrees F.

2.3 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE Handbook - Fundamentals.

C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

D. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on certerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

E. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.

F. Provide air foil turning vanes when rectangular elbows must be used.

G. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

H. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

2.4 DUCT MANUFACTURERS

A. Metal-Fab, Inc; www.mtlfab.com.

B. SEMCO Incorporated; www.semcoinc.com.

C. United McGill Corporation; www.unitedmcgill.com.

2.5 MANUFACTURED DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Double Wall Insulated Round Ducts: Round spiral lockseam duct with galvanized steel outer wall, perforated galvanized steel inner wall; fitting with solid inner wall.

1. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
2. Manufacturers:

    a. AMPCO by Commercial Products Group of Hart & Cooley, Inc; www.ampcostacks.com.
    b. Selkirk by Commercial Products Group of Hart & Cooley, Inc; www.selkirkcorp.com.

C. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.

1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
2. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
3. Maximum Velocity: 4000 fpm.
4. Temperature Range: -10 degrees F to 160 degrees F.

D. Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.

1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
2. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
3. Maximum Velocity: 4000 fpm.
4. Temperature Range: -20 degrees F to 210 degrees F.

2.6 CASINGS

A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and construct for operating pressures indicated.

B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gage galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.

2.7 KITCHEN HOOD EXHAUST DUCTWORK

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, SMACNA Kitchen Ventilation Systems and Food Service Equipment Fabrication & Installation Guidelines and, and NFPA 96.

B. Construct of 16 gage carbon steel or 18 gage stainless steel, using continuous external welded joints.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Install in accordance with manufacturer's instructions.

C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

D. Kitchen Hood Exhaust: Provide residue traps at base of vertical risers with provisions for clean out.

E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

F. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

G. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

I. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

J. Connect flexible ducts to metal ducts with adhesive.

K. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

L. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for clean out.

M. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

N. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

3.2 SCHEDULES

A. Ductwork Material:

1. Low Pressure Supply (Heating Systems): Steel, Aluminum, Fibrous Glass.
2. Low Pressure Supply (System with Cooling Coils): Steel, Aluminum, Fibrous Glass.
3. Medium and High Pressure Supply: Steel.
4. Return and Relief: Steel, Aluminum.
5. General Exhaust: Steel, Aluminum.
6. Kitchen Hood Exhaust: Steel, Stainless Steel.
7. Outside Air Intake: Steel.
8. Combustion Air: Steel.

B. Ductwork Pressure Class:

1. Supply (Heating Systems): 1/2 inch
2. Supply (System with Cooling Coils): 1/2 inch.
3. Return and Relief: 1/2 inch.
4. General Exhaust: 1/2 inch.
5. Outside Air Intake: 1/2 inch.
6. Combustion Air: 1/2 inch.

END OF SECTION

SECTION 15820 - DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Backdraft dampers.

B. Duct access doors.

C. Duct test holes.

D. Filter Boxes

E. Flexible duct connections.

F. Volume control dampers.

1.2 RELATED REQUIREMENTS

A. Section 15072 - Vibration Isolation.

B. Section 15810 - Ducts.

C. Section 15840 - Air Terminal Units: Pressure regulating damper assemblies.

D. Section 16140 – Wiring Devices: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.

B. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

D. Project Record Drawings: Record actual locations of access doors and test holes.

E. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.

1. See Section 01600 – Materials and Equipment, for additional provisions.
2. Extra Fusible Links: One of each type and size.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 - PRODUCTS

2.1 BACKDRAFT DAMPERS

A. Manufacturers:

1. Louvers & Dampers, Inc: www.louvers-dampers.com.
2. Nailor Industries Inc: www.nailor.com.
3. PCI Industries, Inc; Pottorff Brand: www.portorff.com.
4. Ruskin Company: www.ruskin.com.

B. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.2 DUCT ACCESS DOORS

A. Manufacturers:

1. Acudor Products Inc: www.acudor.com.
2. Elgen Manufacturing: www.elgenmfg.com.
3. Nailor Industries Inc: www.nailor.com.
4. Ruskin Company: www.ruskin.com.
5. SEMCO Incorporated: www.semcoinc.com.
6. Ward Industries by Commercial Products Group of Hart & Cooley, Inc: www.wardind.com.

B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.

1. Less Than 12 inches Square: Secure with sash locks.
2. Up to 18 inches Square: Provide two hinges and two sash locks.
3. Up to 24 x 48 inches: Three hinges and two compression latches with outside and inside handles.
4. Sash Lock: Similar to Ventlock Model 90
5. Compression Latch: Similar to Ventlock Model 140, 202, or 310.
6. Hinge: Small hinges to be zinc plated steel, mimimum 2 x 1-1/2 inches wide or 1-1/2 inch wide piano hinge. Large hinges to be zinc plated steel, minimum 3 x 2 inches wide or 2 inch wide piano hinge. Similar to Ventlock Model 150, 157, or 167, 250.
7. Access doors with sheet metal screw fasteners are not acceptable.

2.3 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.4 DUCT MOUNTED FILTER BOX

A. Filter Box: Duct mounted section with filter guides, access doors from both sides, for side loading with gaskets and blank-off plates. Provide blank-off plates to prevent air bypassing filters. 24x24 inch size filter box with vee filter arrangement.

B. Filter Frame and Housing: Fabricate filter frames and supporting structures of 16 gage galvanized steel with gaskets between frames and walls. Hinged access doors with continuous gaskets and positive locking devices. Metal slide pull for ease in changing filters.

C. Filter Media: UL 900 listed, Class II, rated at ASHRAE 52-76 at 30% dust spot efficiency with an arrestance of 90%, maximum velocity of 400 fpm per square foot of filter. Flat 2 inches deep disposable slide in panel filters. Farr 30/30 or similar. 24x24 inch size filter box with vee filter arrangement.

D. Filter Gauges: 3-1/2 inch diameter diaphragm actuated dial in metal case, with static pressure tips. Install filter gauges each side of filter box.

2.5 FLEXIBLE DUCT CONNECTIONS

A. Manufacturers:

1. Elgen Manufacturing: www.elgenmfg.com.
2. Durodyne.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Flexible Duct Connections: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A,

minimum density 30 oz per sq yd.

a. Net Fabric Width: Approximately 2 inches wide.

2. Metal: 3 inches wide, 24 gage thick galvanized steel.

D. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

2.6 VOLUME CONTROL DAMPERS

A. Manufacturers:

1. Louvers & Dampers, Inc: www.louvers-dampers.com.
2. Nailor Industries Inc: www.nailor.com.
3. PCI Industries, Inc; Pottorff Brand: www.portorff.com.
4. Ruskin Company: www.ruskin.com.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

C. Splitter Dampers:

1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw .

D. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

1. Fabricate for duct sizes up to 6 x 30 inch.
2. Blade: 24 gage, minimum.

E. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

F. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

G. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 15810 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

E. Provide duct test holes where indicated and required for testing and balancing purposes.

F. For fans developing static pressures of 5.0 inches and over, cover flexible connections with leaded vinyl sheet, held in place with metal straps.

G. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

H. Use splitter dampers only where indicated.

I. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 15833 - CENTRIFUGAL FANS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Backward inclined centrifugal fans.

B. Motors and drives.

C. Fan accessories.

1.2 RELATED REQUIREMENTS

A. Section 15072 - Vibration Isolation.

B. Section 15086 - Duct Insulation.

C. Section 15820 - Duct Accessories: Backdraft dampers.

D. Section 16140 – Wiring Devices: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; American Bearing Manufacturers Association, Inc.; 1990 (Reapproved 2000).

B. ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings; American Bearing Manufacturers Association, Inc.; 1990 (Reapproved 1999).

C. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc.; 2003.

D. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; Air Movement and Control Association International, Inc.; 2007 (ANSI/AMCA 210, same as ANSI/ASHRAE 51).

E. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; http://www.amca.org/licenses/search.aspx.

F. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc.; 2008.

G. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.; 2006.

H. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2007.

I. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

C. Shop Drawings: Indicate assembly of centrifugal fans and accessories including fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

D. Manufacturer's Instructions: Include complete installation instructions.

E. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

F. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.
   1. See Section 01600 – Materials and Equipment, for additional provisions.
   2. Extra Fan Belts: One set for each individual fan.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

1.7 FIELD CONDITIONS

A. Permanent fans may not be used for ventilation during construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. ACME Engineering and Manufacturing Corporation: www.acmefan.com.

B. Loren Cook Company: www.lorencook.com.

C. PennBarry: www.pennbarry.com.

D. Greenheck.

2.2 WHEEL AND INLET

A. Backward Inclined: Steel or aluminum construction with smooth curved inlet flange, heavy back plate, backwardly curved blades welded or riveted to flange and back plate; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws.

2.3 HOUSING

A. Heavy gage steel, spot welded, adequately braced, designed to minimize turbulence with spun inlet bell and shaped cut

B. Factory finish before assembly to manufacturer's standard. For fans handling air downstream of humidifiers, fabricate of galvanized steel.

C. Provide bolted construction with horizontal flanged split housing, where indicated.

2.4 BEARINGS AND DRIVES

A. Bearings: Heavy duty pillow block type, self-aligning, grease-lubricated ball bearing with AFBMA 9 L-10 life at 200,000 hours or roller bearings, with ABMA 11, L-10 life at 200,000 hours.

B. Shafts: Hot rolled steel, precision ground and polished, with keyway, protectively coated with lubricating oil, and shaft guard.

C. Drive: Cast iron or steel sheaves, dynamically balanced, keyed. Variable and adjustable pitch sheaves for motors 15 hp and under, selected so required rpm is obtained with sheaves set at mid Fixed sheave for 20 hp and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.

D. Belt Guard: Fabricate to SMACNA Duct Construction Standards - Metal and Flexible; 0.106 inch thick, 3/4 inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

2.5 ACCESSORIES

A. Premium Efficiency Motor (Minimum 85%).

B. Isolation base with restrained spring isolators.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install fans with resilient mountings and flexible electrical leads. Refer to Section 15072.

C. Install flexible connections between fan inlet and discharge ductwork; refer to Section 15820. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

D. Provide backdraft dampers on discharge of exhaust fans and as indicated; refer to Section 15820.

END OF SECTION

SECTION 15835 - POWER VENTILATORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Roof exhausters.

B. Wall exhausters.

1.2 RELATED REQUIREMENTS

A. Section 15072 - Vibration Isolation.

B. Section 15820 - Duct Accessories: Backdraft dampers.

C. Section 16140 – Wiring Devices: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc.; 2003.

B. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; Air Movement and Control Association International, Inc.; 2007 (ANSI/AMCA 210, same as ANSI/ASHRAE 51).

C. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; http://www.amca.org/licenses/search.aspx.

D. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc.; 2008.

E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.; 2006.

F. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2007.

G. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association; 2008.

H. UL 705 - Power Ventilators; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Indicate installation instructions.

D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

E. Maintenance Materials: Furnish the following for City and Borough of Juneau's use in maintenance of project.

1. See Section 01600 – Materials and Equipment, for additional provisions.
2. Extra Fan Belts: One set for each individual fan.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 FIELD CONDITIONS

A. Permanent ventilators may not be used for ventilation during construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Greenheck: www.greenheck.com.

B. Loren Cook Company: www.lorencook.com.

C. PennBarry: www.pennbarry.com.

D. Substitutions: See Section 01600 – Materials and Equipment.

2.2 POWER VENTILATORS - GENERAL

A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating

Seal.

C. Fabrication: Conform to AMCA 99.

D. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.

E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

F. Kitchen Range Hood Exhaust Fans: Comply with requirements of NFPA 96.

2.3 ROOF EXHAUSTERS-DOWNBLAST TYPE.

A. Performance Ratings: See Schedule on M0.2.

B. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

C. Roof Curb: 12 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, interior baffle with acoustic insulation, curb bottom, and factory installed nailer strip.

D. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.4 WALL EXHAUSTERS

A. Performance Ratings: See Schedule on M0.2.

B. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 0.062 inch thick aluminum wire bird screen.

C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.

E. Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.5 ROOF EXHAUSTERS-UPBLAST TYPE.

A. Performance Ratings: See Schedule on M0.2.

B. Fan Unit: V-belt or direct driven as indicated, with upblast spun aluminum with grease tray housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

C. Ventilated Roof Curb: 12 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, ventilated double wall, hinged curb adapter, and factory installed nailer strip.

D. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.

E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

D. Provide sheaves required for final air balance.

E. Install backdraft dampers on inlet to roof and wall exhausters.

END OF SECTION

SECTION 15840 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Variable volume terminal units. Work in this section is in Alternate work.

1.2 RELATED REQUIREMENTS

A. Section 15182 - Hydronic Piping: Connections to heating coils.

B. Section 15183 - Hydronic Specialties: Connections to heating coils.

C. Section 15765 - Air Coils.

D. Section 15810 - Ducts.

E. Section 15820 - Duct Accessories.

F. Section 15850 - Air Outlets and Inlets.

G. Section 15926 - Building Automation Systems and Autimatic Controls

H. Section 16140 – Wiring Devices: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilation Systems; National Fire Protection Association; 2009.

B. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01300 – Submittals; for submittal procedures.

B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate air flow, static pressure, and NC designation. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate support and hanging details, and service clearances required.

D. Project Record Documents: Record actual locations of units.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant volume regulators.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in City and Borough of Juneau's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for air terminal units.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Ceiling mounted variable air volume supply air control terminals for connection to single duct, central air systems, with electronic variable volume controls,, electric heating coils.

B. Identify each terminal unit with clearly marked identification label and air flow indicator. Include unit nominal air flow, maximum factory set airflow, minimum factory set air flow, and coil type.

2.2 SYSTEM POWERED VARIABLE VOLUME UNITS (VAV)

A. Basic Assembly:

1. Casings: Galvanized steel.
2. Lining: Minimum 1/2 inch thick neoprene or vinyl coated fibrous glass insulation, 1.5 lb/cu ft density, meeting NFPA 90A requirements and UL 181 erosion requirements. Face lining with mylar film.

B. Basic Unit:

1. Configuration: Air volume damper and automatic flow control assemblies inside unit casing.
2. Volume Damper: Construct of galvanized steel with peripheral gasket and self lubricating bearings.

C. Regulator Assembly: System-air powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Polypropylene material shall perform at temperatures of 0 to 140 degrees F and be impervious to moisture and fungus. Design bellows for 10 inches static pressure and factory check for leaks.

D. Hot Water Heating Coil:

1. Construction: 1/2 inch copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig pressure, factory installed.
2. Capacity: Based on 195 degree F entering water, 165 degree F leaving water and 50 percent total air volume.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide ceiling access doors or locate units above easily removable ceiling components.

C. Support units individually from structure. Do not support from adjacent ductwork.

D. Connect to ductwork in accordance with Section 15810.

E. Provide minimum of 5 ft of 1 inch thick lined ductwork downstream of units.

F. Install heating coils in accordance with Section 15765.

G. Verify that electric power is available and of the correct characteristics.

3.2 ADJUSTING

A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to 0 percent full flow. Set units with heating coils for minimum 50 percent full flow.

END OF SECTION

SECTION 15850 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

C. Louvers.

D. Roof hoods.

1.2 RELATED REQUIREMENTS

A. Section 09900 - Paints and Coatings: Painting of ducts visible behind outlets and inlets.

1.3 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.; 2007.

B. ARI 890 - Standard for Air Diffusers and Air Diffuser Assemblies; Air-Conditioning and Refrigeration Institute; 2008.

C. ASHRAE Std 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.; 2006.

D. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

1.4 SUBMITTALS

A. See Section 01300 – Submittals, for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

C. Project Record Documents: Record actual locations of air outlets and inlets.

1.5 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Carnes Company HVAC: www.carnes.com.

B. Krueger: www.krueger-hvac.com.

C. Price Industries: www.price-hvac.com.

D. Titus: www.titus-hvac.com.

2.2 DISPLACEMENT SUPPLY AIR DIFFUSER (SG-1, SG-4)

A. Manufacturers:

1. Price DF1

B. Type: One-way low velocity air supply diffuser. Diffuser shall be specifically designed for displacement ventilation applications providing low turbulence horizontal air supply in one way horizontal pattern. Flat faced recessed type with perforated face. Aluminum equalization baffle located behind diffuser face required to provide uniform, low velocity, distribution of air.

C. Diffusers: Perforated front panel. 16 gauge steel.

D. Frame: Mounting frame for insertion and connection of separate diffuser face. Diffuser shall clip into mounting frame. Fully concealed mounting.

E. Fabrication: Steel with powder coat polyester paint. Color selected by Architect. Architect will provide color sample (Benjamin Moore) to match.

2.3 CEILING SUPPLY DIFFUSERS (SG-2, SG-3)

A. Manufacturers:

1. Titus TDCA-AA
2. Krueger
3. Anemostat
4. Price

B. Type: Square 24x24 inch module size for lay-in type. Surface mount type for hard ceilings. Removable Core. Louver size as shown on plans. Round neck with size as shown on drawings.

C. Diffusers: Movable vanes, accessible from face to adjust discharge from horizontal to vertical. Core for discharge pattern of four-way corner blow. Diffusers are four-way blow unless otherwise shown on schedule.

D. Frame: 24"x24" Lay-in type border for all T-bar ceilings, surface type border for hard ceilings. Coordinate with ceiling plans for border type.

E. Fabrication: Aluminum with white baked enamel finish.

2.4 EXHAUST AND RETURN REGISTERS/GRILLES (EG-1/RG-1)

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 35 degrees, horizontal face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: As selected by ARCHITECT..

2.5 WALL SUPPLY REGISTERS/GRILLES (SG-5)

A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, double deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: As selected by ARCHITECT.

2.6 LOUVERS

A. Manufacturers:

1. Ruskin ELF6375DXH
2. Greenheck

B. Type: Extruded aluminum, 0.125 inch nominal thickness. 6 inch deep with fixed blades on 37 degree slope, heavy channel frame, bird screen with 1/2 inch square mesh. Blades 5-inches on center. High performance louver with drainable blade.

C. Performance:

1. Free area intake Velocity at beginning point of water penetration: 1000 ft/min.
2. Maximum pressure drop at intake velocity: 0.04 inches w.g. at 500fpm

3. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

D. Fabrication: Extruded 6063T5 aluminum welded construction

E. Finish: 70% Kynar Finish for 10 year warranty. Color and gloss to be selected by the ARCHITECT.

F. Sizes for air louvers are shown on plans.

G. Mounting: Provide extended sill.

2.7 INTAKE/EXHAUST AIR ROOF CAPS

A. Manufacturers:

1. ACME
2. Cook
3. Metalform
4. Greenheck

B. Fabricate intake/exhaust hoods in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

C. Low contour, rectangular type. Fabricate of reinforced galvanized, minimum 16 gage base and 20 gage hood, or aluminum, minimum 16 gage base and 18 gage hood. Provide removable hood; bird screen with 1/2 inch square mesh for exhaust, and factory finish with a thermosetting polyester urethane. Prepare steel with a phosphatized treatment. Coating suitable for salt spray marine type applications.

D. Mount unit on minimum 18 inch high curb base on upper side of curb (short side) with insulation between duct and curb.

E. Make hood inlet or outlet free area minimum of twice throat area.

F. Throat and top insulated on inside to preclude condensation.

G. Exhaust and Intake Caps: Install on pre-insulated curb. See Section 15060 - Hangers and Supports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify inlet/outlet locations.

B. Verify ceiling and wall systems are ready for installation.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09900.

F. Modify ceiling and ceiling lay-in panels as required for diffuser installation.

G. Install all flashing required for complete water type installation. Test louver installation for water tightness.

H. Install preinsulated curbs as required by manufacture and roof manufactures'. Field modify curb flashing with extended piece minimum of 12 inches horizontal.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Check locations of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement, and ceiling mounted equipment.

END OF SECTION

SECTION 15926 - BUILDING AUTOMATION SYSTEM AND AUTOMATIC CONTROLS

PART 1 - GENERAL

1.1 OVERVIEW

A. Furnish all labor, materials, equipment, and service necessary for a renovation and replacement of the HVAC control system for the Gastineau Elementary School Renovation. Work includes a complete replacement of the pneumatic and electric control system with a new Direct Digital Control (DDC) Building Automation System (BAS) and a partial replacement of existing DDC systems. The system will be an extension of the existing SIEBE Network 8000 district system. This specification describes the primary products and performance of the connection and addition to the direct digital control system and pneumatic control system. Associated schematic control diagrams detail the scope of WORK for this project. The direct digital control equipment for this project shall be comprised of SIEBE Network 8000 controllers and associated devices. The Owner's existing “Signal” graphical software, upgraded to current version, will be used for the additional graphic screens associated with this project.

1.2. QUALITY ASSURANCE

A. The direct digital control system addition for this project shall be a Siebe Environmental Controls system. The control Subcontractor shall maintain an office in Juneau or Anchorage with repair parts and maintenance personnel to ensure prompt response to an emergency call during the warranty period. The contractor shall maintain a complete sales, engineering, installation, and service organization.

B. All WORK described in this section shall be installed, wired, circuit tested and calibrated by factory trained electricians and mechanics qualified for this WORK.. The installing office shall have a minimum of five years of installation experience with the manufacturer and shall provide documentation in submittal package verifying that installation experience. Installation shall not be subcontracted. Supervision, calibration and checkout of the system shall be by personnel with documented experience with specified manufacturer.

C. All materials and equipment used shall be standard components, of regular manufacture for this application. All systems and components shall have been thoroughly tested and proven in actual use. Barber-Colman/Siebe Environmental Controls products are used as the basis of the design. Exceptions to the specification will qualify the bid as unacceptable.

D. The automatic control system shall be installed by trained, qualified personnel and commissioned by factory-trained technicians.

E. Perform work in accordance with NFPA 70.

F. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.3. SYSTEM DESCRIPTION

A. Scope of WORK:

1. This specification describes the primary products and performance of the automatic control system. The existing system is a pneumatic/electronic system with Network 8000 interface.
2. The work includes a conversion from pneumatic controls to DDC and the renovation of existing electric/electronic and DDC controls with new. Except as shown otherwise, existing control systems serving existing fan units, VU-4, RF-4, VU-5, RF-5, and VU-6 systems shall remain and be integrated into the new DDC system.
3. Alternate Work includes the renovation of the existing VU-6 control system.
4. The Work includes removal of all pneumatic devices, panels, and equipment in Project Area as shown and required. Pneumatic tubing shall be removed throughout the Project area except during phases where systems need to remain operational until fully demolished. Where pneumatic thermostats are to be replaced (typically installed at 60-inches above finished floor) with DDC thermostats (to be installed at 48-inches above finished floor) the controls Contractor shall coordinate and provide all requirements necessary including cutting and patching. Work includes BASE BID work and ALTERNATES. See Drawings and Specifications for additional information.
5. The automatic control system shall be comprised of Siebe (Barber-Colman) control equipment. The BAS system shall be Network 8000 equipment and field devices and be fully compatible with the existing School District Direct Digital Control system. The DDC system shall provide stand-alone DDC control for all designated equipment described in the sequence of operation and shown on the control schematics. The distributed DDC equipment shall be networked to the Global Digital Controllers and connected to the existing District's central operators station (Host) to provide a complete facility management system.
6. New DDC system shall be integrated into existing District wide BAS and graphics system.
7. The work includes working with the adjustment contractor, VFD supplier and start-up representative, and mechanical contractor for adjustment and setting of the VFD systems.
8. The work also includes connection to an uninterruptible power system (UPS) battery back-up system for GCM and Microzone controllers. UPS for distributed controllers such as for FP, CV, dampers, and valve actuators are not required. Coordinate with Electrical.
9. All control equipment abandoned or no longer required due to this renovation shall be removed.
10. All wiring serving new, revised, or replaced control systems shall be new.
11. The control system shall be designed such that each mechanical system will be able to operate under stand-alone control. In the event of a network failure, or the loss of any other controller, the control system shall continue to operate under independent control.
12. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.
13. Provide supervisory specialists and technicians at the job site to assist in all phases of system installation, startup, balancing, inspection, and commissioning.
14. Provide necessary temporary equipment and connections required for the various Work phases in order for occupied areas to remain functional.
15. Provide a comprehensive operator and technician training program as described herein.
16. Provide as-built documentation, operator’s terminal software, diagrams, and all other associated project operational documentation including technical manuals, on approved media, the sum total of which accurately represents the final system.

17. Work will be done in phases so Control Contractor is required to maintain mechanical control systems required for Owner occupancy throughout the construction period including the winter.

1.4 COORDINATION

A. Equipment: Control Subcontractor shall supply control equipment for installation by equipment suppliers and mechanical Subcontractor where required. This includes all control equipment installed in piping systems such as thermostat wells and automatic valves. Control Subcontractor shall also coordinate locations of control equipment, including, but not limited to, thermostats, and valve actuators, thermostat bulbs and averaging elements.

B. During the adjustment of the mechanical systems, air and water, the BAS Subcontractor shall provide a trained technician on-site to help the adjuster with their balancing procedures including any software required to interface with the control sequences. Responsibility for coordination of the times is included under the automatic controls.

1.5 ACCEPTABLE MANUFACTURERS

A. Siebe Environmental Controls (INVENSYS). No substitutions.

1.6 SUBMITTALS

A. Submittal of the entire control system design shall be provided. Submittal shall consist of shop drawings, a complete list of equipment and materials, manufacturer's catalog data sheets, and installation instructions. Terminal identification for all control wiring shall be shown on the shop drawings. Prior to installing the automatic control systems, submit the following for review and approval:

B. Shop Drawings: Control system installation drawings showing the equipment controlled, the locations of field devices, field wiring, layout drawings, riser diagrams, sequence of operation, and bill of materials, in addition to the following:

1. Electrical drawings that show all system internal and external connection points, terminal block layouts, and terminal identification.
2. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
3. List connected data points, including connected control unit and input device. List all input/output object listings and an alarm point summary listing.
4. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration diskette containing graphics.
5. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
6. Indicate description and sequence of operation of operating, user, and application software.
7. Bill of materials for all control equipment and components. Provide valve and damper schedules.
8. Drawings shall detail all control panels, control devices, and all other field devices on building floor plans.
8. Drawings shall be submitted in the following standard sizes: 11” x 17” (ANSI B).

C. Product data/specification sheets for control system components and field devices.

D. Manufacturer's Instructions: Provide and indicate manufacturer's installation instructions for installation, maintenance, and operation of all manufactured components.

E. Project Management: The vendor shall provide a detailed project design and installation schedule with time markings and details for hardware items and software development phases at the beginning of the project and updated as required. Schedule shall show all phases of the project. Schedule shall show all the target dates for transmission of project information and documents and shall indicate timing and dates for system installation, debugging, and commissioning.

F Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.

1. Revise shop drawings to reflect actual installation and operating sequences.
2. Include submittals data in final "Record Documents" form.
3. Upon completion of the work, provide a complete set of drawings on disk media. Drawings shall be provided as AutoCAD compatible files.

1.7 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be submitted for review and approved before the final inspection and Owner training.

B. The operation and maintenance manuals shall include the following information:

1. A user's guide to operate the building management system. The guide shall include the following: log on procedure; viewing system information; viewing and acknowledging alarms; changing a setpoint; printing a trend or report; overriding a point.
2. Manufacturer's data for all control components and maintenance information for all control components requiring periodic maintenance.
3. Complete system “As-Built” control drawings. Complete software “As-Built” diagrams.

1.8 WARRANTY

A. A warranty period of one year shall commence upon acceptance of the systems by the OWNER. The warranty shall consist of providing parts and labor as required to repair or replace parts of the control system that prove to be faulty due to defective materials or improper installation practices or troubleshooting control sequences that are not operating as specified. Included is reprogramming of the system software to include changes in the point descriptions as requested by the Owner. This warranty excludes normal routine maintenance.

1.9 TRAINING

A. After substantial completion and prior to final completion of the installation, operating personnel of the School District Maintenance shall be instructed on site in the sequence of operation and maintenance of the system hardware and software by the Subcontractor's qualified representative. A minimum 12 hours of training is to be provided. Coordinate with owner to determine the nature of training to be provided.

B. Subcontractor is to provide minimum of 7 days notice to the School District Maintenance Director prior to training and warranty visits.

1.10 VFD CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit installation instructions, servicing requirements, assembly views, lubrication instructions, and replacement parts list.

B. Start-up provided by VFD System Supplier.

1.11 VFD QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. VFD Industrial Control Panel Manufacturer: Company specializing in manufacturing products and UL listed Industrial Control Panels specified in this section with minimum three years documented experience.

C. Installer: Company specializing in performing WORK of this section with minimum three years documented experience.

PART 2 - PRODUCTS

2.1 BUILDING AUTOMATION SYSTEM (BAS) COMMUNICATIONS

A. The distributed stand-alone DDC controller trunk communications shall consist of a multi-drop RS-485 bus architecture. The distributed DDC controllers shall provide communication transient protection.

B. A high-speed Network Interface Module (NIM) shall be provided to support either Ethernet or Echelon communication. (BAS LAN) The NIM shall support a variety of cabling types. Minimum connectivity shall be provided for 10 Base 2 (ThinNet RG-58 A/U Coaxial cabling with BNC connectors) or 10BaseT (Twisted - Pair RJ-45 UTP cabling).

C. Portable operator's terminal: (1) Required.

1. Configuration: Provide Laptop work station.
2. PC Processor 1.8 GHz dual-core, or 3.0 GHz single processor.
3. 80 GB hard drive.
4. Minimum memory: 2GB RAM.
5. Cache memory: 512 Mbytes.
6. High-performance graphics adapter.
7. Keyboard: Low profile, detachable, having Qwerty layout plus 10 key numeric pad.
8. CD/DVD writer. Minimum of two USB ports.
9. Mouse: Software supported mouse with support software including self building menus and display of system operations and functions.
10. Minimum of a 17 inch diagonal flat screen monitor.
11. Communication: 56K modem, wireless network card, and future PCMCIA slot for a

network card for hard connection.

12. Printer: Support color printer.
13. Operating system: Windows XP Professional or Windows 7.
14. The contractor shall coordinate with Owner to connect the computer to the networks and to implement on the Owners networks prior to Substantial Completion.
15. Provide with DDC operational software and diagnostic software for field troubleshooting equipment, trending, and editing software.
16. Computer shall be provided and usable for interface with BAS system and shall have all necessary software and graphics capabilities loaded and operational.

D. Printer:

1. Wide carriage with output of ten characters per inch and 132 characters per line of paper, capable of using fan-fold paper. Color.
2. Minimum operating speed of 120 characters per second.
3. Paper: Two cartons fan-fold paper containing minimum 2500 sheets.

E. Standard BACnet object types accessed by the workstation shall include as a minimum: Analog Value, Analog Input, Analog Output, Binary Value, Binary Input, Binary Output, Calendar, Device, Event Enrollment, File, Notification Class, Program and Schedule object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

F. Workstation shall support Foreign Device Registration to allow temporary workstation connection to IP network. The Operator Workstation shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on wide area networks (WANs) and campus area networks (CANs). Workstation shall support Foreign Device Registration to allow temporary workstation connection to IP network.

2.2 FACILITY MANAGEMENT SYSTEM HOST STATION SOFTWARE (CHS)

A. Graphics shall be provided for the Host computer workstation. The software shall provide the following functions and features:

1. Run in a Microsoft Windows operating environment.
2. Provide color graphics of controlled systems, facility wide access and coordination of global control strategies, and centralized documentation.
3. Provide for assigned password names and codes to limit the access into particular applications and functions of the system. Allow discrete menus into the system for each user.
4. Provide dynamic graphics with “system penetration” method of obtaining system information. Provide dynamic graphic screens of mechanical equipment and DDC controlled systems. Maximum of 128 dynamic points displayed on one screen.
5. Provide display and modification of individual dynamic system points from within any specific dynamic graphic display.
6. Provide help window displays for each point displayed on the screen. User editable information specific to the point and its' relationship to the system currently displayed.
7. Provide centralized scheduling and modification of the time clock functions.

8. Provide alarm management and system exception annunciation with real time trending and reports.
9. CONTRACTOR shall provide a 2 year subscription service for any and all software upgrades that are available from the manufacturer following the final acceptance of the BAS system. Service shall include installation of the software on-site and all necessary equipment to upgrade the system. Copies of the software shall be provided to the OWNER and the Operating and Maintenance manuals shall be updated appropriately.

B. Dynamic Graphics:

1. Upon entering the graphics program floor plans shall be shown with all terminal equipment locations, ALL room temperatures, and any alarm features at the actual physical locations and not in a tabulated format. The floor plan layout shall be shown accurately and as shown on the contract documents with the actual room numbers listed. Mechanical equipment systems shall have their own screens with all control points, adjustable set points, and alarms shown.
2. The user will be able to zoom in to the building from the site plan and then zoom in to a particular area for closer inspection and then further zoom in on this area and so on until the detailed color graphic display of a desired portion of the facility is represented. The operator shall be able in this manner to "penetrate" to any desired system information without being required to enter any commands via the keyboard. A minimum of 70 dynamic points shall be displayable on any one screen.
3. As a minimum, a graphic screen shall be designed showing the entire facility, each major piece of mechanical equipment within each building, all of which will display the data for each area dynamically.
4. Equipment Diagrams: Provide a diagram of each piece of equipment similar to the schematic diagrams shown on the drawings. Display all monitored points, setpoints, control points, schedules, and alarms. Setpoints and schedules shall be adjustable from the equipment diagram. Provide a colored status indicator for the filters with green indicating green and red indicating dirty.

C. Systems Integration:

1. The CHS shall integrate the automation system being installed as a part of this contract with the current automation system now in use at this facility. Systems integration shall be defined as the following:

    a. All point data from the different systems shall be viewed and manipulated through one common format (see previous section "dynamic graphics" for definition of "viewed and manipulated"). Therefore, from the user's perspective, interaction with either of the two or more systems shall be identical in every way.
    b. Points from any of the different systems may be monitored concurrently on one graphic screen.
    c. Alarms shall be viewed and handled in a common format.
    d. Trended data shall be stored in a common database. This shall allow the data to be viewed or manipulated in common reports or charts.
    e. Panel database Upload and Download shall be supported directly by this CHS for each system being integrated and stored to the hard disk.

D. Centralized Scheduling and Modification:

1. Calendars shall be provided for displaying and modification of any of the Mechanical Systems Controller (MSDCs) time clock functions. The user shall be able to view an entire month's scheduling at a time. Holidays and Special functions shall be clearly marked on the calendar. Calendars shall be displayed by area served. A list of "served areas" shall be displayable at any time by clicking on a button on the calendar. The user shall only have to click on a "served area" to view its time clock schedule. A dynamic graphic shall be attached to each calendar allowing the user to view this "served area's" real time statistics, a link shall be provided on this same graphic screen to take the User back to the schedule.
2. Schedule changes may be made by clicking on a day or week and entering the new schedule. Changes shall be permanent or for "one time" or multiple occurrences of varying parameters. Global changes shall be allowed for similar or dissimilar schedules. There shall be no limit to the number of calendars allowed.

E. Alarm and System Exception Annunciation:

1. All alarms shall be displayed on the main alarm screen and be tied into the fire alarm sequence. Alarms shall be acknowledge by the operator in a manner equal to the existing alarm interface.

F. Trend Management and Reports:

1. The BAS system shall be provided with the ability to trend and produce reports with the new points installed under this project.
2. The CHS shall automatically perform time based periodic collection of real time point data and subsequently store it to the systems hard disk. There shall be two modes of operation; local collection shall allow the CHS to directly query the MSDCs for individual point samples; remote collection shall mean that the MSDCs collect and store trend data on individual points and then release the entire trend table(s) upon a request from the CHS. Manipulation and archiving of both types of data collection shall be treated commonly.
3. The report section of the CHS shall be the "gateway" to the CHS's database for all solicited and unsolicited data collected, and shall provide an easy means of reporting and information management.
4. The report generator shall be an integral part of the CHS, systems that use third party packages (such as Excel) for report manipulation shall not be acceptable.
5. Reports on historical trend data shall allow for daily, weekly, monthly and yearly reporting. These reports shall be completely flexible on the data items to be reported on. The user shall be able to select from a list of predefined reports or select data items on-the-fly. The selection of data items shall not be restricted by panel source. Reports may be up to 25 columns and infinite in length. Reports must be capable of reporting on data that has been collected at varying time intervals. Line interpolation shall be used when data samples are not present for a specific time placement, blank data rows for any time slot in the data columns will not be accepted. Report generator shall allow an operator to easily and quickly define the contents of a report as well as define a print time and date if so desired. Information contained in the reports shall be derived from alarm history, CHS or SDC generated exceptions, trend data and timed overrides.

G. Multi-tasking:

1. The CHS shall be capable of true multi-tasking capabilities. The User shall be able to use other non-related programs in the CHS while still running all CHS applications with no interruptions. This shall include the use of real time data in other applications. This CHS shall allow Spread Sheet programs to gather data from the MSDCs dynamically while running a dynamically updating Graphic screen. Up to 16 applications may collect data dynamically and simultaneously from the MSDCs. The CHS shall have the ability to allow the passing of data freely to MS Windows applications which incorporate the use of Dynamic Data Exchange.

2.3 MECHANICAL SYSTEMS CONTROLLERS (MSDCs)

A. General:

1. Controls shall be microprocessor based, Air Handler Digital Controllers (AHDC's). AHDC's shall be provided for Air Handling Units, Boiler, and Pump control, and other applications as shown on the drawings. Subcontractor shall use existing spare points in microzone if possible. AHDC's shall be based on a minimum 16 bit microprocessor working from software program memory which is physically located in the AHDC. The application control program shall be resident within the same enclosure as the input/output circuitry which translates the sensor signals. All input/output signal conversion shall be performed through a minimum of a 10 bit A to D converter. All input points shall be universal in nature allowing their individual function definition to be assigned through the application software. All unused input points must be available as universally definable at the discretion of the owner. If the input points are not fully universal in nature, unused points must be equal in quantity between Analog Inputs and Digital Inputs.
2. The BAS Subcontractor shall provide and field install all AHDC's specified under this section. Mechanical equipment manufacturers desiring to provide AHDC type controls as factory mounted equipment shall provide a separate bid for their products less all controls, actuators, valve assemblies and sensors, which are specified to be provided by the Bas/Temperature Subcontrol Contractor.
3. All input/output signals shall be directly hardwired to the AHDC. Troubleshooting of input/output signals shall be easily executed with a volt-ohm meter (VOM). As a result of this intent, it is specified that power line carrier systems, or other systems which command multiple outputs over a single pair of wires, shall not be utilized.
4. AHDC's shall be in continuous direct communication with the network which forms the facility wide Building Automation System. The AHDCs shall communicate with the SDC at a baud rate of not less than 19,200 baud.

B. Non-Volatile Memory:

1. All control sequences programmed into the AHDC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained. Power failures shall not cause the AHDC memory to be lost, nor shall there be any need for batteries to be recharged or replaced to maintain the integrity of the controller database. The AHDC shall allow for the creation of unique application control sequences. Systems that only allow selection of sequences from a library or table, are not acceptable.
2. All control sequences shall be fully programmable at the AHDC, allowing for the creation and editing of an application control sequence, while at the unit.

C. Service Port:

1. The AHDC shall be provided with an interface port for the HHOT. The interface port shall allow the HHOT to have full functionality as described in the HHOT section of this specification. From the interface port, the HHOT shall be able to directly access any AHDC, LIDC, UDC or VAVDC in the network.

D. Trending:

1. The AHDC shall provide an input/output point trending utility that is capable of accumulating 48 analog point samples and 10 digital point samples, per input/output point. Each sample shall be taken on a user defined interval, ranging from 1 second to 255 hours per sample. The digital readings shall be on a change of state occurrence for the digital points. All samples shall be recorded with the engineering units for the value, along with a time and date identifier for each sample taken. The samples shall be protected against loss due to power interruptions through a battery or capacitor backup method for a minimum of 30 days.
2. Systems unable to provide the above capability shall provide for the individual input/output point trending at the SDC. Specifics as to how each AHDC point will be trended, at the SDC, shall be provided in the submittal documents. Included in the explanation shall be the sample intervals, the memory allocation in the SDC and the number of AHDC's per SDC that can be expected.

E. Diagnostics:

1. The AHDC shall provide LED indication of transmit/receive communications performance, as well as for the proper/improper operation of the controller itself.

F. Controller Location:

1. To simplify controls and mechanical service troubleshooting, the AHDC shall be mounted adjacent to the air handling system. The AHDC shall be provided in a NEMA approved enclosure. The AHDC shall be constructed in a modular orientation such that service of the failed components can be done quickly and easily. The modular construction should limit the quantities of printed circuit boards to a maximum of two. All logic, control system, power supply and input/output circuitry shall be contained on a single plug-in circuit board. When required to replace a printed circuit board, it shall not be necessary to disconnect any field wiring. This shall allow all controls maintenance and troubleshooting to be made while at the air handling unit. The AHDC shall be directly wired to sensory devices, staging relays or modulating valves for heating and cooling.
2. For compatibility to the environment of the air handling unit, AHDC's shall have wide ambient ratings. AHDC's shall be rated for service from -40 Degree F (Degrees Fahrenheit) to 140 Degree F.
3. Subcontractor shall submit description of location of AHDC's on all mechanical and air handling equipment.

2.4 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.5 CONTROL PANELS

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gages, pilot lights, push buttons and switches flush on cabinet panel face.

B. NEMA 250, general purpose utility enclosures with enameled finished face panel.

C. Provide common keying for all panels.

2.6 SENSING AND CONTROL OUTPUT REQUIREMENTS

A. Sensing: All sensing inputs shall be provided via industry standard signals. Temperature, humidity, differential pressure signals, and other signal inputs shall be one of the following types: 0-20 mA; 4-20 mA; 0-5 VDC; 0-12 VDC; 1000 ohm platinum (at O C, 2.62 ohms/ºC); 1000 ohm Balco (2.2 ohms/ºF); 10 k ohm Thermistor (at 25ºC/77ºF). All signal inputs shall be compatible with the controllers used and with the requirements for readout of variables in true scaled engineering units as specified.

B. Control Outputs:

1. The control panel shall internally provide test points for the circuits driving the equipment Subcontactor, for the purpose of troubleshooting the 120 VAC circuit to the Subcontactor. All such relays shall be of modular construction that can be easily and quickly replaced on an individual basis if the module were to be damaged.
2. Modulating outputs shall be industry standard 0-5 VDC, or 0-12 VDC with defineable output spans to adapt to industry available control products. Milliamp outputs of 0-20 mA or 4-20 mA are also acceptable. Drive open/Drive closed type modulating outputs are acceptable for selected terminal unit control.

2.7 SENSORS

A. General:

1. Provide sensors with specified output type for remote sensing of temperature, humidity, pressure, and flow rate. Suitable for medium where used, system conditions, and ambient temperature.
2. Provide two wire temperature and humidity sensors.

B. Space Temperature:

1. Accessible adjustment (55-85F range) with thermometer indicator on cover. Minimum 0.1% accuracy. Removable covers. 3F throttling range. BAS monitoring and remote temperature override capability on ALL thermostats. Locking guards on all thermostats located in Commons, Hallways, Vestibules, and Public Restrooms.

2. Local control thermostats: Thermistor or RTD with 50-80ºF range, accuracy of +/-0.4ºF over full range, and maximum drift of 0.1ºF/year. Removable covers with tamper proof fasteners. Siebe TS-5700 series, TS-8000 series, Mamac TE 205 series or equal. Provide sensors with temperature indication and adjustable setpoint integral with cover. Locking guards on all thermostats located in Commons, Hallways, Vestibules, and Public Restrooms. Local control thermostats installed only for unit heaters located in mechanical rooms.

C. Duct Air Temperature, Probe Type: For supply air, return air, and exhaust air.

1. With separable, perforated bulb guard. Thermistor or RTD with minimum 32-150 F range, accuracy of +/-0.4 F over full range, and maximum drift of 0.1F/year. Siebe TS- 5700 series, Siebe TS-8000 series, Mamac TE 205 series or equal.

D. Duct Air Temperature, Averaging Type: For mixed air, Heat Exchanger inlet/discharge, and low limit temperature sensor.

1. Provide averaging bulb thermostats for mixed air and low limit thermostats with element installed to cover twice the cross-section of the duct.
2. RTD continuous sensing element with appropriate range, accuracy of +/- 0.75 F over full range, and maximum drift of 0.1 F/year. Siebe TS-8000 series or equal.

E. Low Temperture Limit Switch: 4-wire, two SPDT switches, main contacts open on temperature below setpoint, pilot contacts close. Auto-reset unless otherwise indicated. Extended length capillary type element with any one foot at setpoint causing trip. Freeze protection low limit minimum range 0-60ºF. Suitable for ambient temperatures -40 to 140ºF.

F. Fluid Temperature:

1. Thermistor or RTD with minimum 30-230 F range, accuracy of +/-1.0 F over full range, and maximum drift of 1F per year. Siebe TS-8000 series, Mamac TE 205 series or equal. Provide appropriate thermal well for the pressure application to allow removal of the sensing element without draining the system. Wells filled with heat conductive compound.

G. Outside Air Temperature:

1. Platinum RTD with minimum -58-110 F range, Accuracy of +/-1.0 F over full range, and maximum drift of 1F per year. Hy-Cal RTS-5737-W or equal. Provide sunshield and weatherproof box for exterior location as required.

H. Fluid Pressure:

1. Semi-conductor strain gauge pressure transducer with range 150% of operating pressure and over pressure tolerance of 200% of range pressure, +/-2% accuracy over full range, and maximum drift of 1% full range per year. Kele PTX1E, Mamac PR262, or equal.
2. Provide with brass or stainless steel snubber and pigtail on steam applications.
3. Coordinate tap requirements with the mechanical contractor. Provide with gate or ball valve isolation.

I Air Differential Pressure:

1. Semi-conductor strain gauge pressure transducer with range 150% of operating pressure and over pressure tolerance of 200% of range pressure, +/-2% accuracy over full range, and

maximum drift of 1% full range per year. Mamac PR-274/275 or equal.

2. Provide static pressure tips with integral compression fittings for reference tubing at duct penetrations.

J. Equipment Operation Sensors:

1. Status Inputs for Fans: Differential pressure switch with adjustable range of 0 to 5 inches wg.
2. Status Inputs for Electric Motors: Current sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.
3. Current Sensing Switches: Current operated solid state switch with adjustable set-point from 1 to 135 amps. Power and status LED's, non-polarity sensitive.

K. Fluid Flow:

1. Insertion Paddlewheel type flow sensors. Stainless steel or brass probe. 1-1/2 percent accuracy at 4 fps velocity. Working pressure of 200 psi. Capable of 200F operating temperatures.
2. Microprocessor-based signal conditioner with 4-20 mA output suitable for use with flow sensor. Front panel programming and numerical dispay to show flow rate in GPM. Signal conditioner remote mounted on adjacent wall.

L. Carbon Dioxide Sensor:

1. Unit shall monitor indoor carbon dioxide levels in Accordance with ASHRAE Standard 62-1989. 4-20 ma linear output over a range of 0-2000 ppm of CO_2. Programmable analog output of 0-190v/4-20ma and RS 232 interface. Digital display at the unit included. Duct mounted aspiration box and transformer included. Easily verified and recalibrated. Minimum (2) required for each system. Wall mounted type for room sensor. Duct type for return duct.
2. Accuracy of plus or minus 2.5% or 50 ppm whichever is greater. Alarm threshold adjustment range of 50-5000 ppm. Measuring range 0-2000 ppm. Maximum drift 25 ppm.
3. Complete recalibration kit and spare calibration gas refill included.

2.8 FLOW MEASUREMENT

A. Manufacturers:

1. Ebtron

B. Airflow measuring systems:

1. OSA: Multiple probe type. Remote air measuring stations with digital flow readout in CFM (w/ contacts for remote monitoring).

2.9 SWITCHES

A. Differential Pressure Switch - Liquid: Brass bellows operated single pole double throw switch. Where differential pressure is 10 PSI or less provide United Electric J21K Series or equal. Where differential pressure is greater than 10 PSI provide Penn P-74FA-5 or equal. Provide with gate or ball valve isolation.

B. Current Sensing Switches:

1. Current operated solid state switch, 0.5 to 200 amp amperage range. Mini solid-core or split-core for fixed loads. Veris H-800 series or equal.
2. Current operated solid state switch with adjustable set-point from 1 to 135 amps. Power and status LED's, non-polarity sensitive. For detecting belt loss and motor failure. Veris H-708 solid-core, H-908 split-core or equal.

2.10 CONTROL VALVES

A. Automatic Valves: For water or steam, as applicable, suitable for system conditions. 2-inch and smaller: Brass body, threaded, installed with union on each connection. 2-1/2 inch and larger: Iron body, flanged. Seats and discs or plugs of nonferrous metals. Modulating or positive acting as required. See Contract Documents for operation and capacity.

B. Positive-acting: Flat, single discs with renewable composition faces.

C. Modulating: Single or balanced, parabolic or V-notched inner valve plug. Steam valves single seat type for tight shutoff.

D. General: For hot water as applicable.

1. Non-terminal unit control valves (1/2" through 3") sizes shall have cast bronze bodies with static pressure rating conforming to ANSI B16.15- 1971 250 PSIG rating. Maximum water pressure shall be 400 PSIG with 40 to 150ºF water, decreasing to 321 PSIG at the maximum water temperature of 281ºF.
2. Valves with flanged fittings (2.5" through 6") sizes shall have cast iron bodies with static pressure rating conforming to ANSI B16.1-1975 125 PSIG rating Maximum water pressure shall be 200 PSIG with 40 to 150ºF water, decreasing to 165 PSIG at the maximum water temperature of 281ºF.
3. All valves shall have stainless-steel stems, brass or stainless-steel throttling plugs, bronze valve seats, and spring-loaded Teflon -cone packing. Two-way valve plugs for non-steam applications shall have composition disks.
4. All valves shall be fully modulating unless otherwise indicated. control Subcontractor is responsible for the selection of the proper control valves for the project including sizing, pressure rating, flow coefficient, flow characteristic, close-off rating, and actuator selection.
5. All two-way valves shall have contoured or characterized throttling plugs with linear (for steam applications) or equal- percentage flow characteristics.
6. All three-way and four-way valves shall have brass or stainless steel linear throttling plugs with stainless steel stems.

2.11 VALVE ACTUATORS

A. General:

1. Where exposed to outdoor air or air temperatures lower than 50ºF, provide completely weatherproof actuators with internal heaters to allow normal operation at -50ºF.

B. Modulating Electronic Actuators:

1. Modulating actuators for control valves over 1-1/4" to convert electronic 1-10 VDC, or 4-20 mA analog signal to a linear, positive positioning stroke. Direct mount type with appropriate valve and damper linkage kits as needed. Siebe MS-7203, MS-7433 or equal.
2. Modulating actuators for control valves up to 1-1/4" to be hydraulic type with spring return. Proportional control by variable Vdc input signal. Siebe MP-5213 or equal.

C. Two-Position Electronic Actuators:

1. Two-position actuators for larger valves shall be gear train type or direct mount type as required. Siebe MA-418 or Siebe MA-7000 series or equal. Provide integral, adjustable end switches as required for the application.
2. Two-position actuators for small valves shall be direct mount type or hydraulic type as required. Siebe MA-5000 or Siebe MA-7000 series or equal. Provide integral, adjustable end switches as required for the application.

2.12 DAMPER OPERATORS

A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.

1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
2. Provide one operator for maximum 36 sq ft damper section.
3. Electric damper actuators shall be direct shaft mounted and use a V-bolt and toothed V-clamp causing a cold weld effect for positive gripping. Single bolt or setscrew type fasteners are not acceptable.
4. Where exposed to outdoor air or air temperatures lower than 50ºF, provide completely weatherproof actuators with internal heaters to allow normal operation at -50ºF.
5. With auxiliary end switch or sensor for monitoring damper position.

2.13 VARIABLE FREQUENCY DRIVES (VFD) FOR PUMPS P-1A AND P-1B

A. Manufacturers:

1. Allen Bradley
2. ABB

B. Type: UL Listed. Microprocessor based variable frequency drive. All VFD's shall be of same manufacturer.

C. Output Power: Output voltage adjustable from 0 to rated voltage. Output frequency range adjustable from 0 to 400 Hz. Pulse width modulated (PWM) waveform.

D. Operator Interface: Integral LCD digital display. LCD shall be remote mounted on panel door. The keypad shall include programming keys, drive operating keys, and numeric keys for direct entry. LCD shall display the following:

1. Drive operating conditions
2. Fault/alarm indications
3. Output Frequency
4. Motor Speed
5. Motor Current
6. Calculated Motor Torque
7. Calculated Motor Power
8. DC Bus Voltage
9. Output Voltage
10. Heatsink Temperature
11. Analog input values and analog output values.
12. Keypad reference values
13. Elapsed Time Meter
14. Digital input status
15. Digital output status

C. Inputs/Outputs: (1) Programmable 0-10 VDC analog output. (2) 0-10 VDC or 4-20 mA analog inputs. (5) digital inputs. (2) relay outputs. Relays shall be programmable to different conditions including Fault, Alarm, At Speed, Drive Ready.

D. Auto/Manual Mode (H-O-A switch): In Auto mode, the drive receives its frequency command from the programmed source. When in Hand mode, control of the frequency command is transferred to the Operator Interface.

E. Communications: The drive must be capable of communicating with PLC and DDC's through an RS-484 port.

F. Drive Faults:

1. Loss of Reference Fault
2. Overcurrent
3. Overvoltage
4. Undervoltage
5. Overtemperature
6. Ground Fault

G. VFD installed in Panel with the following features:

1. UL listed and labeled industrial control panel as a complete assembly.
2. Enclosure: Nema 1 enclosure. Ventilated with fan as needed.
3. Mechanically interlocked VFD/Bypass contactor.
4. Integral fused disconnect with padlockable handle. Use Class J fuses sized per motor.
5. Utilize 5% line reactor for harmonics reduction.
6. VFD-Bypass selector switch.
7. H-O-A switch for the VFD.
8. Start/Stop push buttons for Bypass mode operation.
9. Motor overload protection for VFD. Motor overload protection for Bypass.

10. Green VFD Running indication lights. Green Bypass Running indication lights. White Ready light for power available.
11. 4-20 mA or 0-10 VDC input for speed control.

H. Provide for interface with automatic controls. Provide dry contact outputs as required:

2.14 WIRING

A. Includes all control wiring to complete the system and provide control arrangements specified or shown on the drawings. Power or interlock wiring shall be run in separate conduits from sensor and communications wiring.

1. Low-voltage Control Wiring (12-24v): Protected in exposed locations including, but not limited to, mechanical rooms and storage rooms. Plenum rated cable installed in ceiling plenums above accessible ceilings only. Motor disconnect switch shall also disconnect control circuit. Indicating lights wired from the motor terminals or from the last controlling device to the motor to show actual operation. All low voltage control wiring 18 AWG minimum.
2. 110-volt and larger Control Wiring: 12 AWG minimum if directly operating a motor, and 14 AWG minimum if controlling relays and holding coils.

B. Control Power: Control Power will be provided under the Electrical Division for new panel locations. The power will be available in J-boxes located in the Mechanical Rooms. Provide the electrical connection between all automatic control equipment and the control power J-boxes. In locations where existing panels are being replaced with new panels, Control Contractor to disconnect 120volt control power and reconnect power to new panel in same location.

2.15. FIRE STOP SYSTEMS

A. Manufacturers

1. Hilti
2. Dow Corning
3. Fyre Putty

B. General purpose Vibration Resistant Fire Stopping Sealant: Silicone based, non-slumping premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours per ASTM E814 and UL 1479.

C. Fire rated Stuffing: Non-combustible mineral wool insulation.

2.16 GLOBAL DIGITAL CONTROLLER (GDC)

A. Provide a microprocessor based, direct digital controller to integrate and communicate with all microprocessor based controllers on the network. All communication interface programs shall be resident within the global controller. The following functions and features shall be provided:

B. Multi-tasking, 16-bit microprocessor operating from software program memory resident in the controller. 80186 Microprocessor with 12 MHZ clock frequency. Global controllers shall exist at the LAN level with the stand-alone digital controllers.

C. The GDC shall provide alarming, point trending, and energy report generation capabilities. Alarming points shall be uniquely definable, with multiple alarms assignable to a single point. The quantities of trended point values shall be limited only by total controller memory space. If necessary, a GDC may be dedicated fully to a trending task, allowing all controller memory to be available for the trend storage. Each unique trend report shall contain a minimum of 4 different points and minimum of 128 samples per point. Trending frequency for each report shall be operator definable from a sample once a second to a sample one every 24 hours. Trend reports shall be internally formatted by the GDC and shall be reportable directly to a serial printer, a VT-100 display terminal, or any other device capable of receiving a formatted ASCII data file.

D. All control sequences programmed into the GDC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery to be retained. Power failures shall not cause the GDC memory to be lost, nor shall there be any need for batteries to be recharged or replaced to maintain the integrity of the controller database.

E. The GDC shall be provided with a battery-backed clock that is capable of maintaining the time of day and calendar for up to thirty days upon loss of power to the GDC without loss of setting. The battery for the time clock shall be field replaceable by the customer.

F. The GDC shall have a complete set of energy and facility management capabilities including maintenance time reminders, energy reports, and trend reports. The energy management functions shall include duty cycle, temperature compensated duty cycling, optimum start/stop, electric demand limiting, enthalpy changeover, and calendar scheduling.

G. The GDC shall have a keypad and display.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify conditions before starting work.

B. Verify that systems are ready to receive work.

C. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

D. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 48 inches above floor. Align with lighting switches.

C. Mount freeze protection thermostats using flanges and element holders.

D. Mount outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.

E. Provide separable sockets for liquids and flanges for air bulb elements.

F. Provide stainless steel thermowells suitable for respective application and for installation under other sections-sized to suit pipe diameter without restricting flow.

G. Provide thermostats in aspirating boxes in front entrances.

H. Provide locking guards and lock on thermostats in all public spaces. Provide keys to owner.

I. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures unless approved.

J. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

3.3 WIRING AND RACEWAYS

A. General:

1. Provide wiring, conduits and raceway complying with the National Electrical Code, Division 16, State and Local Codes and Ordinances.
2. Existing control conduit and junction boxes may be used by the Contractor unless they must be removed due to new Mechanical Work or Architectural modifications. All unused or abandoned conduit, junction boxes, wiring, and control equipment no longer needed shall be removed. Where devices are being removed from existing equipment or ductwork, affected existing equipment or ductwork shall be patched in a clean and airtight manner approved by the Engineer. All wiring shall be new.
3. Unenclosed low voltage wiring shall be plenum rated cabling type and shall be acceptable for installation only in concealed, accessible areas such as above suspended ceilings. All other wiring/cabling shall be installed in conduit.
4. Cutting and patching will be required for vertical drops to sensors and control devices. Existing thermostats are typically at 60-inches AFF. All new thermostats/sensors shall be installed at 48-inch height.
5. Use EMT, metal duct, IMC, rigid conduit, surface metal raceways, or totally enclosed metal through with flexible metal tubing as required by Division 16. Paint all exposed conduit in occupied areas two coats of enamel paint selected by ARCHITECT.
6. Provide wire with copper stranded conductors. Provide color or number coded jackets.
7. Provide 20 gauge minimum foil-shielded cable rated 100 VDC at 80 C. for input/output wiring.
8. Provide communications network wiring meeting the gauge, impedance, capacitance, resistance and shielding requirements specified by the manufacturer of the connected devices.

9. Install wiring in a neat an orderly manner generally running piping and wiring along building lines.
10. Seal conduit penetrations at rated walls with fire-stopping installed in accordance with fire-stopping manufacturers UL listed installation requirements.
11. Wire all electrical controls and switches furnished under this section of the Specifications.
12. Support and conceal wiring in finished areas.

3.4 COORDINATION

A. Coordinate this WORK with the WORK of other trades, and make arrangements for the complete and proper accomplishment of all related WORK. Coordinate required control interlocks with HVAC manufacturers or local representatives as necessary. Coordinate requirements and work with the VFD supplier and contractor.

B. Mechanical Subcontractor Responsibilities: Installs automatic valves and separable wells that are supplied by the Temperature Control Subcontractor.

C. Control Contractor is to provide the Boiler/Burner enabling and sequence controls for the heating system. Responsibility for correct operation of boilers, burners, pumps, and heating plant operation included hereunder.

3.5 TESTING AND ADJUSTING

A. Upon completion of the control installation, start up the system, perform necessary testing, and adjust the system to ensure proper operation.

B. Coordinate the final adjustments and “fine tuning” of control functions and devices so the mechanical systems and the control systems operate and respond as an integrated comfortable and energy efficient component of this facility.

C. Contractor shall help coordinate the necessary testing of the VFD system, and help coordinate the adjustment the system to ensure proper operation.

3.6. ACCEPTANCE TESTING

A. Point Verification:

1. All control points shall be tested and included in point-to-point testing report provided to Engineer prior to inspection. To verify end-to-end operation of the system, the Subcontractor shall provide a hard copy of an All Points Summary Listing to the Owner of each part or system and verify that each point has been successfully tested. Successful testing report must be received prior to being placed in warranty by the Owner. For CHS systems, the Subcontractor shall additionally provide a print screen of the process display showing real time dynamic point information for all points on the subsystem(s) to be accepted.

B. Sequence Verification:

1. The Contractor shall notify the Owner of systems which perform all specified sequences. The Contractor shall provide a report to the Engineer detailing all sequences have been testing and determined to be operating properly prior to inspection. The ARCHITECT shall verify all sequences of operation and place the system into warranty acceptance test.

3.7. WARRANTY ACCESS

A. The Owner shall grant to the Subcontractor, reasonable access to the BAS system during the warranty period. The owner shall provide, at no cost to the Subcontractor, a dedicated voice grade telephone extension for remote telecommunications during this period.

3.8. START-UP AND TRAINING - VFD

A. VFD's: System supplier start-up shall be provided for each drive. System supplier shall be available on-site over a two day period during each equipment start-up. System supplier performing start-up shall be qualified for WORK by manufacturer's representative. Coordinate with CONTRACTOR completion for date of start-up for each piece of equipment. System supplier shall provide 2 hours of training per drive. Provide minimum 15 working days notice to OWNER prior to training.

B. Additional return trip by system supplier shall be provided 6 months after Final Completion for adjustment and additional training. 4 total hours of additional training required. Provide minimum 15 working days notice to OWNER prior to return trip.

C. BAS Contractor shall be on-site during testing and start-up of VFD's.

3.9 SEQUENCE OF OPERATIONS

A. BOILER (B-1 and B-2) MODULATION: Boilers to operate in lead/lag operation with boiler lead/lag priority designation determined on the BAS by School District Maintenance. DDC system shall enable Lead boiler continuously when boiler control switches are in AUTO mode. DDC system shall monitor heating supply header temperature and sequence lead and lag boilers as necessary to maintain an adjustable reset temperature in heating supply main where shown. If Lead boiler fails to operate after a delay of one minute, Lag boiler switches to Lead Boiler designation and operates. Alarm sent to BAS when any burner fails to operate or any safety functions shutdown a respective burner. Indicate Lead and Lag boiler enable/disable, Lead/Lag stage, and all active stages on graphics.

1. Oil Fired Boiler (Boiler #1 & #2 Lead/Lag): When in AUTO mode, DDC system shall modulate oil fired burner from Low Fire to High Fire and back to Low Fire as required. Oil fired boiler shall operate and modulate according to its respective immersion sensors, safety controls, and boiler aquastats whenever the boiler control switch is in MANUAL position. Burners shall shutoff in either Manual or Auto position when deactivated by boiler safety controls. Responsibility for integration with burner controls and necessary coordination with burner manufacturer during burner submittal process required hereunder.

2. Sequencing: Sequence pumps and burners to maintain loop temperature as follows:

    a. Start Lead heating pump for a minimum of 2 minutes prior to enabling Lead Boiler.
    b. Activate low-fire for lead boiler.
    c. Modulate lead boiler burner to high fire if the heating supply temperature is not within 5 degrees F of setpoint and is not increasing at a rate of 1 degree F per 10 minutes.
    d. Switch back to low fire when heating supply temperature is within 2 degrees F of setpoint.
    e. If heating setpoint is not satisfied after approximate time of 30 minutes, repeat steps for lag boiler.
    f. Reverse sequence when heating loop temperature is exceeded.
    g. Oil fired boiler shall shutoff in low fire mode, not high fire.
    h. If Lead Boiler fails to operate, Lag Boiler shall become Lead boiler and start as Lead Boiler in sequence above.
    i. If burner is operated in manual mode through boiler aquastat settings, respective boiler pump will need to be operated in HAND.

3. Reset Schedule: Boilers shall operate to maintain heating supply temperature in heating distribution main according to the following schedule: 180F HS temperature at 0F OSA temperature modulating to 150F HS temperature at 60F OSA temperature.
4. All WORK required for a complete operating lead/lag boiler control system included hereunder, including entire line voltage electrical installation,, low voltage electrical installation, and integration with burner controls. Coordinate provision of sensors, wiring, and connection points with Division 15 and Division 16 and burner controls for a complete system.
5. Manual service switch shall be installed, hereunder, for each boiler to disengage DDC boiler control system and allow boiler operating aquastat to control boiler water temperature.
6. Set boiler operating aquastat to operate from 180F to 200F. Set Electric high limit controller with manual reset at 220F.
7. Provide heating return sensor for BAS monitoring of building hot water return temperature. Display on Graphics.

B. PUMP P-2 AND P-3 BOILER PUMP CONTROLS: Pump P-2 serves Boiler B-1. Pump P-3 serves Boiler B-2. Magnetic starter with three position switch, located on the wall where shown. In AUTO position respective boiler pump to operate according to DDC system operation. Pump to operate for an adjustable 2 minutes prior to activation and following completion of respective burner/boiler operation. When the magnetic starter is in the HAND position, pump to operate continuously. All work required for a complete operating boiler pump system shall be included hereunder, including entire line voltage and low voltage electrical installation. Indicate pump status on graphics. If boiler is to operate under manual controls, respective boiler pump must be run in HAND position for proper operation.

C. BOILER HEATING RETURN TEMPERATURE CONTROL: Immersion thermostat in heating return piping for boiler shall modulate 3-way diverting valve to maintain a minimum 135F return water temperature. Normally open modulating valve returns water directly to boiler until temperature rises above 140F and then slowly modulates closed to allow heating water into building system loop as long as boiler return water temperature remains above 135F. On-Off valve is not acceptable.

D. BUILDING HEATING PUMPS (P-1A AND P-1B): A variable frequency drive (VFD) provides direct power for the respective pump motor. When the VFD is in the AUTO position, the BAS shall operate and modulate the speed of each pump to maintain the required heating water flow as required to maintain the pressure differential setpoint. Sensor located in the heating main where shown. Pumps to operate in lead/lag operation with pumps switching lead/lag designation once per week. Pressure differential required at pressure sensing locations determined by the Adjustment and Control Contractors. Initially set pressure differential at 9 psi. When the VFD is in HAND position, a digital speed control integral with the VFD panel provides manual speed control. When VFD is in BYPASS mode, the pump operates at full speed (60 HZ). Activate an alarm when a VFD generated status alarm occurs due to low current. Include VFD speed and VFD fault alarm inputs to the BAS. Display actual speed, alarms, and status on Graphics. If Lead Pump fails to operate after a delay of one minute, Lag Pump switches to Lead designation and an alarm sent to BAS.

1. Pressure Differential Sensors located where shown. (2) required.
2. Pump Sequencing:

    a. Modulate pumps from 25% flow to 100% flow based on heating system pressure differential.
    b. If one pump cannot maintain heating water pressure differential setpoint for an adjustable 10 minutes, activate lag pump. Once both pumps are required to operate, DDC system shall modulate each pump to operate at same speed (as each other) as necessary to maintain required flow rate up to 100%. Dual operation shall be maintained for a minimum 10 minutes at low flow prior to resetting back to single pump operation.
    c. Flow rates: Flow Meter installed in heating supply main to monitor flow rate in GPM. Display on Graphics.
    d. DDC Display: Indicate heating water main temperature setpoint, reset schedule, lead/lag pump status, pump speed, operation status, and alarms.

E. BUILDING HEATING SYSTEM:

1. Minimum Flow: Minimum flow of 50 GPM as measured at flow meter in 4-inch HS main in boiler room shall be maintained as required for minimum pump flow. Minimum Flow automatic valve AV-69 shall modulate open SLOWLY to maintain minimum flow rate. Slow modulation of valve shall be required in order to avoid over and undershoot, especially since bypass valve is located far from Boiler room flow sensor.
    a. Pressure Differential Sensors shall be located where shown.

F. HOT WATER RECIRCULATING PUMP (HWRP-1): Manual starter installed where shown. In the ON position, pump shall operate whenever immersion thermostat in the recirculating hot water piping, set at 95F, calls for heat.

G. GENERAL FAN UNIT NOTES: The following controls apply to the various ventilation systems outlined in this section, as indicated within each fan system description or listed below as typical for all fan units.

1. Smoke Sensors: Furnished and installed under the ELECTRICAL division.
2. Filter Alarm: Differential pressure sensor across filter to send filter alarm to BAS whenever the differential pressure exceeds an adjustable 0.50 inches water column for pre-filters. Analog input signal with set point adjustable at the BAS. Alarm is to be sent to the BAS for confirmation.

3. Low-limit control: Averaging bulb thermostat at the discharge of the heating coil to stop the fan below an adjustable 40°F upon a time delay of 45 seconds. Mixing dampers repositioned to full recirculation position and automatic valve positioned to full open heating. Fan automatically reset on temperature rise above set point. Alarm is to be sent to the BAS for confirmation.
4. Fan operation status (Supply and Return Fans): Differential pressure sensor installed across supply fans and return fan units to send signal to BAS when in operation. Alarm is to be sent to the BAS for confirmation when fan does not operate when commanded on. Current sensor not acceptable.
5. In HAND position all AHU fans (supply and return) shall operate at the command of the smoke sensors.
6. Exhaust Fan operation status: Current sensor to send fan operation signal to BAS. Alarm is to be sent to the BAS for confirmation when fan does not operate when commanded on.
7. Exhaust Fan Automatic Damper: Where exhaust fan has an automatic damper, an end switch shall be utilized so that fan unit will not start until damper is mostly open. This control shall work in either Auto or Hand position through use of relay. A programmed delay start is not acceptable.
8. Air measuring stations: Provide air measuring stations where shown.
9. AHU coil minimum flow: When OSA drops below 32F, AHU minimum flow rate shall be set at 10% open when fan unit is off to reduce chance of freeze-up.

H. CLASSROOM AIR HANDLING UNIT (AHU-1): Magnetic Starter with a Hand-Off-Auto switch on the cover. In the AUTO position, the supply fan operates according to the Occupied/Unoccupied schedule of the BAS and safety functions such as the low-limit thermostat and the smoke sensor. In the Hand position, the fan operates at the command of the low-limit thermostat and smoke sensor.

1. Schedule of Operation:

   a. Normal Occupied Schedule: Initially set schedule to operate air handling unit AHU-1 from 8:00 am until 2:30 pm Monday through Friday. During normal operation, AHU-1 fan to provide minimum outdoor air as scheduled below.
   b. Extended Occupied Schedule: Prior to School (7:00 am - 8:00 am) and after school (2:30 pm - 5:00 pm) Monday - Friday, AHU-1 to enter Extended Occupied Schedule for reduced outdoor air volume. During extended operation, AHU-1 fan to provide reduced outdoor air as scheduled below.
   c. Unoccupied Mode: AHU-1 shall remain OFF in Unoccupied mode.
   d. Night Setback Mode: AHU-1 does not have a Night Setback mode.

2. During the Normal Occupied schedule, Outside air damper (OAD) to open to minimum position to provide the required minimum outside air. Minimum OSA volumes are as follows and are to be manually verified during initial adjustment of mechanical systems. Air monitoring station, included hereunder, installed in OSA duct to monitor OSA air volume. Minimum OSA control overridden when necessary to provide additional outdoor air for natural cooling when required by supply air control sequence.

   AHU-1 Normal Occupied Minimum OSA: 7000 CFM

3. During the Extended Occupied schedule (7:00am -8:00am and 2:30pm -5:00pm), Outside air damper (OAD) to open to reduced minimum position to provide the required minimum outside air necessary to make-up difference between return fan air volume and supply fan air volume. Extended operation OSA provides outdoor air for reduced occupancy and to replace exhaust air. Minimum OSA volumes are as follows and are to be manually verified during initial adjustment of mechanical systems. Air monitoring station, included hereunder, installed in OSA duct to monitor OSA air volume. Minimum OSA control overridden when necessary to provide additional outdoor air for natural cooling when required by supply air control sequence.

   AHU-1 Extended Operation Minimum OSA: 2550 CFM

4. Mixed air temperature: Mixed air dampers to modulate to provide minimum outdoor air volume as shown above. Averaging bulb duct thermostat in the mixed air to modulate the modulating outside air damper (OAD), the recirculating air damper (RAD), and exhaust air damper (EAD) to maintain the adjustable supply air setpoint listed below as long as minimum outdoor air volume is attained. OSA dampers to modulate open past minimum position when necessary to maximum 10,000 CFM OSA when in normal operation. When outdoor air is above 60F and heat exchanger is being fully bypassed, the OSA damper may modulate open to full outdoor air supply to provide maximum amount of natural cooling and ventilation. Dampers to modulate cooperatively, with the outside air damper OAD and the exhaust air damper EAD closed when the recirculating air damper RAD is open. Dampers to position to the full recirculating positions when the unit is not operating.
5. Heat Recovery Coil (HRC-1b) and Heat Recovery Pumps (P-4): AHU-1 is served by heat recovery coils (HRC-1a) which recover heat from the EF-1 exhaust air stream and transfer heat to incoming outdoor air (through HRC-1b in AHU-1). P-4 shall operate continuously during Occupied mode when OSA temperatures drop below 50F and shall shutoff when OSA temperatures rise above 52F. Pumps P-4 shall operate only when OSA temperatures are below 50F and when activated by AHU-1 supply air temperature control.

   a. Exhaust Fan EF-1 heat recovery

      1) HRC-1a located in EF-1 airstream
      2) HRC-1b located in AHU-1.
      3) Pump P-4 circulates 40% propylene glycol solution between HRC-1a and HRC-1b

6. Heat Exchanger (Internal to AHU-1):

   a. Frost Control with averaging bulb exhaust air sensor, set at 36°F, to modulate face and bypass dampers to bypass air around heat exchanger to maintain minimum frost control exhaust air temperature setting. In addition, a return air sensor is to be installed in the return air prior to heat exchanger for monitoring purposes.
   b. Modulate HX bypass damper open as necessary to maintain supply air discharge temperature per sequence below.

7. Supply air temperature: Supply air discharge sensor to control the heating coil automatic valve, heat exchanger OSA bypass damper, heat recovery pumps, and mixing dampers in order to supply an adjustable air discharge temperature set by the supply air reset; 60°F supply air at 60°F outside air temperature modulating to 63°F supply air at 0F outside air temperature and below. Automatic valve to close on an outside air temperature above an adjustable 60°F OSA.

a. If heating supply discharge temperature is below setpoint, controls shall operate according to the following sequence:

1) OSA damper shall modulate closed to 10,000 CFM outdoor air volume.
2) Plate type Air-to-Air Heat Exchanger (HX) bypass damper shall modulate to circulate air through AHU cross flow heat exchanger as required to maintain supply air temperature setpoint. (Outdoor air damper shall provide maximum 10,000 CFM OSA when HX face damper is full open and HX bypass is closed. Heat Exchanger is sized for maximum 10,000 CFM OSA.)
3) Wrap-Around Heat Recovery Coil (HRC) pump P-4 shall activate if OSA is below 50F and supply air temperature is below setpoint.
4) OSA dampers shall modulate to minimum open position
5 Heating coil Automatic Valve shall modulate open.

b. If heating supply discharge temperature is above setpoint, controls shall operate according to the following sequence:

1) Automatic Valve at heating coil shall modulate closed to maintain setpoint.
2) OSA damper shall modulate open to maximum 10,000 CFM (when using HX).
3) If automatic valve is closed, OSA damper is open (to normal maximum setting of 10,000 CFM), and supply air discharge temperature is still above setpoint, heat recovery coil pump P-4 shall shutoff.
4) Plate type HX bypass damper shall modulate open to bypass air around HX. OSA to remain at normal maximum 10,000 CFM setting until HX face damper is fully closed and all OSA is entering bypass.
5 After HX face damper is closed, Outdoor air damper shall modulate to full open (15140 CFM OSA) to provide maximum natural cooling.

8. Downstream supply main sensor: Provide SA sensor near the end of the supply duct main to monitor supply air temperature at end of supply main.
9. Pressure sensor located in the main corridor outside of the main toilet rooms and at outside wall. Provide input to BAS system.
10. Return fan (RF): Magnetic starter with a Hand-Off-Auto switch on the cover. In the Auto position, Return fan to operate whenever supply fan operates unless shutoff by smoke sensor. In the Hand position, the fan operates unless shutoff by smoke sensor.
11. EF-1 fan unit shall operate in its Occupied Schedule and whenever AHU-1 operates. See EF-1Sequence.
12. Provide Low-Limit Control, Filter Alarm, Air Measuring Station(s), Fan Operation Status, and AHU Minimum Coil Flow: See above for descriptions.

I. ADMIN/COMMONS AIR HANDLING UNIT (AHU-2): Magnetic Starter with a Hand-Off-Auto switch on the cover. In the AUTO position, the supply fan operates according to the Occupied/Unoccupied schedule of the BAS and safety functions such as the low-limit thermostat and the smoke sensor. In the Hand position, the fan operates at the command of the low-limit thermostat and smoke sensor.

1. Schedule of Operation:

a. Normal Occupied Schedule: Initially set schedule to operate air handling unit AHU-2 from 7:00 am until 4:30 pm Monday through Friday. During normal operation, AHU-2 fan to provide minimum outdoor air as scheduled below.

b. Ventilation Override: AHU-2 air handling unit shall modulate outdoor air damper open as required to maintain acceptable minimum CO2 levels (800 ppm maximum) in the following spaces. When CO2 override is not required, outdoor air shall be controlled by minimum OSA damper position shown below, or as needed to provide natural cooling per supply air control.

1) Administration return air duct
2) Commons
3). AHU-2 Return Air

c. Unoccupied Mode: AHU-2 shall remain OFF in Unoccupied mode unless activated by Night Setback mode.
d. Night Setback Mode: AHU-2 shall be activated if Commons room temperature drops below 60F.

2. During the Occupied schedule, Outside air damper (OAD) to open to minimum position to provide the required minimum outside air due to exhaust fan operation. Minimum OSA volumes are as follows and are to be manually verified during initial adjustment of mechanical systems. Air monitoring station, included hereunder, installed in OSA duct to monitor OSA air volume.
   AHU-2 1200 CFM due to EF-2 operation
3. Mixed air temperature: Averaging bulb duct thermostat in the mixed air to modulate the modulating outside air damper (OAD), the recirculating air damper (RAD), and relief air damper (RLD) to maintain the adjustable supply air temperature reset schedule listed below unless overridden to provide additional outdoor air to satisfy CO2 sensor control. Dampers to modulate cooperatively, with the outside air damper OAD and the exhaust air damper EAD closed when the recirculating air damper RAD is open. Dampers to position to the full recirculating positions during Night Setback and when the unit is not operating. Mixed air dampers shall not modulate lower than a 40F mixed air temperature.
4. Heat Recovery Coil System (HRC-2) and Heat Recovery Pump (P-5): AHU-2 is served by heat recovery coil (HRC-2a) which recovers heat from EF-2 exhaust air stream and transfers heat to incoming outdoor air (through HRC-2b in AHU-2). P-5 shall operate continuously during Occupied mode when OSA temperatures drop below 60F and shall shutoff when OSA temperatures rise above 62F or if supply air temperature is above setpoint. Pumps P-5 shall operate only when OSA temperature is below 60F and when activated by AHU-2 supply air temperature control.

   a. Exhaust Fan EF-2 heat recovery

      1) HRC-2a located in EF-2 airstream
      2) HRC-2b located in AHU-3.
      3) Pump P-5 circulates 40% propylene glycol solution between HRC-2a and HRC-2b

5. Supply air temperature: Duct thermostat in the supply air discharge to control the automatic valve and mixed air dampers to supply an adjustable supply air discharge initially set at 65F. Automatic valve to close on an outside air temperature above an adjustable 65°F OSA.
6. EF-2 fan unit shall operate in its Occupied Schedule and whenever AHU-2 operates. See EF-2 Sequence.
7. Provide Low-Limit Control, Filter Alarm, Air Measuring Station(s), Fan Operation Status, and AHU Minimum Coil Flow: See above for descriptions.

J. KITCHEN MAKE UP AIR FAN (AHU-3): Fan activation and speed control are LOCAL control through variable volume hood control system (Provided by Mechanical and installed by Electrical). Variable speed drive, provided with fan unit. When the VFD is in the AUTO position, the Kitchen hood controls shall operate and modulate the fan speed as required. When the VFD is in manual position, the fan to operate at full speed. In the AUTO position and Hand position, the supply fan shall shutoff on activation of low limit control. Low limit control operation including relays, wiring, and correct operation included hereunder.

1. Outdoor air damper to open as required during operation of AHU-3 unit.
2. Supply air: Averaging bulb duct thermostat in the supply air discharge to modulate coil face and bypass dampers and two-way modulating valve to supply an adjustable air temperature in order to maintain an adjustable 60°F supply air temperature. Automatic valve to close on an outside air temperature above an adjustable 60°F OSA.
3. Provide Low-Limit Control, Filter Alarm, and Fan Operation Status: See above for descriptions.
4. Coordinate with Electrical and Mechanical for complete operating system.

K. EXHAUST FAN (EF-1, EF-2): Magnetic starter with a Hand-Off-Auto switch on the cover. In the Auto position, respective exhaust fan to operate and EAD to open whenever in scheduled Occupied mode or when respective AHU operates. In the Hand position, the fan operates and EAD to open. Alarm is to be sent to the BAS for confirmation when fan does not operate when commanded on. Current sensor is acceptable for status indication. EF fan unit not to operate until EAD is mostly open through the use of an end switch.

1. Schedule of Operation:

    a. EF-1 shall operate whenever AHU-1 operates and also when scheduled as shown below.
    b. EF-2 shall operate whenever AHU-2 operates and also when scheduled as shown below.
    c. Normal Schedule: Initially set schedule to operate exhaust fans EF-1 and EF-2 from 7:00 am until 5:00 pm Monday through Friday. Exhaust Fans EF-1 through EF-2 shall have separate adjustable schedules. EF-1 and EF-2 shall also operate whenever respective air handler operates.
    d. Unoccupied Mode: EF's shall remain OFF in Unoccupied mode.
    e. Night Setback Mode: EF's remain OFF during AHU Night Setback modes.

L. KITCHEN GREASE HOOD EXHAUST FAN (EF-3): Variable speed drive, provided with variable volume hood controls. When the VFD is in the AUTO position, the Kitchen hood controls shall operate and modulate the fan speed as required. When the VFD is in manual position, fan to operate at full speed. Fan activation and speed control are LOCAL control through variable volume hood control system (Provided by Mechanical and installed by Electrical). BAS to monitor operation of EF-3.

M. HEAT REMOVAL FAN (EF-4): Magnetic Starter with a Hand-Off-Auto switch on the cover. In the Auto position, the exhaust fan operates when room thermostat is above setpoint, initially set at 75F. Fan shuts off at 3 degrees below setpoint. In the Hand position, the fan operates.

N. (IN ALTERNATE) EXISTING VU-6 FAN SYSTEM MODIFICATIONS: Modify the existing VU-6 controls as required for the following revised sequence.

1. A variable frequency drive located on the mounting board, provides direct power for the supply fan motor. When the VFD is in the AUTO position, the BAS shall operate and modulate the speed as required to maintain an adjustable supply fan duct discharge pressure of 0.8" TSP as measured by duct static pressure sensor installed where shown. . When the VFD is in bypass position, a digital speed control integral with the VFD panel provides manual speed control. Activate an alarm when a VFD generated status alarm occurs due to low current. Include VFD speed and VFD fault alarm inputs to the BAS. Display speed, alarms, and status on Graphics. In the AUTO position, the supply fan operates according to the Occupied/Unoccupied schedule of the BAS and safety functions such as the low-limit thermostat and the smoke sensor. In the HAND position, the fan operates in the Occupied mode at the command of the low-limit thermostat and the smoke sensor.
2. Schedule of Operation:

    a. Normal Occupied Schedule: Initially set schedule to operate existing air handling unit VU-6 from 7:00 am until 4:30 pm Monday through Friday. During normal operation, VU-6 fan to provide minimum outdoor air as required by CO2 sensor input except when additional outdoor air is required to maintain supply air reset temperature setpoint.
    b. CO2 Ventilation Control: VU-6 air handling unit shall control outdoor air damper as required to maintain acceptable minimum CO2 levels (800 ppm maximum) in the following spaces. Outdoor air damper shall also modulate open as needed to provide natural cooling per supply air control.

        1) Computer
        2) Library
        3) VU-6 Return Air

    c. Unoccupied Mode: VU-6 shall remain OFF in Unoccupied mode unless activated by Night Setback Mode.
    d. Night Setback Mode: VU-6 shall be activated into Night Setback Mode if any zone temperature (rooms served by VU-6) drops below 60F. VU-6 operates with OAD and EAD fully closed and RAD in the open position until the minimum zone temperature rises above 68F.

3. Mixed air temperature: Mixed air dampers to modulate cooperatively as required to maintain acceptable CO2 levels or as needed to provide cooling air to the spaces per supply air control. Carbon dioxide sensor located in the return air duct to modulate the outside air damper, the recirculating air damper, and exhaust air damper to maintain an adjustable maximum 800 ppm at each of the (2) carbon dioxide sensors. The BAS system shall default to an averaging bulb mixed air temperature set at 60°F upon failure of carbon dioxide sensor control. Dampers to modulate cooperatively, with the outside air damper OAD and the exhaust air damper EAD closed when the recirculating air damper RAD is open. Dampers to position to the full recirculating positions during the Night setback mode and when the unit is not operating. Mixed air dampers shall not modulate lower than a 45F mixed air temperature during carbon dioxide sensor control operation.
4. Natural Cooling: If any of VU-6 room zone sensors cannot maintain room thermostat cooling setpoint (2 degrees above heating setpoint) and the respective VAV box is already full open to cooling, modulate the outdoor air damper open as needed to provide the

necessary natural cooling required to maintain room setpoint. Outdoor air damper to modulate open to a minimum of 55F mixed air temperature during natural cooling mode.

5. Mechanical Cooling: If natural cooling does not satisfy room temperature setpoint (4F above room setpoint for mechanical cooling activation) and outdoor air temperature is above 60F, rooftop cooling unit shall be energized. When mechanical cooling is energized, rooftop compressor/condenser unit shall operate and existing refrigerant solenoid valve shall modulate to provide 55F supply air discharge temperature. Rooftop cooling unit shall not operate unless VU-6 fan unit is operating and mechanical cooling is required as stated above. Cooling cycle shall not operate during the unoccupied schedule. BAS shall deactivate rooftop cooling unit when building cooling is no longer required or when outdoor air temperature drops below 58F. Rooftop cooling unit shall operate for minimum of 10 minutes.
6. Room temperature control: Room sensor to control the heating and cooling in series, with dead area between.

    a. Heating cycle: VAV to operate at minimum flow during heating cycle. Averaging bulb duct thermostat in the supply air discharge to modulate two-way modulating valve to supply an adjustable zone discharge air temperature in order to maintain an adjustable 68°F room temperature setpoint. Supply air temperature discharge to be set by the supply air reset schedule according to PID loop control. PID loop shall reset the supply air discharge setpoint between 55F and 100F as required to maintain room temperature setpoint.
    b. Cooling cycle: VAV shall modulate to full open position as necessary to maintain room setpoint.

7. Existing Non-freeze control: Averaging bulb thermostat at the discharge of VU-6, where shown, to stop the fan below 40F and to open all (3) automatic valves to full heating.
8. Existing Smoke sensor control: Fan unit to shutoff when activated by fire alarm panel.

O. BOOSTER COILS (BC)

1. Room Temperature Control: Room sensor to operate booster coil automatic valve as required to maintain room temperature setpoint. Discharge air temperature sensor input to BAS for monitoring.
2. Booster Coils serving AHU-1 interior zones: Discharge air sensor located in ductwork downstream of booster coil to control booster coil automatic valve. Discharge air sensor, set at an adjustable 68°F, to modulate respective booster coil automatic valve as required to maintain discharge air temperature setpoint.

P. FINNED PIPE CONTROL (FP) and CONVECTORS (CV): Respective room thermostat, set at an adjustable 68°F to open finned pipe or convector automatic valves to supply heat to individual rooms as needed. Normally open automatic valves open on failure of control power.

Q. EXISTING UNIT HEATERS (UH) - LOCAL CONTROL: Verify operation of existing controls after relocation of devices. Room thermostat, set at an adjustable 65F, operates the fan and opens the two-way valve when heating is required.

R. CABINET UNIT HEATERS (CUH): A manual starter with an ON-OFF switch is located adjacent to the unit. A room thermostat, operates the fan and opens the two-way valve when heating is required. Local Control is NOT acceptable. Thermostat sensor value displayed on floor plan graphic with Alarm sent to BAS when temperature drops below adjustable 50F.

S. LIGHTING CONTROL PANEL AND INTRUSION ALARMS: Provide monitoring of intrusion alarms and enable/disable control of lighting control panel. See Electrical for all locations and Scope of Work.

END OF SECTION

SECTION 15950 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic and refrigerating systems.

C. Measurement of final operating condition of HVAC systems.

1.2 RELATED REQUIREMENTS

A. Section 01911 - Commissioning: Commissioning requirements that apply to all types of work.

1.3 SUMMARY

A. Scope of Work: Adjust and balance existing and new building air systems. Adjust and balance entire existing and new building hydronic systems. Air volumes are located on the diffuser and grille schedules. Flow rates for all hydronic systems are shown on the schedules. Coordinate with contract document requirements.

1. Ventilation and Exhaust Systems

    a. AHU-1 and EF-1 System
    b. AHU-2 and EF-2 System
    c. AHU-3 System
    d. Kitchen Hood and EF-3 System.
    e. VU-4 and RF-4 System
    f. VU-5 and RF-5 System (Measure volume of systems)
    g. VU-6 System
    h. EF-4

2. Hydronic Heating Systems.
3. Hydonic Hot Water Recirculation Systems
4. Heat Recovery Systems
5. Coordination during Controls Start-up and Testing
6. Temporary system adjustment between Construction Seasons.
7. Variable Freguency Drives – Assist BAS Contractor (Main Heating Pumps and Alternate work in VU-6 System.)
8. Comissioning.

1.4 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance

Council; 2002.

B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1988, with 1997 Errata.

C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau; 2005, Seventh Edition.

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association; 2002.

1.5 SUBMITTALS

A. See Section 01300 - Submittals, for submittal procedures.

B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

1. Submit to Murray & Associates PC-Mechanical Engineers.
2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
3. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Murray & Associates PC-Mechanical Engineers and other installers to sufficiently understand the design intent for each system.
4. Include at least the following in the plan:

    a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
    c. Identification and types of measurement instruments to be used and their most recent calibration date.
    d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
    e. Final test report forms to be used.
    f. Detailed step-by-step procedures for TAB work for each system and issue, including:

        1) Terminal flow calibration (for each terminal type).
        2) Diffuser proportioning.
        3) Branch/submain proportioning.
        4) Total flow calculations.
        5) Rechecking.
        6) Diversity issues.

    g. Criteria for using air flow straighteners or relocating flow stations and sensors; analogous explanations for the water side.
    h. Details of how TOTAL flow will be determined; for example:

1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.

i. Confirmation of understanding of the outside air ventilation criteria under all conditions.
j. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
k. Method of checking building static and exhaust fan and/or relief damper capacity.
l. Proposed selection points for sound measurements methods.
m. Time schedule for TAB work to be done in phases (by floor, etc.).
n. False loading of systems to complete TAB work, if specified.
o. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
p. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. Field Logs: Submit at least twice a week to Commissioning Authority.

E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

F. Progress Reports.

G. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Revise TAB plan to reflect actual procedures and submit as part of final report.
2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Murray & Associates PC-Mechanical Engineers and for inclusion in operating and maintenance manuals.
3. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
6. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
7. Include the following on the title page of each report:

a. Name of Testing, Adjusting, and Balancing Agency.
b. Address of Testing, Adjusting, and Balancing Agency.
c. Telephone number of Testing, Adjusting, and Balancing Agency.
d. Project name.
e. Project location.
f. Project Murray & Associates PC-Mechanical Engineers.
g. Project Engineer.
h. Project.
i. Project altitude.
j. Report date.

H. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:

1. AABC MN-1, AABC National Standards for Total System Balance.
2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
5. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
2. Having minimum of three years documented experience.
3. Certified by one of the following:

a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
b. NEBB, National Environmental Balancing Bureau: www.nebb.org.
c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.

4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Air coil fins are cleaned and combed.
8. Access doors are closed and duct end caps are in place.
9. Air outlets are installed and connected.
10. Duct system leakage is minimized.
11. Hydronic systems are flushed, filled, and vented.
12. Pumps are rotating correctly.
13. Proper strainer baskets are clean and in place.
14. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.

1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Murray & Associates PC-Mechanical Engineers to facilitate spot checks during testing.

C. Provide additional balancing devices as required.

3.4 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:

1. Running log of events and issues.
2. Discrepancies, deficient or uncompleted work by others.
3. Contract interpretation requests.
4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to

be restored. Set and lock memory stops.

D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the City and Borough of Juneau.

H. Check and adjust systems approximately six months after final acceptance and submit report.

3.6 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

3.7 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.8 SCOPE

A. Test, adjust, and balance the following:

1. Plumbing Pumps
2. HVAC Pumps
3. Unit Air Conditioners
4. Air Coils
5. Terminal Heat Transfer Units
6. Air Handling Units
7. Fans
8. Air Filters
9. Air Inlets and Outlets

3.9 MINIMUM DATA TO BE REPORTED

A. Electric Motors:

1. Manufacturer
2. Model/Frame
3. HP/BHP
4. Phase, voltage, amperage; nameplate, actual, no load
5. RPM
6. Service factor
7. Starter size, rating, heater elements
8. Sheave Make/Size/Bore

B. V-Belt Drives:

1. Identification/location
2. Required driven RPM

3. Driven sheave, diameter and RPM
4. Belt, size and quantity
5. Motor sheave diameter and RPM
6. Center to center distance, maximum, minimum, and actual

C. Pumps:

1. Identification/number
2. Manufacturer
3. Size/model
4. Impeller
5. Service
6. Design flow rate, pressure drop, BHP
7. Actual flow rate, pressure drop, BHP
8. Discharge pressure
9. Suction pressure
10. Total operating head pressure

D. Heating Coils:

1. Identification/number
2. Location
3. Service
4. Manufacturer
5. Air flow, design and actual
6. Water flow, design and actual
7. Water pressure drop, design and actual
8. Entering water temperature, design and actual
9. Leaving water temperature, design and actual
10. Entering air temperature, design and actual
11. Leaving air temperature, design and actual
12. Air pressure drop, design and actual

E. Air Moving Equipment:

1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Arrangement/Class/Discharge
6. Air flow, specified and actual
7. Return air flow, specified and actual
8. Outside air flow, specified and actual
9. Total static pressure (total external), specified and actual
10. Inlet pressure
11. Discharge pressure
12. Sheave Make/Size/Bore
13. Number of Belts/Make/Size
14. Fan RPM

F. Return Air/Outside Air:

1. Identification/location

2. Design air flow
3. Actual air flow
4. Design return air flow
5. Actual return air flow
6. Design outside air flow
7. Actual outside air flow
8. Return air temperature
9. Outside air temperature
10. Required mixed air temperature
11. Actual mixed air temperature
12. Design outside/return air ratio
13. Actual outside/return air ratio

G. Exhaust Fans:

1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Air flow, specified and actual
6. Total static pressure (total external), specified and actual
7. Inlet pressure
8. Discharge pressure
9. Sheave Make/Size/Bore
10. Number of Belts/Make/Size
11. Fan RPM

H. Duct Traverses:

1. System zone/branch
2. Duct size
3. Area
4. Design velocity
5. Design air flow
6. Test velocity
7. Test air flow
8. Duct static pressure
9. Air temperature
10. Air correction factor

I. Air Monitoring Stations:

1. Identification/location
2. System
3. Size
4. Area
5. Design velocity
6. Design air flow
7. Test velocity
8. Test air flow

END OF SECTION

SECTION 16050 – BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following electrical materials and methods:

1. Supporting devices for electrical components.
2. Concrete equipment bases.
3. Electrical identification.
4. Electrical demolition.
5. Cutting and patching for electrical construction.
6. Touchup painting.
7. Meter sockets.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of Section 01300 – CONTRACTOR Submittals.

B. Provide catalog cut sheets providing product data for each type of product specified. Note specifically what component is being submitted when more than one model or version is shown on the cut sheet. Where there is more than one of each type of component (circuit breaker), label the top of each cut sheet with the specific component that the cut sheet applies to.

C. Provide Shop Drawings detailing fabrication and installation of supports and anchorage for electrical items. Show all components of a system and how they relate to each other during installation. Include details of mounting brackets, wiring interconnections, single line diagrams, component layout diagrams for enclosures, materials lists for components in enclosures, wiring schematic diagrams with each wire numbered and each terminal numbered for wiring in enclosures.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 for components and installation.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.5 SEQUENCING AND SCHEDULING

A. Coordinate electrical equipment installation with other trades.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.

C. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the WORK.

E. Coordinate connecting electrical systems with exterior underground utilities and services. Comply with requirements of governing regulations, utility requirements, and controlling agencies.

F. Coordinate installing electrical identification after completion of finishing where identification is applied to field-finished surfaces.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components.

1. Material: Steel, except as otherwise indicated, protected from corrosion with zinc coating or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.
2. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel, or type 316L stainless steel, except as otherwise indicated.

B. Steel channel supports have 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.

1. Fittings and accessories mate and match with channels and are from the same manufacturer.

C. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, fiberglass-resin channels and angles with 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.

1. Fittings and accessories mate and match with channels or angles and are from the same manufacturer.
2. Fitting and Accessory Material: Same as channels and angles, except metal items may be stainless steel.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps or "click"- type hangers.

E. Sheet-Metal Sleeves: 0.0276-inch or heavier galvanized sheet steel, round tube, closed with welded longitudinal joint.

F. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

G. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable iron casting with hot-dip galvanized finish.

H. Expansion Anchors: Red Head, Hilti, or equal. Stainless steel. When mounting devices to concrete, use Hilti products designed for that purpose.

I. Toggle Bolts: All-steel springhead type.

J. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 ELECTRICAL IDENTIFICATION

A. Manufacturer's Standard Products: Where more than one type is listed for a specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Raceway and Cable Labels: Conform to ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway or cable size.

1. Type: Preprinted, flexible, self-adhesive, vinyl. Legend is overlaminated with a clear, weather- and chemical-resistant coating.
2. Color: Black legend on orange field.
3. Legend: Indicates voltage.

C. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch wide.

D. Underground Line Warning Tape: Permanent, bright-colored, detectable, continuous-printed, vinyl tape with the following features:

1. Size: Not less than 4 mils thick by 6 inches wide.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend that indicates type of underground line.

E. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

F. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.

G. Engraved, Plastic-Laminated Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched for mechanical fasteners 1/16-inch minimum thick for signs up to 20 sq. in., 1/8 inch thick for larger sizes. Engraved legend in black letters on white face.

H. Fasteners for Plastic-Laminated and Metal Signs: Self-tapping stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.3 TOUCHUP PAINT

A. For Equipment: Provided by equipment manufacturer and selected to match equipment finish.

B. For Nonequipment Surfaces: Matching type and color of undamaged, existing adjacent finish.

C. For Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION REQUIREMENTS

A. Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated.

B. Install items level, plumb, and parallel and perpendicular to other building systems and components, except where otherwise indicated.

C. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Give right of way to raceways and piping systems installed at a required slope.

E. Coordinate with all other trades to install electrical equipment without being in conflict with other work. Where devices or equipment is in conflict, work out a solution that accommodates both trades and coordinate solution with owner's representative. Do not change the design without the engineer's approval.

F. Keep all equipment in a dry, heated, secure storage area prior to installation. After installation, all equipment shall be kept dry and above 55 degrees Farenheit. If the building can not be kept that warm, do not install any equipment with microprocessors, any access control equipment, any fire alarm equipment, any video equipment, or any telephone/data/television equipment.

3.2 ELECTRICAL SUPPORTING METHODS

A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components. Consider the exterior of the building a damp location.

B. Support Clamps for PVC Raceways: Click-type clamp system.

C. Conform to manufacturer's recommendations for selecting supports.

D. Strength of Supports: Adequate to carry all present and future loads, times a safety factor of at least 4; 200-lb-minimum design load.

3.3 INSTALLATION

A. Install devices to securely and permanently fasten and support electrical components.

B. Raceway Supports: Comply with NFPA 70 and the following requirements:

1. Conform to manufacturer's recommendations for selecting and installing supports.
2. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
3. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
4. Spare Capacity: Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.
5. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.
6. Hanger Rods: 1/4-inch diameter or larger threaded steel, except as otherwise indicated.
7. Spring Steel Fasteners: Specifically designed for supporting single conduits or tubing. May be used in lieu of malleable iron hangers for 1-1/2-inch and smaller

raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to channel and slotted angle supports.

8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway terminals.

C. Vertical Conductor Supports: Install simultaneously with conductors.

D. Miscellaneous Supports: Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices except where components are mounted directly to structural features of adequate strength.

E. Sleeves: Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

F. Fastening: Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure. Perform fastening according to the following:

1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and by machine screws, welded threaded studs, or spring-tension clamps on steel.
2. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts, machine screws, or wood screws.
3. Drill holes in concrete beams so holes more than 1-1/2 inches deep do not cut main reinforcing bars.
4. Drill holes in concrete so holes more than 3/4 inch deep do not cut main reinforcing bars.
5. Fill and seal holes drilled in concrete and not used.
6. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof-test load.

G. Install identification devices where required.

1. Install labels where indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
2. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated on the contract documents or required by codes and standards. Use consistent designations throughout the Project.
3. Self-Adhesive Identification Products: Clean surfaces of dust, loose material, and oily films before applying.
4. Tag or label power circuits for future connection and circuits in raceways and enclosures with other circuits. Identify source and circuit numbers in each

cabinet, pull box, junction box, and outlet box. Color coding may be used for voltage and phase indication.

5. Identify Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above power and communication lines. Locate 6 to 8 inches below finished grade. Where multiple lines installed in a common trench or concrete envelope do not exceed an overall width of 16 inches, use a single line marker.
6. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

H. Store all material and equipment in a dry, heated area until it is installed. Keep all material dry and if it has printed circuit boards or any other electronic components, keep it in a dry heated location after it is installed.

I. Replace all materials and equipment damaged during construction.

J. All materials and equipment shall be new unless otherwise noted.

3.4 DEMOLITION

A. Where electrical WORK to remain is damaged or disturbed in the course of the WORK, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Keep all existing electrical systems on the project site fully operational during the course of the WORK

3.5 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of the trades involved.

B. Repair disturbed surfaces to match adjacent undisturbed surfaces.

3.6 TOUCH-UP PAINTING

A. Thoroughly clean damaged areas and provide primer, intermediate, and finish coats to match the existing color of adjacent surface.

B. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

END OF SECTION 16050

SECTION 16060 – GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Grounding systems and equipment.

B. Section includes grounding systems and equipment

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

A. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Ground rods.
2. Grounding for sensitive electronic equipment.

B. Qualification Data: For qualified testing agency and testing agency's field supervisor.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Predrilled rectangular bars of annealed. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel 3/4 inch in diameter by 10 feet in length.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters,

dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

G. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch grounding bus.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

H. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 LABELING

A. Comply with requirements in Section 16075 "Electrical Identification" for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and at the ground bus at MDP.

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal**,** and at individual ground rods. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

E. Grounding system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).

H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 16060

SECTION 16091 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL & SIGNAL RACEWAYS AND CABLING

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. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 07840 “Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit EQ 4: For sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inches.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inches.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.
e. Proco Products, Inc.

2. Sealing Elements: EPDM or Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating,of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Presealed Systems.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
2. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

   a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07920 "Joint Sealants."
   b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 16091

SECTION 16120 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

C. Conductors: Use only copper conductors: Comply with NEMA WC 70.

D. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN, XHHW.

E. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC, nonmetallic-sheathed cable, Type NM with ground wire.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Exposed Feeders: Type THHN-THWN, single conductors in raceway. Metal-clad cable, Type MC may be used only where shown.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway. Metal-clad cable, Type MC may be used only where shown in Drawings.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW, single conductors in raceway.

D. Exposed Branch Circuits: Type THHN-THWN, single conductors in raceway. Metal-clad cable, Type MC may be used for lighting circuits only.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway. Metal-clad cable, Type MC may be used for lighting circuits only.

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW, single conductors in raceway.

G. Branch Circuits in Cable Tray: Only signal circuits may be run in cable tray. Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

I. Class 1 Control Circuits: Type THHN-THWN, in raceway.

J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Section 16073 "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Section 16075 "Electrical Identification."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 16091 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 07840 "Firestopping."

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.

2. Perform each visual and mechanical inspection.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 16120

SECTION 16123 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

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. Section Includes:

1. UTP cabling.
2. 62.5/125-micrometer, multimode optical fiber cabling.
3. Low-voltage control cabling.
4. Control-circuit conductors.
5. Identification products.

1.3 DEFINITIONS

A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.

B. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel section.

C. EMI: Electromagnetic interference.

D. IDC: Insulation displacement connector.

E. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).

F. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

G. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

H. RCDD: Registered Communications Distribution Designer.

I. Solid-Bottom or Nonventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal side rails, and a bottom without ventilation openings.

J. Trough or Ventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal rails and a bottom having openings sufficient for the passage of air and using 75 percent or less of the plan area of the surface to support cables.

K. UTP: Unshielded twisted pair.

1.4 ACTION SUBMITTALS

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

B. Shop Drawings: For cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements. Include the following:

1. Vertical and horizontal offsets and transitions.
2. Clearances for access above and to side of cable trays.
3. Vertical elevation of cable trays above the floor or bottom of ceiling structure.
4. Load calculations to show dead and live loads as not exceeding manufacturer's rating for tray and its support elements.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For wire and cable to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

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. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.
   1. Test optical fiber cable on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; include the loss value of each. Retain test data and include the record in maintenance data.
   2. Test each pair of UTP cable for open and short circuits.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install UTP and optical fiber cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. Support of Open Cabling: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

   1. Support brackets with cable tie slots for fastening cable ties to brackets.
   2. Lacing bars, spools, J-hooks, and D-rings.
   3. Straps and other devices.

B. Cable Trays:

   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

      a. Cable Management Solutions, Inc.
      b. Cablofil Inc.
      c. Cooper B-Line, Inc.
      d. Cope - Tyco/Allied Tube & Conduit.
      e. GS Metals Corp.

   2. Cable Tray Materials: Metal, suitable for indoors and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inches thick.
      a. Ladder Cable Trays: Provide ladder cable trays on this project that are either nominally 16 or 24 inches wide as shown on the plans, with a rung spacing of 9 inches.

C. Conduit and Boxes: Comply with requirements in Section 16130 "Raceways and Boxes."

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.2 BACKBOARDS

A. Description: Plywood, 3/4 thickness, other dimensions as stated on drawings. Comply with requirements for plywood backing panels in Section 06100 "Rough Carpentry."

2.3 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Belden CDT Inc.; Electronics Division.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.
4. Draka USA.
5. Genesis Cable Products; Honeywell International, Inc.
6. KRONE Incorporated.
7. Mohawk; a division of Belden CDT.
8. Nordex/CDT; a subsidiary of Cable Design Technologies.
9. Superior Essex Inc.
10. SYSTIMAX Solutions; a CommScope, Inc. brand.
11. 3M.
12. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Description: 100-ohm, four-pair UTP.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
    a. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
    b. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.

2.4 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Technology Systems Industries, Inc.
2. Dynacom Corporation.
3. Hubbell Premise Wiring.
4. KRONE Incorporated.
5. Leviton Voice & Data Division.
6. Molex Premise Networks; a division of Molex, Inc.
7. Nordex/CDT; a subsidiary of Cable Design Technologies.

8. Panduit Corp.
9. Siemon Co. (The).
10. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. UTP Cable Connecting Hardware: IDC type, using modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of the same category or higher.

C. Connecting Blocks: 110 style for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare; integral with connector bodies, including plugs and jacks where indicated.

2.5 OPTICAL FIBER CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Berk-Tek; a Nexans company.
2. CommScope, Inc.
3. Corning Cable Systems.
4. General Cable Technologies Corporation.
5. Mohawk; a division of Belden CDT.
6. Nordex/CDT; a subsidiary of Cable Design Technologies.
7. Optical Connectivity Solutions Division; Emerson Network Power.
8. Superior Essex Inc.
9. SYSTIMAX Solutions; a CommScope, Inc. brand.
10. 3M.
11. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Description: Multimode, 62.5/125-micrometer, 6-fiber, nonconductive, tight buffer, optical fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications.
3. Comply with TIA/EIA-492AAAA-B for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

a. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.

5. Conductive cable shall be aluminum-armored type.
6. Maximum Attenuation: 3.5 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
7. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:

1. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.

2. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.6 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ADC.
2. American Technology Systems Industries, Inc.
3. Berk-Tek; a Nexans company.
4. Corning Cable Systems.
5. Dynacom Corporation.
6. Hubbell Premise Wiring.
7. Molex Premise Networks; a division of Molex, Inc.
8. Nordex/CDT; a subsidiary of Cable Design Technologies.
9. Optical Connectivity Solutions Division; Emerson Network Power.
10. Siemon Co. (The).

B. Cable Connecting Hardware: Comply with the Fiber Optic Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.

1. Quick-connect, simplex and duplex, Type SC connectors. Insertion loss not more than 0.75 dB.
2. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.7 LOW-VOLTAGE CONTROL CABLE

A. Non-Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

B. Non-Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Plastic jacket.
5. Flame Resistance: NFPA 262, Flame Test.

C. Provide cable size as shown on the drawings. Provide the above cable where cable type not shown, conductor size as required and as recommended by manufacturer.

2.8 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN or Type XHHN, in raceway, complying with UL 44.

B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN or Type XHHN, in raceway, complying with UL 44.

2.9 IDENTIFICATION PRODUCTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brady Corporation.
2. HellermannTyton.
3. Kroy LLC.
4. Panduit Corp.

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Section 16075 "Electrical Identification."

2.10 SOURCE QUALITY CONTROL

A. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.

B. Factory test UTP cables according to TIA/EIA-568-B.2.

C. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.

B. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

C. Comply with requirements in Section 16130 "Raceways and Boxes" for installation of conduits and wireways.

D. Install manufactured conduit sweeps and long-radius elbows if possible.

E. Pathway Installation in Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed or in the corner of room if multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard if entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

F. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Install 110-style IDC termination hardware unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in Section 16130 "Raceways and Boxes."

E. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.
2. Cable shall be terminated on connecting hardware that is rack or cabinet mounted.

F. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.3 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables.

3.4 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits, No. 16 AWG.

3.5 FIRESTOPPING

A. Comply with requirements in Section 07841 "Through-Penetration Firestop Systems."

B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING

A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Section 16060 "Grounding and Bonding."

3.7 IDENTIFICATION

A. Identify system components, wiring, and cabling according to TIA/EIA-606-A. Comply with requirements for identification specified in Section 16075 "Electrical Identification."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not after cross connection.

a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

4. Optical Fiber Cable Tests:

a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

b. Link End-to-End Attenuation Tests:

1) Multimode Link Measurements: Test at 850 or 1300 nm in one direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.

2) Attenuation test results for links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.

C. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

D. End-to-end cabling will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 16123

SECTION 16130 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

D. Samples: For wireways nonmetallic wireways and surface raceways and for each color and texture specified, 12 inches long.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

C. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. 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. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney; a brand of EGS Electrical Group.
6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company; a division of John Maneely Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.

2. Coating Thickness: 0.040 inch, minimum.

G. EMT: Comply with ANSI C80.3 and UL 797.

H. FMC: Comply with UL 1; zinc-coated steel.

I. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

J. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:

   a. Material: Steel.
   b. Type: compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

K. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Non-metallic conduit shall be used underground, but not in the building.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.
6. Condux International, Inc.
7. Electri-Flex Company.
8. Kraloy.
9. Lamson & Sessions; Carlon Electrical Products.
10. Niedax-Kleinhuis USA, Inc.
11. RACO; a Hubbell company.
12. Thomas & Betts Corporation.

C. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. ENT: Not allowed.

E. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

F. LFNC: Comply with UL 1660.

G. Rigid HDPE: Comply with UL 651A.

H. Continuous HDPE: Comply with UL 651B.

I. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.

J. RTRC: Comply with UL 1684A and NEMA TC 14.

K. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

L. Fittings for LFNC: Comply with UL 514B.

M. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

N. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company.
3. Mono-Systems, Inc.
4. Square D; a brand of Schneider Electric.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: **Screw-cover type** unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish indoors and hot dipped galvanized or 316 stainless steel outdoors or in damp locations.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Allied Moulded Products, Inc.
2. Hoffman; a Pentair company.
3. Lamson & Sessions; Carlon Electrical Products.
4. Niedax-Kleinhuis USA, Inc.

B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.

D. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

E. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

F. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Mono-Systems, Inc.
    b. Panduit Corp.
    c. Wiremold / Legrand.

C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Hubbell Incorporated; Wiring Device-Kellems Division.
    b. Mono-Systems, Inc.
    c. Panduit Corp.
    d. Wiremold / Legrand.

D. Tele-Power Poles:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Mono-Systems, Inc.
    b. Panduit Corp.
    c. Wiremold / Legrand.

2. Material: Galvanized steel with ivory baked-enamel finish.
3. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Adalet.
2. Cooper Technologies Company; Cooper Crouse-Hinds.
3. EGS/Appleton Electric.
4. Erickson Electrical Equipment Company.
5. FSR Inc.
6. Hoffman; a Pentair company.
7. Hubbell Incorporated; Killark Division.
8. Kraloy.

9. Milbank Manufacturing Co.
10. Mono-Systems, Inc.
11. O-Z/Gedney; a brand of EGS Electrical Group.
12. RACO; a Hubbell Company.
13. Robroy Industries.
14. Spring City Electrical Manufacturing Company.
15. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
16. Thomas & Betts Corporation.
17. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:

1. Material: Cast metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Nonmetallic Floor Boxes: Nonadjustable, rectangular.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

K. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

L. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

M. Gangable boxes are allowed.

N. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 4 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Fiberglass.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

O. Cabinets:

1. NEMA 250, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. CDR Systems Corporation; Hubbell Power Systems.
d. NewBasis.
e. Oldcastle Precast, Inc.; Christy Concrete Products.
f. Synertech Moulded Products; a division of Oldcastle Precast, Inc.

2. Standard: Comply with SCTE 77.
3. Configuration: Designed for flush burial with integral closed bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
6. Cover Legend: Molded lettering, "ELECTRIC."

7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
8. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of cast iron.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. CDR Systems Corporation; Hubbell Power Systems.
d. NewBasis.
e. Nordic Fiberglass, Inc.
f. Oldcastle Precast, Inc.; Christy Concrete Products.
g. Synertech Moulded Products; a division of Oldcastle Precast, Inc.

2. Standard: Comply with SCTE 77.
3. Color of Frame and Cover: Green.
4. Configuration: Designed for flush burial with integral closed bottom unless otherwise indicated.
5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
7. Cover Legend: Molded lettering, "ELECTRIC.".
8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
9. Handholes 12 Inches Wide by 24 Inches Long and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.8 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by an independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC.
3. Underground Conduit: GRC within 10 feet of building or structure.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X stainless steel or hot dipped galvanized steel.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 16073 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 1 inch of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Surface Raceways:

1. Install surface raceway with a minimum 2-inch radius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

W. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental

temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.

2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
    d. Attics: 135 deg F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Z. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

BB. Locate boxes so that cover or plate will not span different building finishes.

CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

EE. Set metal floor boxes level and flush with finished floor surface.

FF. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 02300 "Earthwork" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 02300 "Earthwork."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 02300 "Earthwork."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Section 16075 "Electrical Identification."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. Install handholes with bottom below frost line.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.

F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 16091 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07840 "Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 16130

SECTION 16136 - CABLE TRAYS FOR COMMUNICATIONS 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.

1.2 SUMMARY

A. Section Includes:

1. Ladder cable trays.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cable tray.

1. Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: For each type of cable tray.

1. Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Include scaled cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements.
2. Vertical and horizontal offsets and transitions.
3. Clearances for access above and to side of cable trays.
4. Vertical elevation of cable trays above the floor or below bottom of ceiling structure.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes in cable tray installed outdoors.

1. Temperature Change: 120 deg F, ambient.

2.2 GENERAL REQUIREMENTS FOR CABLE TRAYS

A. Cable Trays and Accessories: Identified as defined in NFPA 70 and marked for intended location, application, and grounding.

1. Source Limitations: Obtain cable trays and components from single manufacturer.

B. Sizes and Configurations: See the drawings for cable tray sizes.

C. Structural Performance: See articles for individual cable tray types for specific values for the following parameters:

1. Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.
2. Concentrated Load: A load applied at midpoint of span and centerline of tray.
3. Load and Safety Factors: Applicable to both side rails and rung capacities.

2.3 LADDER CABLE TRAYS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Allied Tube & Conduit; a Tyco International Ltd. Co.
2. Chalfant Manufacturing Company.
3. Cooper B-Line, Inc.
4. Mono-Systems, Inc.
5. MP Husky.
6. Niedax-Kleinhuis USA, Inc.

B. Description:

1. Configuration: Two I-beam side rails with transverse rungs welded to side rails.
2. Rung Spacing: 12 incheso.c.
3. Radius-Fitting Rung Spacing: 9 inches at center of tray's width.
4. Minimum Cable-Bearing Surface for Rungs: 7/8-inch width with radius edges.
5. No portion of the rungs shall protrude below the bottom plane of side rails.

6. Structural Performance of Each Rung: Capable of supporting a maximum cable load, with a safety factor of 1.5, plus a 200-lb concentrated load, when tested according to NEMA VE 1.
7. Minimum Usable Load Depth: 4 inches.
8. Straight Section Lengths: 24 feet except where shorter lengths are required to facilitate tray assembly.
9. Width: 24 inches unless otherwise indicated on Drawings.
10. Fitting Minimum Radius: 24 inches.
11. Class Designation: Comply with NEMA VE 1, Class 12B.
12. Splicing Assemblies: Bolted type using serrated flange locknuts.
13. Hardware and Fasteners: Steel, zinc plated according to ASTM B 633.
14. Splice Plate Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

2.4 MATERIALS AND FINISHES

A. Aluminum:

1. Materials: Alloy 6063-T6 according to ANSI H 35.1/H 35.1M for extruded components and **Alloy 5052-H32** according to ANSI H 35.1/H 35.1M for fabricated parts.
2. Hardware: **Chromium-zinc-plated steel, ASTM F 1136** or **Stainless steel, Type 316, ASTM F 593 and ASTM F 594**.
3. Hardware for Aluminum Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.

2.5 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

B. Covers: Solid type made of same materials and with same finishes as cable tray.

C. Barrier Strips: Same materials and finishes as for cable tray.

D. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.6 WARNING SIGNS

A. Lettering: 1-1/2-inch-high, black letters on yellow background with legend "Warning! Not To Be Used as Walkway, Ladder, or Support for Ladders or Personnel."

B. Comply with requirements for fasteners in Section 16075 "Electrical Identification."

2.7 SOURCE QUALITY CONTROL

A. Testing: Test and inspect cable trays according to NEMA FG 1.

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

A. Install cable trays according to NEMA FG 1.

B. Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

C. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.

D. Remove burrs and sharp edges from cable trays.

E. Join aluminum cable tray with splice plates; use four square neck-carriage bolts and locknuts.

F. Fasten cable tray supports to building structure.

G. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb . Comply with requirements in Section 16073 "Hangers and Supports for Electrical Systems."

H. Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

I. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

J. Support bus assembly to prevent twisting from eccentric loading.

K. Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.

L. Locate and install supports according to NEMA FG 1. Do not install more than one cable tray splice between supports.

M. Support wire-basket cable trays with trapeze hangers.

N. Support trapeze hangers for wire-basket trays with 1/4-inch-diameter rods.

O. Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.

P. Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in NEMA FG 1. Space connectors and set gaps according to applicable standard.

Q. Make changes in direction and elevation using manufacturer's recommended fittings.

R. Make cable tray connections using manufacturer's recommended fittings.

S. Seal penetrations through fire and smoke barriers. Comply with requirements in Section 07841 "Through-Penetration Firestop Systems."

T. Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

U. Install cable trays with enough workspace to permit access for installing cables.

V. Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.

W. Install permanent covers, if used, after installing cable. Install cover clamps according to NEMA VE 2.

X. Clamp covers on cable trays installed outdoors with heavy-duty clamps.

Y. Install warning signs in visible locations on or near cable trays after cable tray installation.

3.2 CABLE TRAY GROUNDING

A. Ground cable trays according to NFPA 70 unless additional grounding is specified. Comply with requirements in Section 16060 "Grounding and Bonding."

B. Cable trays with communications cable shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

C. Cable trays with control conductors shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

D. When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.

E. Bond cable trays to power source for cables contained within with bonding conductors sized according to NFPA 70, Article 250.122, "Size of Equipment Grounding Conductors."

3.3 CABLE INSTALLATION

A. Install cables only when each cable tray run has been completed and inspected.

B. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

C. Fasten cables on vertical runs to cable trays every 18 inches.

D. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches.

E. Tie MI cables down every 36 inches where required to provide a 2-hour fire rating and every 72 inches elsewhere.

F. In existing construction, remove inactive or dead cables from cable trays.

3.4 CONNECTIONS

A. Remove paint from all connection points before making connections. Repair paint after the connections are completed.

B. Connect pathways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
3. Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by NFPA 70. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.
4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
7. Check for improperly sized or installed bonding jumpers.
8. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
9. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

B. Prepare test and inspection reports.

3.6 PROTECTION

A. Protect installed cable trays and cables.

1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION 16136

SECTION 16140 - WIRING DEVICES

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. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Tamper-resistant receptacles.
3. Weather-resistant receptacles.
4. Solid-state fan speed controls.
5. Wall-switch and exterior occupancy sensors.
6. Communications outlets.
7. Pendant cord-connector devices.
8. Cord and plug sets.
9. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Service/Power Poles: One for every 20, but no fewer than one.
2. Floor Service-Outlet Assemblies: One for every 20, but no fewer than one.
3. Poke-Through, Fire-Rated Closure Plugs: One for every ten floor service outlets installed, but no fewer than two.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596. Commercial Specification Grade.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; 5351 (single), CR5362 (duplex).
b. Hubbell; HBL5351 (single), HBL5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through and non-feed-through type. Commercial Specification Grade.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; VGF20.
b. Hubbell; GFR5352L.
c. Pass & Seymour; 2095.
d. Leviton; 7590.

2.5 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.6 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.7 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A, Commercial Specification Grade:

1. Products: Subject to compliance with requirements, that may be incorporated into the Work include, but are not limited to, the following:

1) Single Pole:

2) Cooper; AH1221.
3) Hubbell; HBL1221.
4) Leviton; 1221-2.
5) Pass & Seymour; CSB20AC1.

6) Two Pole:

7) Cooper; AH1222.
8) Hubbell; HBL1222.
9) Leviton; 1222-2.
10) Pass & Seymour; CSB20AC2.

11) Three Way:

12) Cooper; AH1223.
13) Hubbell; HBL1223.
14) Leviton; 1223-2.
15) Pass & Seymour; CSB20AC3.

16) Four Way:

17) Cooper; AH1224.
18) Hubbell; HBL1224.
19) Leviton; 1224-2.
20) Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; AH1221PL for 120 and 277 V.
b. Hubbell; HBL1201PL for 120 and 277 V.
c. Leviton; 1221-LH1.
d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Key-Operated Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; AH1221L.
b. Hubbell; HBL1221L.
c. Leviton; 1221-2L.
d. Pass & Seymour; PS20AC1-L.

2. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Dimmers. Provide toggle switch type with slider dimmer. Provide with 120V, 1500VA rating for LED or incandescent lamps.

F. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; 1995L.
b. Hubbell; HBL1557L.
c. Leviton; 1257L.
d. Pass & Seymour; 1251L.

2.8 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch-thick, satin-finished, Type 302 stainless steel
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant die-cast aluminum with lockable cover.

2.9 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

B. Wall Plate Color: No plastic covers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.

2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 16075 "Electrical Identification."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Test straight-blade for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.

D. Wiring device will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 16140

SECTION 16264 - STATIC UNINTERRUPTIBLE POWER SUPPLY

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. Section Includes:

1. Three-phase, on-line, double-conversion, static-type, UPS units with the following features:

a. Surge suppression.
b. Input harmonics reduction.
c. Rectifier-charger.
d. Inverter.
e. Static bypass transfer switch.
f. Battery and battery disconnect device.
g. Internal maintenance bypass/isolation switch.
h. Output isolation transformer.
i. Remote UPS monitoring provisions.
j. Battery monitoring.
k. Remote monitoring.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. LCD: Liquid-crystal display.

C. LED: Light-emitting diode.

D. PC: Personal computer.

E. THD: Total harmonic distortion.

F. UPS: Uninterruptible power supply.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include data on features, components, ratings, and performance.

B. Shop Drawings: For UPS. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, components, and location and identification of each field connection. Show access, workspace, and clearance requirements; details of control panels; and battery arrangement.
2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates: For each product, from manufacturer.

B. Factory Test Reports: Comply with specified requirements.

C. Field quality-control reports.

D. Performance Test Reports: Indicate test results compared with specified performance requirements, and provide justification and resolution of differences if values do not agree.

E. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For UPS units to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One for every 20 of each type and rating, but no fewer than one of each.
2. Cabinet Ventilation Filters: One complete set(s).

1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Listed and labeled under UL 1778 by an NRTL.

C. NFPA Compliance: Mark UPS components as suitable for installation in computer rooms according to NFPA 75.

1.9 WARRANTY

A. Special Battery Warranties: Specified form in which manufacturer and Installer agree to repair or replace UPS system storage batteries that fail in materials or workmanship within specified warranty period.

1. Warranted Cycle Life for Valve-Regulated, Lead-Calcium Batteries: Equal to or greater than that represented in manufacturer's published table, including figures corresponding to the following, based on annual average battery temperature of 77 deg F:

Discharge Rate	Discharge Duration	Discharge End Voltage	Cycle Life
8 hours	8 hours	1.67	6 cycles
30 minutes	30 minutes	1.67	20 cycles
15 minutes	45 seconds	1.67	120 cycles

2. Warranted Cycle Life for Premium Valve-Regulated, Lead-calcium Batteries: Equal to or greater than that represented in manufacturer's published table, including figures corresponding to the following, based on annual average battery temperature of 77 deg F:

Discharge Rate	Discharge Duration	Discharge End Voltage	Cycle Life
8 hours	8 hours	1.67	40 cycles
30 minutes	30 minutes	1.67	125 cycles
15 minutes	1.5 minutes	1.67	750 cycles

3. Warranted Cycle Life for Flooded Batteries: Equal to or greater than that represented in manufacturer's published table, including figures corresponding to the following, based on annual average battery temperature of 77 deg F:

Discharge Rate	Discharge Duration	Discharge End Voltage	Cycle Life
8 hours	8 hours	1.75	40 cycles
1 hour	1 hour	1.75	80 cycles
15 minutes	45 seconds	1.67	2700 cycles

PART 2 - PRODUCTS

2.1 OPERATIONAL REQUIREMENTS

A. Automatic operation includes the following:

1. Normal Conditions: Load is supplied with power flowing from the normal power input terminals, through the rectifier-charger and inverter, with the battery connected in parallel with the rectifier-charger output.
2. Abnormal Supply Conditions: If normal supply deviates from specified and adjustable voltage, voltage waveform, or frequency limits, the battery supplies energy to maintain constant, regulated inverter power output to the load without switching or disturbance.
3. If normal power fails, energy supplied by the battery through the inverter continues supply-regulated power to the load without switching or disturbance.
4. When power is restored at the normal supply terminals of the system, controls automatically synchronize the inverter with the external source before transferring the load. The rectifier-charger then supplies power to the load through the inverter and simultaneously recharges the battery.
5. If the battery becomes discharged and normal supply is available, the rectifier-charger charges the battery. On reaching full charge, the rectifier-charger automatically shifts to float-charge mode.
6. If any element of the UPS system fails and power is available at the normal supply terminals of the system, the static bypass transfer switch switches the load to the normal ac supply circuit without disturbance or interruption.
7. If a fault occurs in the system supplied by the UPS, and current flows in excess of the overload rating of the UPS system, the static bypass transfer switch operates to bypass the fault current to the normal ac supply circuit for fault clearing.
8. When the fault has cleared, the static bypass transfer switch returns the load to the UPS system.
9. If the battery is disconnected, the UPS continues to supply power to the load with no degradation of its regulation of voltage and frequency of the output bus.

B. Manual operation includes the following:

1. Turning the inverter off causes the static bypass transfer switch to transfer the load directly to the normal ac supply circuit without disturbance or interruption.
2. Turning the inverter on causes the static bypass transfer switch to transfer the load to the inverter.

C. Maintenance Bypass/Isolation Switch Operation: Switch is interlocked so it cannot be operated unless the static bypass transfer switch is in the bypass mode. Device provides manual selection among the three conditions in subparagraphs below without interrupting supply to the load during switching:

1. Full Isolation: Load is supplied, bypassing the UPS. Normal UPS ac input circuit, static bypass transfer switch, and UPS load terminals are completely disconnected from external circuits.
2. Maintenance Bypass: Load is supplied, bypassing the UPS. UPS ac supply terminals are energized to permit operational checking, but system load terminals are isolated from the load.
3. Normal: Normal UPS ac supply terminals are energized and the load is supplied through either the static bypass transfer switch and the UPS rectifier-charger and inverter, or the battery and the inverter.

D. Environmental Conditions: The UPS shall be capable of operating continuously in the following environmental conditions without mechanical or electrical damage or degradation of operating capability, except battery performance.

1. Ambient Temperature for Electronic Components: 32 to 104 deg F.
2. Ambient Temperature for Battery: 41 to 95 deg F.
3. Relative Humidity: 0 to 95 percent, noncondensing.
4. Altitude: Sea level to 4000 feet.

2.2 PERFORMANCE REQUIREMENTS

A. The UPS shall perform as specified in this article while supplying rated full-load current, composed of any combination of linear and nonlinear load, up to 100 percent nonlinear load with a load crest factor of 3.0, under the following conditions or combinations of the following conditions:

1. Inverter is switched to battery source.
2. Steady-state ac input voltage deviates up to plus or minus 10 percent from nominal voltage.
3. Steady-state input frequency deviates up to plus or minus 5 percent from nominal frequency.
4. THD of input voltage is 15 percent or more with a minimum crest factor of 3.0, and the largest single harmonic component is a minimum of 5 percent of the fundamental value.
5. Load is 50 percent unbalanced continuously.

B. Minimum Duration of Supply: If battery is sole energy source supplying rated full UPS load current at 80 percent power factor, duration of supply is 15 minutes.

C. Input Voltage Tolerance: System steady-state and transient output performance remains within specified tolerances when steady-state ac input voltage varies plus 10, minus 15 percent from nominal voltage.

D. Maximum Energizing Inrush Current: Six times the full-load current.

E. Maximum AC Output-Voltage Regulation for Loads up to 50 Percent Unbalanced: Plus or minus 2 percent over the full range of battery voltage.

F. Output Frequency: 60 Hz, plus or minus 0.5 percent over the full range of input voltage, load, and battery voltage.

G. Limitation of harmonic distortion of input current to the UPS shall be as follows:

1. Description: Either a tuned harmonic filter or an arrangement of rectifier-charger circuits shall limit THD to 5 percent, maximum, at rated full UPS load current, for power sources with X/R ratio between 2 and 30.
2. Description: THD is limited to a maximum of 32 percent, at rated full UPS load current, for power sources with X/R ratio between 2 and 30.

H. Maximum Harmonic Content of Output-Voltage Waveform: 5 percent rms total and 3 percent rms for any single harmonic, for 100 percent rated nonlinear load current with a load crest factor of 3.0.

I. Maximum Harmonic Content of Output-Voltage Waveform: 5 percent rms total and 3 percent rms for any single harmonic, for rated full load with THD up to 50 percent, with a load crest factor of 3.0.

J. Minimum Overload Capacity of UPS at Rated Voltage: 125 percent of rated full load for 10 minutes, and 150 percent for 30 seconds in all operating modes.

K. Maximum Output-Voltage Transient Excursions from Rated Value: For the following instantaneous load changes, stated as percentages of rated full UPS load, voltage shall remain within stated percentages of rated value and recover to, and remain within, plus or minus 2 percent of that value within 100 ms:

1. 50 Percent: Plus or minus 5 percent.
2. 100 Percent: Plus or minus 5 percent.
3. Loss of AC Input Power: Plus or minus 1 percent.
4. Restoration of AC Input Power: Plus or minus 1 percent.

L. Input Power Factor: A minimum of 0.85 lagging when supply voltage and current are at nominal rated values and the UPS is supplying rated full-load current.

M. EMI Emissions: Comply with FCC Rules and Regulations and with 47 CFR 15 for Class A equipment.

2.3 UPS SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Liebert GTX 6 series or comparable product by:
1. Liebert Corporation; a division of Emerson.

B. Electronic Equipment: Solid-state devices using hermetically sealed, semiconductor elements. Devices include rectifier-charger, inverter, static bypass transfer switch, and system controls.

C. Enclosures: Comply with NEMA 250, Type 1, unless otherwise indicated.

D. Control Assemblies: Mount on modular plug-ins, readily accessible for maintenance.

E. Surge Suppression: Protect internal UPS components from surges that enter at each ac power input connection including main disconnect switch, static bypass transfer switch**,** and maintenance bypass/isolation switch. Protect rectifier-charger, inverter, controls, and output components.

1. Use factory-installed surge suppressors tested according to IEEE C62.41.1 and IEEE C62.41.2, Category B.
2. Additional Surge Protection: Protect internal UPS components from low-frequency, high-energy voltage surges described in IEEE C62.41.1 and IEEE C62.41.2. Design the

circuits connecting with external power sources and select circuit elements, conductors, conventional surge suppressors, and rectifier components and controls so input assemblies will have adequate mechanical strength and thermal and current-carrying capacity to withstand stresses imposed by 40-Hz, 180 percent voltage surges described in IEEE C62.41.1 and IEEE C62.41.2.

F. Maintainability Features: Mount rectifier-charger and inverter sections and the static bypass transfer switch on modular plug-ins, readily accessible for maintenance.

G. Capacity Upgrade Capability: Arrange wiring, controls, and modular component plug-in provisions to permit future 25 percent increase in UPS capacity.

H. Seismic-Restraint Design: UPS assemblies, subassemblies, and components (and fastenings and supports, mounting, and anchorage devices for them) shall be designed and fabricated to withstand static and seismic forces.

I. UPS Cabinet Ventilation: Redundant fans or blowers draw in ambient air near the bottom of cabinet and discharge it near the top rear.

J. Output Circuit Neutral Bus, Conductor, and Terminal Ampacity: Rated phase current times a multiple of 1.73, minimum.

2.4 RECTIFIER-CHARGER

A. Capacity: Adequate to supply the inverter during rated full output load conditions and simultaneously recharge the battery from fully discharged condition to 95 percent of full charge within 10 times the rated discharge time for duration of supply under battery power at full load.

B. Output Ripple: Limited by output filtration to less than 0.5 percent of rated current, peak to peak.

C. Control Circuits: Immune to frequency variations within rated frequency ranges of normal and emergency power sources.

1. Response Time: Field adjustable for maximum compatibility with local generator-set power source.

D. Battery Float-Charging Conditions: Comply with battery manufacturer's written instructions for battery terminal voltage and charging current required for maximum battery life.

2.5 INVERTER

A. Description: Pulse-width modulated, with sinusoidal output.

B. Description: Pulse-width modulated, with sinusoidal output. Include a bypass phase synchronization window adjustment to optimize compatibility with local engine-generator-set power source.

2.6 STATIC BYPASS TRANSFER SWITCH

A. Description: Solid-state switching device providing uninterrupted transfer. A contactor or electrically operated circuit breaker automatically provides electrical isolation for the switch.

B. Switch Rating: Continuous duty at the rated full UPS load current, minimum.

2.7 BATTERY

A. Description: Valve-regulated, premium, heavy-duty, recombinant, lead-calcium units; factory assembled in an isolated compartment or in a separate matching cabinet, complete with battery disconnect switch.

B. 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. C&D Technologies, Inc.; Standby Power Division.
2. Eaton Corporation; Powerware Division.
3. EnerSys.
4. Panasonic Corporation of North America; Panasonic Industrial Company.

C. Seismic-Restraint Design: Battery racks, cabinets, assemblies, subassemblies, and components (and fastenings and supports, mounting, and anchorage devices for them) shall be designed and fabricated to withstand static and seismic forces.

D. Provide sufficient battery capacity to operate UPS at 2 hours at rated capacity.

2.8 CONTROLS AND INDICATIONS

A. Description: Group displays, indications, and basic system controls on a common control panel on front of UPS enclosure.

B. Minimum displays, indicating devices, and controls include those in lists below. Provide sensors, transducers, terminals, relays, and wiring required to support listed items. Alarms include audible signals and visual displays.

C. Dry-form "C" contacts shall be available for remote indication of the following conditions:

1. UPS on battery.
2. UPS on-line.
3. UPS load-on bypass.
4. UPS in alarm condition.
5. UPS off (maintenance bypass closed).

D. Emergency Power Off Switch: Capable of local operation and operation by means of activation by external dry contacts.

2.9 MAINTENANCE BYPASS/ISOLATION SWITCH

A. Description: Manually operated switch or arrangement of switching devices with mechanically actuated contact mechanism arranged to route the flow of power to the load around the rectifier-charger, inverter, and static bypass transfer switch.

1. Switch shall be electrically and mechanically interlocked to prevent interrupting power to the load when switching to bypass mode.
2. Switch shall electrically isolate other UPS components to permit safe servicing.

B. Comply with NEMA PB 2 and UL 891.

C. Switch Rating: Continuous duty at rated full UPS load current.

D. Mounting Provisions: Internal to system cabinet.

E. Key interlock requires unlocking maintenance bypass/isolation switch before switching from normal position with key that is released only when the UPS is bypassed by the static bypass transfer switch. Lock is designed specifically for mechanical and electrical component interlocking.

2.10 OUTPUT ISOLATION TRANSFORMER

A. Description: Unit with low forward transfer impedance up to 3 kHz, minimum. Include the following features:

1. Comply with applicable portions of UL 1561, including requirements for nonlinear load current-handling capability for a K-factor of approximately 13.
2. Output Impedance at Fundamental Frequency: Between 3 and 4 percent.
3. Regulation: 5 percent, maximum, at rated nonlinear load current.
4. Full-Load Efficiency at Rated Nonlinear Load Current: 96 percent, minimum.
5. Electrostatic Shielding of Windings: Independent for each winding.
6. Coil Leads: Physically arranged for minimum interlead capacitance.
7. Shield Grounding Terminal: Separately mounted; labeled "Shield Ground."
8. Capacitive Coupling between Primary and Secondary: 33 picofarads, maximum, over a frequency range of 20 Hz to 1 MHz.

2.11 OUTPUT DISTRIBUTION SECTION

A. Hard wired connection to feed separate panelboard.

2.12 MONITORING BY REMOTE STATUS AND ALARM PANEL

A. Description: Labeled LEDs on panel faceplate indicate five basic status conditions. Audible signal indicates alarm conditions. Silencing switch in face of panel silences signal without altering visual indication.

1. Cabinet and Faceplate: Surface or flush mounted to suit mounting conditions indicated.

2.13 MONITORING BY REMOTE COMPUTER

A. Description: Communication module in unit control panel provides capability for remote monitoring of status, parameters, and alarms specified in "Controls and Indications" Article. The remote computer and the connecting signal wiring are not included in this Section. Include the following features:

1. RJ45 jack connection to Ethernet connection.
2. Software designed for control and monitoring of UPS functions and to provide on-screen explanations, interpretations, diagnosis, action guidance, and instructions for use of monitoring indications and development of meaningful reports. Permit storage and analysis of power-line transient records. Software shall be windows based for a IBM based PC.

2.14 BASIC BATTERY MONITORING

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Albercorp.
2. BTECH, Inc.
3. Eaton Corporation; Powerware Division.

B. Battery Ground-Fault Detector: Initiates alarm when resistance to ground of positive or negative bus of battery is less than 5000 ohms.

C. Battery compartment smoke/high-temperature detector initiates an alarm when smoke or a temperature greater than 75 deg C occurs within the compartment.

D. Annunciation of Alarms: At UPS control panel.

2.15 BATTERY-CYCLE WARRANTY MONITORING

A. Description: Electronic device, acceptable to battery manufacturer as a basis for warranty action, for monitoring of charge-discharge cycle history of batteries covered by cycle-life warranties.

2.16 SOURCE QUALITY CONTROL

A. Factory test complete UPS system before shipment. Use **actual batteries that are part of final installation**. Include the following:

1. Test and demonstration of all functions, controls, indicators, sensors, and protective devices.
2. Full-load test.
3. Transient-load response test.
4. Overload test.
5. Power failure test.

B. Observation of Test: Give 14 days' advance notice of tests and provide opportunity for Owner's representative to observe tests at Owner's choice.

C. Report test results. Include the following data:

1. Description of input source and output loads used. Describe actions required to simulate source load variation and various operating conditions and malfunctions.
2. List of indications, parameter values, and system responses considered satisfactory for each test action. Include tabulation of actual observations during test.
3. List of instruments and equipment used in factory tests.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for conditions affecting performance of the UPS.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Equipment Mounting: Install UPS on concrete base. Comply with requirements for concrete base specified in Section 03300 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

C. Connections: Interconnect system components. Make connections to supply and load circuits according to manufacturer's wiring diagrams unless otherwise indicated.

3.3 GROUNDING

A. Separately Derived Systems: If not part of a listed power supply for a data-processing room, comply with NFPA 70 requirements for connecting to grounding electrodes and for bonding to metallic piping near isolation transformer.

3.4 IDENTIFICATION

A. Identify components and wiring according to Section 16075 "Electrical Identification."

1. Identify each battery cell individually.

3.5 BATTERY EQUALIZATION

A. Equalize charging of battery cells according to manufacturer's written instructions. Record individual-cell voltages.

3.6 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Comply with manufacturer's written instructions.
2. Inspect interiors of enclosures, including the following:

    a. Integrity of mechanical and electrical connections.
    b. Component type and labeling verification.
    c. Ratings of installed components.

3. Inspect batteries and chargers according to requirements in NETA Acceptance Testing Specifications.
4. Test manual and automatic operational features and system protective and alarm functions.
5. Test communication of status and alarms to remote monitoring equipment.
6. Load the system using a variable-load bank to simulate kilovolt amperes, kilowatts, and power factor of loads for unit's rating. Use instruments calibrated within the previous 24 months according to NIST standards.

    a. Simulate malfunctions to verify protective device operation.
    b. Test duration of supply on emergency, low-battery voltage shutdown, and transfers and restoration due to normal source failure.
    c. Test harmonic content of input and output current less than 25, 50, and 100 percent of rated loads.
    d. Test output voltage under specified transient-load conditions.
    e. Test efficiency at 50, 75, and 100 percent of rated loads.
    f. Test remote status and alarm panel functions.
    g. Test battery-monitoring system functions.

B. Seismic-restraint tests and inspections shall include the following:

1. Inspect type, size, quantity, arrangement, and proper installation of mounting or anchorage devices.
2. Test mounting and anchorage devices according to requirements in Section 16074 "Vibration and Seismic Controls for Electrical Systems."

C. The UPS system will be considered defective if it does not pass tests and inspections.

D. Record of Tests and Inspections: Maintain and submit documentation of tests and inspections, including references to manufacturers' written instructions and other test and inspection criteria. Include results of tests, inspections, and retests.

E. Prepare test and inspection reports.

3.7 PERFORMANCE TESTING

A. Monitoring and Testing Schedule: Perform monitoring and testing in a single 10-day period.

1. Schedule monitoring and testing activity with Owner, through Architect, with at least 14 days' advance notice.
2. Schedule monitoring and testing after Substantial Completion, when the UPS is supplying power to its intended load.

B. Monitoring and Testing Instruments: Three-phase, recording, power monitors. Instruments shall provide continuous simultaneous monitoring of electrical parameters at UPS input terminals and at input terminals of loads served by the UPS. Instruments shall monitor, measure, and graph voltage current and frequency simultaneously and provide full-graphic recordings of the values of those parameters before and during power-line disturbances that cause the values to deviate from normal beyond the adjustable threshold values. Instruments shall be capable of recording either on paper or on magnetic media and have a minimum accuracy of plus or minus 2 percent for electrical parameters. Parameters to be monitored include the following:

1. Current: Each phase and neutral and grounding conductors.
2. Voltage: Phase to phase, phase to neutral, phase to ground, and neutral to ground.
3. Frequency transients.
4. Voltage swells and sags.
5. Voltage Impulses: Phase to phase, phase to neutral, phase to ground, and neutral to ground.
6. High-frequency noise.
7. Radio-frequency interference.
8. THD of the above currents and voltages.
9. Harmonic content of currents and voltages above.

C. Monitoring and Testing Procedures:

1. Exploratory Period: For the first two days, make recordings at various circuit locations and with various parameter-threshold and sampling-interval settings. Make these

measurements with the objective of identifying optimum UPS, power system, load, and instrumentation setup conditions for subsequent test and monitoring operations.

2. Remainder of Test Period: Perform continuous monitoring of at least two circuit locations selected on the basis of data obtained during exploratory period.

    a. Set thresholds and sampling intervals for recording data at values selected to optimize data on performance of the UPS for values indicated, and to highlight the need to adjust, repair, or modify the UPS, distribution system, or load component that may influence its performance or that may require better power quality.
    b. Operate the UPS and its loads in each mode of operation permitted by UPS controls and by the power distribution system design.
    c. Using temporarily connected resistive/inductive load banks, create and simulate unusual operating conditions, including outages, voltage swells and sags, and voltage, current, and frequency transients. Maintain normal operating loads in operation on system to maximum extent possible during tests.
    d. Make adjustments and repairs to UPS, distribution, and load equipment to correct deficiencies disclosed by monitoring and testing and repeat appropriate monitoring and testing to verify success of corrective action.

D. Coordination with Specified UPS Monitoring Functions: Obtain printouts of built-in monitoring functions specified for the UPS and its components in this Section that are simultaneously recorded with portable instruments in this article.

1. Provide the temporary use of an appropriate PC and printer equipped with required connections and software for recording and printing if such units are not available on-site.
2. Coordinate printouts with recordings for monitoring performed according to this article, and resolve and report any anomalies in and discrepancies between the two sets of records.

E. Monitoring and Testing Assistance by Contractor:

1. Open UPS and electrical distribution and load equipment and wiring enclosures to make monitoring and testing points accessible for temporary monitoring probe and sensor placement and removal as requested.
2. Observe monitoring and testing operations; ensure that UPS and distribution and load equipment warranties are not compromised.
3. Perform switching and control of various UPS units, electrical distribution systems, and load components as directed by power quality specialist. Specialist shall design this portion of monitoring and testing operations to expose the UPS to various operating environments, conditions, and events while response is observed, electrical parameters are monitored, and system and equipment deficiencies are identified.
4. Make repairs and adjustments to the UPS and to electrical distribution system and load components, and retest and repeat monitoring as needed to verify validity of results and correction of deficiencies.
5. Engage the services of the UPS manufacturer's factory-authorized service representative periodically during performance testing operations for repairs, adjustments, and consultations.

F. Documentation: Record test point and sensor locations, instrument settings, and circuit and load conditions for each monitoring summary and power disturbance recording. Coordinate simultaneous recordings made on UPS input and load circuits.

G. Analysis of Recorded Data and Report: Review and analyze test observations and recorded data and submit a detailed written report. Include the following in report:

1. Description of corrective actions performed during monitoring and survey work and their results.
2. Recommendations for further action to provide optimum performance by the UPS and appropriate power quality for non-UPS loads. Include a statement of priority ranking and a cost estimate for each recommendation that involves system or equipment revisions.
3. Copies of monitoring summary graphics and graphics illustrating harmonic content of significant voltages and currents.
4. Copies of graphics of power disturbance recordings that illustrate findings, conclusions, and recommendations.
5. Recommendations for operating, adjusting, or revising UPS controls.
6. Recommendation for alterations to the UPS installation.
7. Recommendations for adjusting or revising generator-set or automatic transfer switch installations or their controls.
8. Recommendations for power distribution system revisions.
9. Recommendations for adjusting or revising electrical loads, their connections, or controls.

H. Interim and Final Reports: Provide an interim report at the end of each test period and a final comprehensive report at the end of final test and analysis period.

3.8 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain the UPS.

END OF SECTION 16264

SECTION 16269 - VARIABLE FREQUENCY CONTROLLERS

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. Section includes separately enclosed, pre-assembled, combination VFCs, rated 600 V and less, for speed control of three-phase, squirrel-cage induction motors.

1.3 DEFINITIONS

A. BAS: Building automation system.

B. CE: Conformite Europeene (European Compliance).

C. CPT: Control power transformer.

D. EMI: Electromagnetic interference.

E. IGBT: Insulated-gate bipolar transistor.

F. LAN: Local area network.

G. LED: Light-emitting diode.

H. MCP: Motor-circuit protector.

I. NC: Normally closed.

J. NO: Normally open.

K. OCPD: Overcurrent protective device.

L. PCC: Point of common coupling.

M. PID: Control action, proportional plus integral plus derivative.

N. PWM: Pulse-width modulated.

O. RFI: Radio-frequency interference.

P. TDD: Total demand (harmonic current) distortion.

Q. THD(V): Total harmonic voltage demand.

R. VFC: Variable-frequency motor controller.

1.4 ACTION SUBMITTALS

A. Product Data: For each type and rating of VFC indicated. Include features, performance, electrical ratings, operating characteristics, shipping and operating weights, and furnished specialties and accessories.

B. LEED Submittals:

1. Product Data for Credit EA 5: For continuous metering equipment for energy consumption.

C. Shop Drawings: For each VFC indicated. Include dimensioned plans, elevations, and sections; and conduit entry locations and sizes, mounting arrangements, and details, including required clearances and service space around equipment.

1. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Each installed unit's type and details.
b. Factory-installed devices.
c. Enclosure types and details.
d. Nameplate legends.
e. Short-circuit current (withstand) rating of enclosed unit.
f. Features, characteristics, ratings, and factory settings of each VFC and installed devices.
g. Specified modifications.

2. Schematic and Connection Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around VFCs. Show VFC layout and relationships between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

B. Qualification Data: For qualified testing agency.

C. Seismic Qualification Certificates: For VFCs, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based, and their installation requirements.

D. Product Certificates: For each VFC, from manufacturer.

E. Harmonic Analysis Study and Report: Comply with IEEE 399 and NETA Acceptance Testing Specification; identify the effects of nonlinear loads and their associated harmonic contributions on the voltages and currents throughout the electrical system. Analyze possible operating scenarios, including recommendations for VFC input filtering to limit TDD and THD(V) at each VFC to specified levels.

F. Source quality-control reports.

G. Field quality-control reports.

H. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate, full-load currents.

I. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that switch settings for motor-running overload protection suit actual motors to be protected.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For VFCs to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01782 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting thermal-magnetic circuit breaker and MCP trip settings.
2. Manufacturer's written instructions for setting field-adjustable overload relays.
3. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor control modules.
4. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Indicating Lights: Two of each type and color installed.

4. Auxiliary Contacts: Furnish one spare(s) for each size and type of magnetic controller installed.
5. Power Contacts: Furnish three spares for each size and type of magnetic contactor installed.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

A. If stored in space that is not permanently enclosed and air conditioned, remove loose packing and flammable materials from inside controllers and install temporary electric heating, with at least 250 W per controller.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation, capable of driving full load without derating, under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than 14 deg F and not exceeding 104 deg F.
2. Ambient Storage Temperature: Not less than minus 4 deg F and not exceeding 140 deg F
3. Humidity: Less than 95 percent (noncondensing).
4. Altitude: Not exceeding 3300 feet.

B. Interruption of Existing Electrical Systems: Do not interrupt electrical systems in facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify **Owner** no fewer than **two** days in advance of proposed interruption of electrical systems.
2. Indicate method of providing temporary electrical service.
3. Do not proceed with interruption of electrical systems without **Owner's** written permission.
4. Comply with NFPA 70E.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFCs, including clearances between VFCs, and adjacent surfaces and other items.

1.11 COORDINATION

A. Coordinate features of motors, load characteristics, installed units, and accessory devices to be compatible with the following:

1. Torque, speed, and horsepower requirements of the load.
2. Ratings and characteristics of supply circuit and required control sequence.
3. Ambient and environmental conditions of installation location.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace VFCs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by:
1. Siemens Energy & Automation, Inc.

B. General Requirements for VFCs: Comply with NEMA ICS 7, NEMA ICS 61800-2, and UL 508C.

C. Applications: Constant torque and variable torque.

D. VFC Description: Variable-frequency power converter (rectifier, dc bus, and IGBT, PWM inverter) factory packaged in an enclosure, with integral disconnecting means and overcurrent and overload protection; listed and labeled by an NRTL as a complete unit; arranged to provide self-protection, protection, and variable-speed control of one or more three-phase induction motors by adjusting output voltage and frequency.

1. Units suitable for operation of NEMA MG 1, Design A and Design B motors as defined by NEMA MG 1, Section IV, Part 30, "Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both."
2. Units suitable for operation of inverter-duty motors as defined by NEMA MG 1, Section IV, Part 31, "Definite-Purpose Inverter-Fed Polyphase Motors."

3. Listed and labeled for integrated short-circuit current (withstand) rating by an NRTL acceptable to authorities having jurisdiction.

E. Design and Rating: Match load type, such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

F. Output Rating: Three-phase; 10 to 60 Hz, with voltage proportional to frequency throughout voltage range; maximum voltage equals input voltage.

G. Unit Operating Requirements:

1. Input AC Voltage Tolerance: Plus 10 and minus 10 percent of VFC input voltage rating.
2. Input AC Voltage Unbalance: Not exceeding 3 percent.
3. Input Frequency Tolerance: Plus or minus 3 percent of VFC frequency rating.
4. Minimum Efficiency: 96 percent at 60 Hz, full load.
5. Minimum Displacement Primary-Side Power Factor: 96 percent under any load or speed condition.
6. Minimum Short-Circuit Current (Withstand) Rating: 10kA.
7. Ambient Temperature Rating: Not less than 14 deg F and not exceeding 104 deg F.
8. Ambient Storage Temperature Rating: Not less than minus 4 deg F and not exceeding 140 deg F.
9. Humidity Rating: Less than 95 percent (noncondensing).
10. Altitude Rating: Not exceeding 3300 feet.
11. Vibration Withstand: Comply with IEC 60068-2-6.
12. Overload Capability: 1.1 times the base load current for 60 seconds; minimum of 1.8 times the base load current for three seconds.
13. Starting Torque: Minimum 100 percent of rated torque from 3 to 60 Hz.
14. Speed Regulation: Plus or minus 5 percent.
15. Output Carrier Frequency: Selectable; 0.5 to 15 kHz.
16. Stop Modes: Programmable; includes fast, free-wheel, and dc injection braking.

H. Inverter Logic: Microprocessor based, 16 bit, isolated from all power circuits.

I. Isolated Control Interface: Allows VFCs to follow remote-control signal over a minimum 40:1 speed range.

1. Signal: Electrical.
2. Signal: Pneumatic.

J. Internal Adjustability Capabilities:

1. Minimum Speed: 5 to 25 percent of maximum rpm.
2. Maximum Speed: 80 to 100 percent of maximum rpm.
3. Acceleration: [0.1 to 999.9] seconds.
4. Deceleration: [0.1 to 999.9] seconds.
5. Current Limit: 30 to minimum of 150 percent of maximum rating.

K. Self-Protection and Reliability Features:

1. Input transient protection by means of surge suppressors to provide three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.
2. Loss of Input Signal Protection: Selectable response strategy, including speed default to a percent of the most recent speed, a preset speed, or stop; with alarm.
3. Under- and overvoltage trips.
4. Inverter overcurrent trips.
5. VFC and Motor Overload/Overtemperature Protection: Microprocessor-based thermal protection system for monitoring VFCs and motor thermal characteristics, and for providing VFC overtemperature and motor overload alarm and trip; settings selectable via the keypad; NRTL approved.
6. Critical frequency rejection, with three selectable, adjustable deadbands.
7. Instantaneous line-to-line and line-to-ground overcurrent trips.
8. Loss-of-phase protection.
9. Reverse-phase protection.
10. Short-circuit protection.
11. Motor overtemperature fault.

L. Automatic Reset/Restart: Attempt three restarts after drive fault or on return of power after an interruption and before shutting down for manual reset or fault correction; adjustable delay time between restart attempts.

M. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped, unless "Bidirectional Autospeed Search" feature is available and engaged.

N. Bidirectional Autospeed Search: Capable of starting VFC into rotating loads spinning in either direction and returning motor to set speed in proper direction, without causing damage to drive, motor, or load.

O. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

P. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

Q. Integral Input Disconnecting Means and OCPD: NEMA AB 1, thermal-magnetic circuit breaker with pad-lockable, door-mounted handle mechanism.

1. Disconnect Rating: Not less than 115 percent of VFC input current rating.
2. Disconnect Rating: Not less than 115 percent of NFPA 70 motor full-load current rating or VFC input current rating, whichever is larger.
3. Auxiliary Contacts: NO/NC, arranged to activate before switch blades open.
4. Auxiliary contacts "a" and "b" arranged to activate with circuit-breaker handle.
5. NO alarm contact that operates only when circuit breaker has tripped.

2.2 CONTROLS AND INDICATION

A. Status Lights: Door-mounted LED indicators displaying the following conditions:

1. Power on.
2. Run.
3. Overvoltage.
4. Line fault.
5. Overcurrent.
6. External fault.

B. Panel-Mounted Operator Station: Manufacturer's standard front-accessible, sealed keypad and plain-English language digital display; allows complete programming, program copying, operating, monitoring, and diagnostic capability.

1. Keypad: In addition to required programming and control keys, include keys for HAND, OFF, and AUTO modes.
2. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: View only; view and operate; and view, operate, and service.

a. Control Authority: Supports at least four conditions: Off, local manual control at VFC, local automatic control at VFC, and automatic control through a remote source.

C. Historical Logging Information and Displays:

1. Real-time clock with current time and date.
2. Running log of total power versus time.
3. Total run time.
4. Fault log, maintaining last four faults with time and date stamp for each.

D. Indicating Devices: Digital display mounted flush in VFC door and connected to display VFC parameters including, but not limited to:

1. Output frequency (Hz).
2. Motor speed (rpm).
3. Motor status (running, stop, fault).
4. Motor current (amperes).
5. Motor torque (percent).
6. Fault or alarming status (code).
7. PID feedback signal (percent).
8. DC-link voltage (V dc).
9. Set point frequency (Hz).
10. Motor output voltage (V ac).

E. Control Signal Interfaces:

1. Electric Input Signal Interface:

a. A minimum of two programmable analog inputs: 4- to 20-mA dc.
b. A minimum of six multifunction programmable digital inputs.

2. Pneumatic Input Signal Interface: 3 to 15 psig.
3. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the BAS or other control systems:

a. 0- to 10-V dc.
b. 4- to 20-mA dc.
c. Potentiometer using up/down digital inputs.
d. Fixed frequencies using digital inputs.

4. Output Signal Interface: A minimum of one programmable analog output signal (4- to 20-mA dc), which can be configured for any of the following:

a. Output frequency (Hz).
b. Output current (load).
c. DC-link voltage (V dc).
d. Motor torque (percent).
e. Motor speed (rpm).
f. Set point frequency (Hz).

5. Remote Indication Interface: A minimum of two programmable dry-circuit relay outputs (120-V ac, 1 A) for remote indication of the following:

a. Motor running.
b. Set point speed reached.
c. Fault and warning indication (overtemperature or overcurrent).
d. PID high- or low-speed limits reached.

F. PID Control Interface: Provides closed-loop set point, differential feedback control in response to dual feedback signals. Allows for closed-loop control of fans and pumps for pressure, flow, or temperature regulation.

1. Number of Loops: One.

G. BAS Interface: Factory-installed hardware and software to enable the BAS to monitor, control, and display VFC status and alarms[and energy usage]. Allows VFC to be used with an external system within a multidrop LAN configuration; settings retained within VFC's nonvolatile memory.

1. Network Communications Ports: Ethernet.
2. Embedded BAS Protocols for Network Communications: Siemens System 600 APOGEE protocols accessible via the communications ports.

2.3 LINE CONDITIONING AND FILTERING

A. Input Line Conditioning: Based on the harmonic analysis study and report, provide input filtering, as required, to limit TDD at input terminals of all VFCs to less than 5 percent and THD(V) to 5 percent.

B. Input Line Conditioning: Based on the harmonic analysis study and report, provide input filtering, as required, to limit TDD and THD(V) at the defined PCC per IEEE 519.

C. EMI/RFI Filtering: CE marked; certify compliance with IEC 61800-3 for Category C2.

2.4 BYPASS SYSTEMS

A. Bypass Operation: Safely transfers motor between power converter output and bypass circuit, manually, automatically, or both. Selector switches set modes and indicator lights indicate mode selected. Unit is capable of stable operation (starting, stopping, and running) with motor completely disconnected from power converter.

B. Bypass Mode: Manual operation only; requires local operator selection at VFC. Transfer between power converter and bypass contactor and retransfer shall only be allowed with the motor at zero speed.

C. Bypass Mode: Field-selectable automatic or manual, allows local and remote transfer between power converter and bypass contactor and retransfer, either via manual operator interface or automatic control system feedback.

D. Bypass Controller: Two-contactor-style bypass allows motor operation via the power converter or the bypass controller; with input isolating switch and barrier arranged to isolate the power converter and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.

1. Bypass Contactor: Load-break, NEMA-rated contactor.
2. Output Isolating Contactor: Non-load-break, NEMA-rated contactor.
3. Isolating Switch: Non-load-break switch arranged to isolate power converter and permit safe troubleshooting and testing of the power converter, both energized and de-energized, while motor is operating in bypass mode; pad-lockable, door-mounted handle mechanism.

E. Bypass Controller: Three-contactor-style bypass allows motor operation via the power converter or the bypass controller; with input isolating switch and barrier arranged to isolate the power converter input and output and permit safe testing and troubleshooting of the power converter, both energized and de-energized, while motor is operating in bypass mode.

1. Bypass Contactor: Load-break, NEMA-rated contactor.
2. Input and Output Isolating Contactors: Non-load-break, NEMA-rated contactors.
3. Isolating Switch: Non-load-break switch arranged to isolate power converter and permit safe troubleshooting and testing of the power converter, both energized and de-energized, while motor is operating in bypass mode; pad-lockable, door-mounted handle mechanism.

F. Bypass Contactor Configuration: Full-voltage (across-the-line) type.

1. NORMAL/BYPASS selector switch.
2. HAND/OFF/AUTO selector switch.
3. NORMAL/TEST Selector Switch: Allows testing and adjusting of VFC while the motor is running in the bypass mode.
4. Contactor Coils: Pressure-encapsulated type with coil transient suppressors.

    a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.
    b. Power Contacts: Totally enclosed, double break, and silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.

5. Control Circuits: 120-V ac; obtained from integral CPT, with primary and secondary fuses, with CPT of sufficient capacity to operate all integral devices and remotely located pilot, indicating, and control devices.

    a. CPT Spare Capacity: 100 VA.

6. Overload Relays: NEMA ICS 2.

    a. Melting-Alloy Overload Relays:

        1) Inverse-time-current characteristic.
        2) Class 10 tripping characteristic.
        3) Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.

    b. Bimetallic Overload Relays:

        1) Inverse-time-current characteristic.
        2) Class 10 tripping characteristic.
        3) Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
        4) Ambient compensated.
        5) Automatic resetting.

    c. Solid-State Overload Relays:

        1) Switch or dial selectable for motor-running overload protection.
        2) Sensors in each phase.
        3) Class 10/20 selectable tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
        4) Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
        5) Analog communication module.

    d. NO isolated overload alarm contact.
    e. External overload reset push button.

2.5 OPTIONAL FEATURES

A. Multiple-Motor Capability: VFC suitable for variable-speed service to multiple motors. Overload protection shuts down VFC and motors served by it, and generates fault indications, when overload protection activates.

1. Configure to allow two or more motors to operate simultaneously at the same speed; separate overload relay for each controlled motor.
2. Configure to allow two motors to operate separately; operator selectable via local or remote switch or contact closures; single overload relay for both motors; separate output magnetic contactors for each motor.
3. Configure to allow two motors to operate simultaneously and in a lead/lag mode, with one motor operated at variable speed via the power converter and the other at constant speed via the bypass controller; separate overload relay for each controlled motor.

B. Damper control circuit with end of travel feedback capability.

C. Sleep Function: Senses a minimal deviation of a feedback signal and stops the motor. On an increase in speed-command signal deviation, VFC resumes normal operation.

D. Motor Preheat Function: Preheats motor when idle to prevent moisture accumulation in the motor.

E. Firefighter's Override (Smoke Purge) Input: On a remote contact closure from the firefighter's control station, this password-protected input:

1. Overrides all other local and external inputs (analog/digital, serial communication, and all keypad commands).
2. Forces VFC to operate motor, without any other run or speed command, at a field-adjustable, preset speed.
3. Forces VFC to transfer to Bypass Mode and operate motor at full speed.
4. Causes display of Override Mode on the VFC display.
5. Reset VFC to normal operation on removal of override signal automatically.

F. Remote Indicating Circuit Terminals: Mode selection, controller status, and controller fault.

G. Remote digital operator kit.

H. Communication Port: RS-232 port, USB 2.0 port, or equivalent connection capable of connecting a printer and a notebook computer.

2.6 ENCLOSURES

A. VFC Enclosures: NEMA 250, to comply with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: Type 1.
2. Outdoor Locations: Type 4X.
3. Kitchen and Wash-Down Areas: Type 4X stainless steel.
4. Other Wet or Damp Indoor Locations: Type 4.

5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.

B. Plenum Rating: UL 1995; NRTL certification label on enclosure, clearly identifying VFC as "Plenum Rated."

2.7 ACCESSORIES

A. General Requirements for Control-Circuit and Pilot Devices: NEMA ICS 5; factory installed in VFC enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: Heavy-duty, type.

a. Push Buttons: Covered types; maintained.
b. Pilot Lights: LED; push to test.
c. Selector Switches: Rotary type.
d. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.

B. Reversible NC/NO bypass contactor auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

1. Current Transformers: Continuous current rating, basic impulse insulating level (BIL) rating, burden, and accuracy class suitable for connected circuitry. Comply with IEEE C57.13.

E. Supplemental Analog Meters:

1. Elapsed-time meter.
2. Kilowatt meter.
3. Kilowatt-hour meter.

F. Breather and drain assemblies, to maintain interior pressure and release condensation in NEMA 250, Type 4X enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

G. Space heaters, with NC auxiliary contacts, to mitigate condensation in NEMA 250, Type 4X enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

H. Cooling Fan and Exhaust System: For NEMA 250, Type 1; UL 508 component recognized: Supply fan, with stainless steel intake and exhaust grills and filters; **120** -V ac; obtained from integral control power transformer.

I. Sun shields installed on fronts, sides, and tops of enclosures installed outdoors and subject to direct and extended sun exposure.

J. Spare control-wiring terminal blocks; unwired.

2.8 SOURCE QUALITY CONTROL

A. Testing: Test and inspect VFCs according to requirements in NEMA ICS 61800-2.

1. Test each VFC while connected to its specified motor.
2. Verification of Performance: Rate VFCs according to operation of functions and features specified.

B. VFCs will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFCs, with Installer present, for compliance with requirements for installation tolerances, and other conditions affecting performance.

B. Examine VFC before installation. Reject VFCs that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFC installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 HARMONIC ANALYSIS STUDY

A. Perform a harmonic analysis study to identify the effects of nonlinear loads and their associated harmonic contributions on the voltages and currents throughout the electrical system. Analyze possible operating scenarios, including recommendations for VFC input filtering to limit TDD and THD(V) at each VFC to specified levels.

B. Prepare a harmonic analysis study and report complying with IEEE 399 and NETA Acceptance Testing Specification.

3.3 INSTALLATION

A. Coordinate layout and installation of VFCs with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Wall-Mounting Controllers: Install VFCs on walls with tops at uniform height and with disconnect operating handles not higher than 79 inches above finished floor unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not on walls, provide freestanding racks complying with Section 16073 "Hangers and Supports for Electrical Systems."

C. Floor-Mounting Controllers: Install VFCs on 4-inch nominal thickness concrete base. Comply with requirements for concrete base specified in Section 03300 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Roof-Mounting Controllers: Install VFC on roofs with tops at uniform height and with disconnect operating handles not higher than 79 inches (2000 mm) above finished roof surface unless otherwise indicated, and by bolting units to curbs or mounting on freestanding, lightweight, structural-steel channels bolted to curbs. Seal roof penetrations after raceways are installed.

1. Structural-steel channels are specified in Section 16073 "Hangers and Supports for Electrical Systems."

E. Seismic Bracing: Comply with requirements specified in Section 16074 "Vibration and Seismic Controls for Electrical Systems."

F. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

G. Install fuses in each fusible-switch VFC.

H. Install fuses in control circuits if not factory installed. Comply with requirements in Section 16491 "Fuses."

I. Install heaters in thermal-overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

J. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

K. Comply with NECA 1.

3.4 IDENTIFICATION

A. Identify VFCs, components, and control wiring. Comply with requirements for identification specified in Section 16075 "Electrical Identification."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each VFC with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

B. Operating Instructions: Frame printed operating instructions for VFCs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of VFC units.

3.5 CONTROL WIRING INSTALLATION

A. Install wiring between VFCs and remote devices and facility's central-control system. Comply with requirements in Section 16123 "Control-Voltage Electrical Power Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic control devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic control devices that have no safety functions when switches are in manual-control position.
2. Connect selector switches with control circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each VFC element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect VFC, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.

2. Test insulation resistance for each VFC element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at VFC locations are within 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Architect before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each VFC. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each VFC 11 months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. VFCs will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies the VFC and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations made after remedial action.

3.7 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.8 ADJUSTING

A. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable, instantaneous trip elements. Initially adjust to six times the motor nameplate full-load amperes and attempt to start motors several times, allowing for motor cool-down between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Owner before increasing settings.

D. Set the taps on reduced-voltage autotransformer controllers.

E. Set field-adjustable circuit-breaker trip ranges.

F. Set field-adjustable pressure switches.

3.9 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until controllers are ready to be energized and placed into service.

B. Replace VFCs whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.10 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, reprogram, and maintain VFCs.

END OF SECTION 16269

SECTION 16289 - TRANSIENT VOLTAGE SUPPRESSION

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. Section includes field-mounted TVSS for low-voltage (120 to 600 V) power distribution and control equipment.

B. Related Sections:
   1. Section 16442 "Panelboards" for factory-installed TVSS.

1.3 DEFINITIONS

A. ATS: Acceptance Testing Specifications.

B. SVR: Suppressed voltage rating.

C. TVSS: Transient voltage surge suppressor(s), both singular and plural; also, transient voltage surge suppression.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating weights, electrical characteristics, furnished specialties, and accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Certificates: For TVSS devices, from manufacturer.

C. Field quality-control reports.

D. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For TVSS devices to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Replaceable Protection Modules: One of each size and type installed.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.

C. Comply with IEEE C62.41.2 and test devices according to IEEE C62.45.

D. Comply with NEMA LS 1.

E. Comply with UL 1283 and UL 1449.

F. Comply with NFPA 70.

1.9 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed electrical service interruptions.
2. Do not proceed with interruption of electrical service without Owner's written permission.

B. Service Conditions: Rate TVSS devices for continuous operation under the following conditions unless otherwise indicated:

1. Maximum Continuous Operating Voltage: Not less than 115 percent of nominal system operating voltage.
2. Operating Temperature: 30 to 120 deg F.
3. Humidity: 0 to 85 percent, noncondensing.

4. Altitude: Less than 20,000 feet above sea level.

1.10 COORDINATION

A. Coordinate location of field-mounted TVSS devices to allow adequate clearances for maintenance.

B. Coordinate TVSS devices with Section 16215 "Electrical Power Monitoring and Control."

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

B. Special Warranty for Cord-Connected, Plug-in Surge Suppressors: Manufacturer's standard form in which manufacturer agrees to repair or replace electronic equipment connected to circuits protected by surge suppressors.

PART 2 - PRODUCTS

2.1 BRANCH PANEL SUPPRESSORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by:
1. Liebert Corporation; a division of Emerson Network Power.

B. Surge Protection Devices:

1. Non-modular.
2. LED indicator lights for power and protection status.
3. Audible alarm, with silencing switch, to indicate when protection has failed.
4. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

C. Surge Protection Devices:

1. Comply with UL 1449.
2. [Modular design (with field-replaceable modules).
3. Fuses, rated at 200-kA interrupting capacity.
4. Fabrication using bolted compression lugs for internal wiring.
5. Integral disconnect switch.

6. Redundant suppression circuits.
7. Redundant replaceable modules.
8. Arrangement with copper bus bars and for bolted connections to phase buses, neutral bus, and ground bus.
9. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
10. LED indicator lights for power and protection status.
11. Audible alarm, with silencing switch, to indicate when protection has failed.
12. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
13. Four-digit transient-event counter set to totalize transient surges.

D. Peak Single-Impulse Surge Current Rating: 320 kA per mode/640 kA per phase.

E. Minimum single impulse current ratings, using 8-by-20-mic.sec waveform described in IEEE C62.41.2

1. Line to Neutral: 70,000 A.
2. Line to Ground: 70,000A.
3. Neutral to Ground: 50,000 A.

F. Protection modes and UL 1449 SVR for grounded wye circuits with 208Y/120 V, 3-phase, 4-wire circuits shall be as follows:

1. Line to Neutral: 400 V for 208Y/120 V.
2. Line to Ground: 400 V for 208Y/120 V.
3. Neutral to Ground: 400 V for 208Y/120 V.

2.2 ENCLOSURES

A. Indoor Enclosures: NEMA 250 Type 1.

B. Outdoor Enclosures: NEMA 250 Type 4X.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install TVSS devices for panelboards and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

1. Provide multiple, 30-A circuit breaker as a dedicated disconnecting means for TVSS unless otherwise indicated.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.
2. After installing TVSS devices but before electrical circuitry has been energized, test for compliance with requirements.
3. Complete startup checks according to manufacturer's written instructions.

B. TVSS device will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Do not energize or connect panelboards to their sources until TVSS devices are installed and connected.

B. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to maintain TVSS devices.

END OF SECTION 16289

SECTION 16410 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Receptacle switches.
4. Shunt trip switches.
5. Molded-case circuit breakers (MCCBs).
6. Molded-case switches.
7. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Manufacturer's field service report.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. Include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.8 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
2. Altitude: Not exceeding 6600 feet.

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Owner's written permission.
4. Comply with NFPA 70E.

1.10 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by:
1. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
6. Hookstick Handle: Allows use of a hookstick to operate the handle.
7. Lugs: Mechanical type, suitable for number, size, and conductor material.
8. Service-Rated Switches: Labeled for use as service equipment.
9. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

2.2 NONFUSIBLE SWITCHES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by:
1. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical type, suitable for number, size, and conductor material.
7. Accessory Control Power Voltage: Remote mounted and powered; 120-V ac.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by:

1. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I^2t response.

F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

G. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

H. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

I. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

J. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection (if required by Drawing): Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip (if required by Drawing): Trip coil energized from separate circuit, with coil-clearing contact.
6. Undervoltage Trip (if required by Drawing): Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
7. Auxiliary Contacts (if required by Drawing): One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 4X stainless steel.
3. Kitchen and Wash-Down Areas: NEMA 250, Type 4X stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Section 16074 "Vibration and Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Section 16075 "Electrical Identification."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 16410

SECTION 16420 – MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes ac motor-control devices rated 600 V and less that are supplied as enclosed units.

B. Related Sections include the following:

1. Division 16 Section 16050 "Basic Electrical Materials and Methods" for general materials and installation methods.

1.3 SUBMITTALS

A. Product Data: For products specified in this Section. Include dimensions, ratings, and data on features and components.

B. Maintenance Data: For products to include in the maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain similar motor-control devices through one source from a single manufacturer.

B. Comply with NFPA 70.

C. Listing and Labeling: Provide motor controllers specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

1.5 COORDINATION

A. Coordinate features of controllers and accessory devices with pilot devices and control circuits to which they connect.

B. Coordinate features, accessories, and functions of each motor controller with the ratings and characteristics of the supply circuit, the motor, the required control sequence, and the duty cycle of the motor and load.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB Power Distribution, Inc.; ABB Control, Inc. Subsidiary.
2. Allen-Bradley Co.; Industrial Control Group.
3. Crouse-Hinds ECM.; Cooper Industries, Inc. Div.
4. Danfoss Inc.; Danfoss Electronic Drives Div.
5. Eaton Corp.; Westinghouse & Cutler-Hammer Products.
6. Furnas Electric Co.
7. General Electric Co.; Electrical Distribution & Control Div.
8. Siemens Energy & Automation, Inc.
9. Square D Co.

2.2 MAGNETIC MOTOR CONTROLLERS

A. Description: NEMA ICS 2, Class A, full voltage, nonreversing, across the line, unless otherwise indicated.

B. Control Circuit: 120 V; obtained from integral control power transformer, unless otherwise indicated. Include a control power transformer with adequate capacity to operate connected pilot, indicating and control devices, plus 100 percent spare capacity.

C. Overload Relay: Digital Solid State Motor Overload Relay Provide with sensors in each phase matched to nameplate full-load current of specific motor to which they connect, and with appropriate adjustment for duty cycle. Provide Class 20 overload protection or appropriate class as recommended by equipment manufacturer.

2.3 ENCLOSURES

A. Description: Flush or surface-mounted cabinets as indicated. NEMA 250, Type 1, unless otherwise indicated to meet environmental conditions at installed location.

1. Outdoor Locations: NEMA 250, Type 4X.
2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4X.

2.4 COMBINATION STARTER DISCONNECT

A. Provide heavy duty fused disconnect and NEMA magnetic motor controller in one UL listed unit.

B. Provide size as shown on the drawings. Provide with fusing appropriately sized to motor. Provide overload relay size as required for motor.

C. Provide with integral HOA switch and a minimum of two dry normally open auxillary contacts that close with the starter coil.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Select features of each motor controller to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; duty cycle of motor, drive, and load; and configuration of pilot device and control circuit affecting controller functions.

B. Select horsepower rating of controllers to suit motor controlled.

C. Provide starters as shown on the drawings.

D. Provide combination/starters where shown.

3.2 INSTALLATION

A. Install as shown on the drawings.

3.3 IDENTIFICATION

A. Identify motor-control components and control wiring according to Division 16 Section 16050 Basic Electrical Materials and Methods.

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between motor-control devices according to Division 16 Section 16120 Conductors and Cables.

B. Bundle, train, and support wiring in enclosures.

C. Connect hand-off-automatic switch and other automatic control devices where available.

1. Connect selector switches to bypass only the manual and automatic control devices that have no safety functions when switch is in the hand position.
2. Connect selector switches with motor-control circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.5 CONNECTIONS

A. Tighten connectors, terminals, bus joints, and mountings. Tighten field-connected connectors and terminals, including screws and bolts, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.6 FIELD QUALITY CONTROL

A. Testing: After installing motor controllers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Sections 7.5, 7.6, and 7.16. Certify compliance with test parameters.
2. Remove and replace malfunctioning units with new units, and retest.

3.7 CLEANING

A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally, using methods and materials recommended by manufacturer.

END OF SECTION

SECTION 16442 – PANELBOARDS AND SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes lighting and power panelboards and associated auxiliary equipment rated 600 V and less. Also included is the main switchboard.

B. Related Sections include the following:

1. Division 16 SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS for general materials, installation, and labeling methods.

1.3 SUBMITTALS

A. Product Data: For each type of panelboard, switchboard, accessory item, and component specified. Provide shop drawings for the switchboard showing each section and what it contains.

B. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

C. Maintenance Data: For panelboard and switchboard components to include in the maintenance manuals specified in Division 1. Include manufacturer's written instructions for testing circuit breakers.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

C. Comply with NFPA 70.

D. Comply with NEMA PB 1.

1.5 EXTRA MATERIALS

A.Keys: 6 spares of each type for panelboard cabinet lock.

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. Eaton Corp.; Westinghouse & Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Div.
3. Siemens Energy & Automation, Inc.
4. Square D Co.

2.2 PANELBOARD AND SWITCHBOARD FABRICATION

A. Enclosures: Flush- or surface-mounted cabinets as indicated. NEMA PB 1, Type 1, unless otherwise indicated to meet environmental conditions at installed location.

1. Outdoor Locations: NEMA 250, Type 4X.
2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

B. Front: Secured to box with concealed trim clamps, unless otherwise indicated. Front for surface-mounted panelboards shall be same dimensions as box. Fronts for flush panelboards shall overlap box, unless otherwise indicated.

C. Directory Frame: Metal, mounted inside each panelboard door.

D. Bus: Hard drawn copper of 98 percent conductivity.

E. Main and Neutral Lugs: Compression type.

F. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors. Bonded to box.

G. Service Equipment Approval: Listed for use as service equipment for MDP panelboard.

H. Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances, for the overcurrent protective device ampere ratings indicated for future installation of devices.

I. The switch board shall be listed as an assembly with separate sections for each function as shown on the plans. The switchboard shall be a stand alone, self-supporting unit. The bus bar shall run throughout the unit behind a dead front.

2.3 BRANCH-CIRCUIT PANELBOARDS

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: In panelboard front, with concealed hinges. Secure with flush catch and tumbler lock, all keyed alike.

C. The panelboard shall have a series rating with the circuit breaker that feeds it of 65,000 AIC or as shown on the drawings.

2.4 DISTRIBUTION PANELBOARDS

A. Doors: In panelboard front, except omit in fusible-switch panelboard, unless otherwise indicated. Secure door with vault-type latch with tumbler lock, all keyed alike.

B. Branch-Circuit Breakers: Provide a bus with "I-line style" circuit breakers that grasp the bus and are bolted in place. Provisions and other mounting equipment shall not be required to add a circuit breaker. Provide with circuit breaker mounting space shown on the drawings.

C. The panelboard shall have a series rating with the main circuit breaker in the switchboard of 65,000 AIC or as shown on the drawings.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 1, handle lockable.

1. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting capacity rating to meet available fault current. The circuit breaker shall have the AIC rating required for the panel/switchboard it is mounted in.
2. Application Listing: Appropriate for application, including Type SWD for switching fluorescent lighting loads and Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Circuit Breakers, 200 A and Larger: Trip units interchangeable within frame size.
4. Circuit Breakers, 400 A and Larger: Field-adjustable short-time and continuous current settings. The main circuit breaker shall be rated at 1600 amps and shall be field adjustable down to 1200 amps.
5. Current-Limiting Trips: Where indicated, let-through ratings less than NEMA FU 1, Class RK-5.
6. Current Limiters: Where indicated, integral fuse listed for circuit breaker.

7. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.
8. Shunt Trip: Where indicated.

2.6 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items as required for overcurrent protective device test, inspection, maintenance, and operation.

B. Fungus Proofing: Permanent fungicidal treatment for panelboard interior, including overcurrent protective devices and other components.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and switchboard and accessory items according to NEMA PB 1.1.

B. Mounting Heights: Top of trim 74 inches above finished floor, unless otherwise indicated.

C. Mounting: Plumb and rigid without distortion of box. Mount flush panelboards uniformly flush with wall finish.

D. Circuit Directory: Type directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing.

E. Install filler plates in unused spaces.

F. Wiring in Panelboard Gutters: Arrange conductors into groups, and bundle and wrap with wire ties after completing load balancing.

G. Neatly train wiring in switchboard. Bend conductors per their manufacturer's recommendations and listing requirements. Feeder conductors that are bent at a hard ninety degree angle shall be replaced.

3.2 IDENTIFICATION

A. Identify field-installed wiring and components and provide warning signs as specified in Division 16 SECTION 16050 – BASIC ELECTRICAL MATERIALS AND METHODS and Division 16 SECTION 16075 – ELECTRICAL IDENTIFICATION.

B. Nameplates: Label each panelboard and switchboard with engraved laminated-plastic or metal nameplates mounted with corrosion-resistant screws.

3.3 GROUNDING

A. Make equipment grounding connections for panelboards as indicated.

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Make insulation-resistance tests of each panelboard bus, component, and connecting supply, feeder, and control circuits.
2. Make continuity tests of each circuit.

B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units, and retest.

3.6 ADJUSTING

A.Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.7 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION 16470

SECTION 16511 – INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings applicable sections of the specifications, apply to this Section.

1.2 SUMMARY

A. This Section includes interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, lamps, ballasts, emergency lighting units, and accessories.

1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:

Dimensions of fixtures.

1. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings and photometric data.
2. Certified results of laboratory tests for fixtures and lamps for photometric performance.
3. Emergency lighting unit battery and charger.
4. Fluorescent and high-intensity-discharge ballasts.
5. Sound Performance Data: For air-handling fixtures. Indicate sound power level and sound transmission class in test reports certified according to ADC.
6. Types of lamps.

1.4 QUALITY ASSURANCE

A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NFPA 70.

C. FM Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM.

1.5 COORDINATION

A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

1.6 WARRANTY

A. General Warranty: The warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Replace all luminaires, or associated equipment that fails to operate properly within one year from date of final completion.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: 10 for every 100 of each type and rating installed (10%). Furnish at least two of each type.
2. Glass and Plastic Lenses, Covers, and Other Optical Parts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
3. Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
4. Reflectors, Glare Shields, Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in the luminaire schedule on the drawings of equal.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

D. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or annealed crystal glass, unless otherwise indicated.

1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
2. Lens Thickness: 0.125 inch (3 mm) minimum, unless greater thickness is indicated.

F. Electromagnetic Interference Filters: Integral to fixture assembly. Provide one filter for each ballast. Suppress conducted electromagnetic interference filters as required by MIL-STD-461.

2.3 FLUORESCENT LAMP BALLASTS

A. General Requirements: Unless otherwise indicated, features include the following:

1. Designed for type and quantity of lamps indicated at full light output.
2. Total Harmonic Distortion Rating: Less than 20 percent.

B. Electronic Ballasts for Linear Lamps: Unless otherwise indicated, features include the following, besides those in "General Requirements" Paragraph above:

1. Certified Ballast Manufacturer Certification: Indicated by label.
2. Encapsulation: Without voids in potting compound.
3. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.

2.4 LAMPS

A. Fluorescent Color Temperature and Minimum Color-Rendering Index: 3500 K and 85 CRI, unless otherwise indicated.

2.5 FIXTURE SUPPORT COMPONENTS

A. Comply with Division 16 Section 16050 Basic Electrical Materials and Methods, for channel- and angle-iron supports and nonmetallic channel and angle supports.

2.6 FINISHES

A. Fixtures: Manufacturer's standard, unless otherwise indicated.

1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
2. Metallic Finish: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.

B. Provide electronic ballasts on all fluorescent luminaries.

3.2 CONNECTIONS

A. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Provide instruments to make and record test results.

C. Tests: As follows:

1. Verify normal operation of each fixture after installation.
2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
3. Verify normal transfer to battery source and retransfer to normal.
4. Report results in writing.

D. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

E. Corrosive Fixtures: Replace during warranty period.

3.4 CLEANING AND ADJUSTING

A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

END OF SECTION 16511

SECTION 16521 – EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes exterior lighting units with luminaires, lamps, ballasts, poles/support structures, and accessories.

1.3 DEFINITIONS

A. Lighting Unit: A luminaire or an assembly of luminaires complete with a common support, including post, foundation, or other structure, and mounting and support accessories.

B. Luminaire (Light Fixture): A complete lighting device consisting of lamp(s) and ballast(s), when applicable, together with parts designed to distribute light, to position and protect lamps, and to connect lamps to power supply.

1.4 SUBMITTALS

A. Product Data: For each type of lighting unit indicated, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Materials and dimensions of luminaires.
2. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings and photometric data.
3. High-intensity-discharge luminaire ballasts.
4. Provide information on the candela output along the vertical axis for each luminaire to show compliance with the requirements on the drawings.

B. Product Certificates: Signed by manufacturers of lighting units certifying that products comply with requirements.

C. Maintenance Data: For lighting units to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

A. Luminaires and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use, location, and installation conditions by a testing agency acceptable to authorities having jurisdiction

B. Comply with ANSI C2.

C. Comply with NFPA 70.

D. FM Compliance: Units for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM.

1.6 DELIVERY, STORAGE, AND HANDLING OF POLES

A. Store luminaires in warm, dry, and heated space, protected from damage, prior to installation.

1.7 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive OWNER of other rights OWNER may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by CONTRACTOR under requirements of the Contract Documents. Provide a general warranty for all materials and workmanship for a period of three years from the date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least two of each type.
2. Glass and Plastic Lenses, Covers, and Other Optical Parts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
3. Ballasts: 1 for every 100 of each type and rating installed. Furnish at least one of each type.
4. Reflectors, Glare Shields, Globes and Guards: 1 for every 20 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated on the drawings.

2.2 LUMINAIRES

A. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

B. Metal Parts: Free from burrs, sharp corners, and edges.

C. Sheet Metal Components: Corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping and sagging.

D. Housings: Stainless Steel. Weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

E. Doors, Frames, and Other Internal Access: Stainless Steel. Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange to disconnect ballast when door opens.

F. Exposed Hardware Material: Stainless steel.

G. Plastic Parts: No plastic parts.

H. Reflecting Surfaces: Minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

I. Lenses and Refractors: Materials as indicated. Use heat- and aging-resistant, resilient gaskets to seal and cushion lens and refractor in luminaire doors.

J. Photoelectric Relays: As follows:

1. Contact Relays: Single throw, arranged to fail in the on position and factory set to turn light unit on at 1.5 to 3 fc (16 to 32 lx) and off at 4.5 to 10 fc (48 to 108 lx) with 15-second minimum time delay.
2. Relay Mounting: In electrical enclosures.

K. High-Intensity-Discharge Ballasts: Comply with ANSI C82.4. Constant wattage autotransformer or regulating high-power-factor type, unless otherwise indicated.

1. Ballast Fuses: One in each ungrounded supply conductor. Voltage and current ratings as recommended by ballast manufacturer.

2. Single-Lamp Ballasts: Minimum starting temperature of minus 40 deg C.
3. Open-circuit operation will not reduce average life.
4. High-Pressure Sodium Ballasts: Equip with a solid-state igniter/starter having an average life in pulsing mode of 10,000 hours at an igniter/starter case temperature of 90 deg C.
5. Noise: Uniformly quiet operation, with a noise rating of B or better.
6. Surge Protector: Hard-wired unit external to ballast case, rated for supply circuit line voltage, and encapsulated for circuit and moisture protection. Three-stage surge protection with three suppression modes provides 330-V peak clamping, line to neutral, line to ground, and neutral to ground. Pulse life is 500 3KA-8x20 microsecond impulses, and response time is less than 1 nanosecond. Internal fuse takes device off line on failure and lights a light-emitting diode failure indicator.

L. Lamps: Comply with the standard of the ANSI C78 series that is applicable to each type of lamp. Provide luminaires with indicated lamps of designated type, characteristics, and wattage. Where a lamp is not indicated for a luminaire, provide medium wattage lamp recommended by manufacturer for luminaire.

1. Metal-Halide Color Temperature and Minimum Color-Rendering Index: 3600 K and 70 CRI, unless otherwise indicated.

M. Additional Requirements: As shown on the drawings.

2.3 LUMINAIRE SUPPORT COMPONENTS

A. Description: Comply with AASHTO LTS-3 for pole or other support structures, brackets, arms, appurtenances, base, and anchorage and foundation. Wind loads shall be in accordance with UBC-1997.

B. Wind-Load Strength of Total Support Assembly: Adequate to carry support assembly plus luminaires at indicated heights above grade without failure, permanent deflection, or whipping with a basic wind speed of 100 mph and with the application of the revelant height, exposure, 1.2 gust factor, and pressure coefficients. Support assembly includes pole or other support structures, brackets, arms, appurtenances, base, and anchorage and foundation.

1. Strength Analysis: For each pole type and luminaire combination, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

C. Finish: Match finish of pole/support structure for arm, bracket, and tenon mount materials.

D. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Will not cause galvanic action at contact points.
2. Mountings: Correctly position luminaire to provide indicated light distribution.

3. Anchor Bolts, Nuts, and Washers: Hot-dip galvanized after fabrication unless stainless-steel items are indicated.
4. Anchor-Bolt Template: Plywood or steel.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Aluminum: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

1. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

C. Steel: Grind welds and polish surfaces to a smooth, even finish.

1. Galvanized Finish: Hot-dip galvanize after fabrication to comply with ASTM A 123.
2. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
3. Interior: Apply one coat of bituminous paint on interior of pole, or otherwise treat to prevent corrosion.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Luminaire Attachment: Fasten to indicated structural supports.

B. Luminaire Attachment with Adjustable Features or Aiming: Attach luminaires and supports to allow aiming for indicated light distribution.

C. Lamp luminaires with indicated lamps according to manufacturer's written instructions. Replace malfunctioning lamps.

3.2 CONNECTIONS

A. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Ground metal poles/support structures according to Division 16 Section 16060 – Grounding and Bonding.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed unit for damage. Replace damaged units.

B. Advance Notice: Give dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests and Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source, and as follows:

1. Measure light intensities at night if specific illumination performance is indicated. Use photometers with calibration referenced to NIST standards.
2. Check intensity and uniformity of illumination.
3. Check excessively noisy ballasts.

E. Prepare a written report of tests, inspections, observations and verifications indicating and interpreting results.

F. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

3.4 CLEANING AND ADJUSTING

A. Clean units after installation. Use methods and materials recommended by manufacturer.

B. Adjust luminaires and luminaires with adjustable lamp position to provide required light distributions and intensities.

END OF SECTION 16521

SECTION 16723 - EDUCATIONAL INTERCOMMUNICATIONS AND PROGRAM 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.

1.2 SUMMARY

A. Section Includes: Microprocessor-switched telephone/intercommunications and program systems with the following components:

1. Master stations.
2. Call control console.
3. Speaker-microphone stations.
4. Call-switch unit.
5. All-call amplifier.
6. Intercommunication amplifier.
7. Paging amplifier.
8. Loudspeakers/speaker microphones.
9. Conductors and cables.
10. Raceways.

1.3 ACTION SUBMITTALS

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

B. Shop Drawings: For educational intercommunications and program systems. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include scaled drawings for station arrangement of built-in equipment.
3. Wiring Diagrams: For power, signal, and control wiring.

    a. Identify terminals to facilitate installation, operation, and maintenance.
    b. Single-line diagram showing interconnection of components.
    c. Cabling diagram showing cable routing.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and

special moldings are shown and coordinated with each other, using input from installers of the items involved.

B. Qualification Data: For qualified Installer.

C. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For educational intercommunications and program systems to include in operation and maintenance manuals. In addition to items specified in Section 01782 "Operation and Maintenance Data," include the following:

1. A record of final matching transformer-tap settings and signal ground-resistance measurement certified by Installer.
2. A record of Owner's equipment-programming option decisions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain educational intercommunications and program systems from single source from single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for location and application.

D. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate layout and installation of ceiling-mounted speaker microphones and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide a Telecenter VI School Communications System, Model TC6000-based, by:
1. Rauland-Borg Corporation.

2.2 FUNCTIONAL DESCRIPTION OF MICROPROCESSOR-SWITCHED SYSTEMS

A. Master Station:

1. Communicating selectively with other master and speaker-microphone stations by dialing station's number on a 12-digit keypad.
2. Communicating with individual stations in privacy.
3. Communicating on a minimum of three voice channels with up to two simultaneous conversations between master stations and one conversation between a master station and a speaker-microphone station.
4. Increasing the number of conversation channels by adding a module in central-control cabinet.
5. Including up to three other station connections in a conference call.
6. Accessing separate paging speakers or groups of paging speakers by dialing designated numbers on a 12-digit keypad.
7. Overriding any conversation by a designated master station.
8. Displaying selected station.
9. Communicating simultaneously with all other stations by dialing a designated number on a 12-digit keypad.
10. Automatically controlling gain to ensure constant intercom speech level.
11. Controlling the simultaneous distribution of program material to various combinations of speaker-microphone stations or groups over two program channels by using keypad to control sources and distribute programs.
12. Operating and correcting secondary clocks and controlling class-change signals to speakers and bells by using keypad.
13. User-programmable features include the following:

    a. Station calling by room number.
    b. Room station call-in priority levels.
    c. Clock signal schedule functions.
    d. Schedule characteristics of audible signals.
    e. Call-in tone characteristic.
    f. Precedence among master stations as destinations for incoming calls from room stations.
    g. Grouping of rooms and speakers into zones for paging and program distribution purposes.

B. Speaker-Microphone Station:

1. Having privacy from remote monitoring without a warning tone signal at monitored station. Designated speaker-microphone stations have a privacy switch to prevent another station from listening and to permit incoming calls.
2. Communicating hands free.
3. Calling master station by actuating call switch.
4. Returning a busy signal to indicate that station is already in use.

C. Speakers: Free of noise and distortion during operation and when in standby mode.

2.3 FUNCTIONAL DESCRIPTION OF TELEPHONE/INTERCOMMUNICATION SYSTEMS

A. Integrated central system with the following:

1. Direct-dial, full duplex private telephone communications between all locations equipped with telephones. Call initiation among master stations and between master and remote stations by dialing station's number on a 12-digit keypad.
2. Initial system to be able to accommodate up to 72 master and remote stations.
3. Direct-dial, two-way amplified voice intercommunication between master telephones and remote stations without use of press-to-talk or talk-listen switches.
4. Automatic queuing for intercommunication channels, with automatic call waiting.
5. Call transfer among master stations.
6. Display of selected station and answering calling station by pressing a single "response button."
7. Simultaneous communication with other stations on system by dialing a designated number on a 12-digit keypad.
8. Automatic gain control to ensure constant intercom speech level.
9. Simultaneous distribution of emergency announcements to all locations equipped with speakers by dialing a predetermined code number.
10. User-selectable facility for providing selected telephones with dial tone.
11. User-selectable facility for permitting linkage of selected stations to media retrieval center and for permitting on- and off-premise computer linkage.
12. Assignment of speaker locations within any one or more of eight zones for zone paging or time signal reception.
13. Digital readout displays on which up to three incoming calls are displayed with additional calls stored for subsequent display.
14. Off-site diagnostics through a serial data port on central-control station.
15. Control of simultaneous distribution of program material to various combinations of remote stations or groups by using keypad to control sources and distribute programs.
16. Operation and correction of secondary clocks and control of class-change signals to speakers and bells by using keypad.
17. User-programmable features include the following:

    a. Station calling by room number.
    b. Room station call-in priority levels.
    c. Clock signal schedule functions.
    d. Schedule characteristics of audible signals.
    e. Call-in tone characteristic.
    f. Precedence among master stations as destinations for incoming calls from room stations.
    g. Grouping rooms and speakers into zones for paging and program distribution purposes.

18. Telephone interconnect features include the following:

    a. Direct connection to central office trunk lines with initial system wiring for adequate number of trunk lines. Coordinate necessary number of trunk lines with Owner.
    b. Routing of outside trunk lines for "attendant answer incoming" and "direct inward line" functions.
    c. Station programming for access to outside trunk lines to be any of the following:

1) Totally unrestricted access.
2) Restricted access.
3) No access.

d. System programming to allow or disallow local prefixes, and to authorize access for as many as three area codes.
e. Discriminating ringing for identifying internal and outside calls.
f. Circular hunting for outside trunks to prevent excess usage of any one trunk.
g. Direct connection of a single trunk to designated telephone with transfer to attendant if unanswered.
h. Call parking allowing paged party to remotely pick up outside call from any master station.
i. Night-answer mode to allow one or all of the following:

1) Incoming call transferred to predetermined extension.
2) Tone transmitted to speakers to notify key personnel to answer telephone.
3) Dial tone to remote stations to allow answering call from all locations.

j. Call control console to do as follows:

1) Identify, answer, and route incoming outside calls, with reminder and recall features.
2) Directly access outside trunk lines.
3) Hold, park, and transfer calls.
4) Screen outside calls.

B. Remote Stations:

1. Speaker-Microphone Station:

a. Having privacy from remote monitoring without a warning tone signal at monitored station. Designated speaker-microphone stations have a privacy switch to prevent another station from listening and to permit incoming calls.
b. Communicating hands free.
c. Calling master station by actuating call switch.
d. Returning a busy signal to indicate that station is already in use.

C. Speakers: Free of noise and distortion during operation and when in standby mode.

2.4 GENERAL REQUIREMENTS FOR EQUIPMENT AND MATERIALS

A. Coordinate features and select components to form an integrated system. Match components and interconnections for optimum performance of specified functions.

B. Expansion Capability: Increase number of stations in the future by 25 percent above those indicated without adding any internal or external components or main trunk cable conductors.

C. Equipment: Modular type using solid-state components, fully rated for continuous duty unless otherwise indicated. Select equipment for normal operation on input power usually supplied at 110 to 130 V, 60 Hz. Comply with UL 813.

D. Weather-Resistant Equipment: Listed and labeled by an NRTL for duty outdoors or in damp locations.

2.5 MASTER STATION FOR MICROPROCESSOR-SWITCHED SYSTEMS

A. 12-Digit Keypad Selector: Transmits calls to other stations and initiates commands for programming and operation.

B. Volume Control: Regulates incoming-call volume.

C. Tone Annunciation: Momentary audible tone signal announces incoming calls.

D. Lamp Annunciation: Identifies calling stations and stations in use. Lamp remains on until call is answered.

E. Speaker Microphone: Transmits intercom voice signals when used via a voice-operated switch.

1. Minimum Speaker Sensitivity: 91 dB at one meter, with 1-W input.

F. Link Button: To transfer calls.

G. Reset Control: Cancels call and resets system for next call.

H. Digital Display: 16-digit alphanumeric LCD readout to register up to four three-digit station numbers.

I. Central-Equipment Cabinet: Comply with TIA/EIA-310-D. Lockable, ventilated metal cabinet houses terminal strips, power supplies, amplifiers, system volume control, and other switching and control devices required for conversation channels and control functions.

2.6 SPEAKER-MICROPHONE STATIONS

A. Mounting: Flush unless otherwise indicated, and suitable for mounting conditions indicated.

B. Faceplate: Stainless steel or anodized aluminum with tamperproof mounting screws.

C. Back Box: Two-gang galvanized steel with 2-1/2-inch minimum depth.

D. Speaker: Minimum axial sensitivity shall be 91 dB at one meter, with 1-W input. Voice coil shall be not less than 3 inches, 2.3 oz. minimum; permanent magnet.

E. Tone Annunciation: Recurring momentary tone indicates incoming calls.

F. Call Switch: Mount on faceplate. Permits calls to master station.

G. Privacy Switch: Mount on faceplate. When in on position, switch prevents transmission of sound from remote station to system; when in off position, without further switch manipulation, response can be made to incoming calls.

2.7 CALL-SWITCH UNIT

A. Enclosure: Single-gang box with stainless-steel faceplate.

B. Call Switch: Momentary contact signals system that a call has been placed.

C. Privacy Switch: Prevents transmission of sound signals from station to system.

D. Volume Control: Operated by screwdriver blade through a hole in faceplate to adjust output level of associated speaker.

2.8 ALL-CALL AMPLIFIER

A. Output Power: 70-V balanced line. 80 percent of the sum of wattage settings of connected for each station and speaker connected in all-call mode of operation, plus an allowance for future stations.

B. Total Harmonic Distortion: Less than 5 percent at rated output power with load equivalent to quantity of stations connected in all-call mode of operation.

C. Minimum Signal-to-Noise Ratio: 60 dB, at rated output.

D. Frequency Response: Within plus or minus 2 dB from 50 to 12,000 Hz.

E. Output Regulation: Maintains output level within 2 dB from full to no load.

F. Input Sensitivity: Compatible with master stations and central equipment so amplifier delivers full-rated output with sound-pressure level of less than 10 dynes/sq. cm impinging on master stations, speaker microphones, or handset transmitters.

G. Amplifier Protection: Prevents damage from shorted or open output.

2.9 INTERCOMMUNICATION AMPLIFIER

A. Minimum Output Power: 15 W; adequate for all functions.

B. Total Harmonic Distortion: Less than 5 percent at rated output power with load equivalent to one station connected to output terminals.

C. Minimum Signal-to-Noise Ratio: 50 dB, at rated output.

D. Frequency Response: Within plus or minus 3 dB from 70 to 10,000 Hz.

E. Output Regulation: Maintains output level within 2 dB from full to no load.

F. Input Sensitivity: Matched to input circuit and to provide full-rated output with sound-pressure level of less than 10 dynes/sq. cm impinging on microphones in master stations, speaker microphones, or handset transmitters.

G. Amplifier Protection: Prevents damage from shorted or open output.

2.10 PAGING AMPLIFIER

A. Input Voltage: 120-V ac, 60 Hz.

B. Frequency Response: Within plus or minus 3 dB from 60 to 10,000 Hz.

C. Minimum Signal-to-Noise Ratio: 60 dB, at rated output.

D. Total Harmonic Distortion: Less than 3 percent at rated output power from 70 to 12,000 Hz.

E. Output Regulation: Less than 2 dB from full to no load.

F. Controls: On-off, input levels, and low-cut filter.

G. Input Sensitivity: Matched to input circuit and to provide full-rated output with sound-pressure level of less than 10 dynes/sq. cm impinging on speaker microphones or handset transmitters.

H. Amplifier Protection: Prevents damage from shorted or open output.

2.11 CONE-TYPE LOUDSPEAKERS/SPEAKER MICROPHONES

A. Minimum Axial Sensitivity: 91 dB at one meter, with 1-W input.

B. Frequency Response: Within plus or minus 3 dB from 70 to 15,000 Hz.

C. Minimum Dispersion Angle: 100 degrees.

D. Line Transformer: Maximum insertion loss of 0.5 dB, power rating equal to speaker's, and at least four level taps.

E. Enclosures: Steel housings or back boxes, acoustically dampened, with front face of at least 0.0478-inch steel and whole assembly rust proofed and factory primed; complete with mounting assembly and suitable for surface ceiling, flush ceiling, pendant or wall mounting; with relief of back pressure.

F. Baffle: For flush speakers, minimum thickness of 22ga zinc coated steel with baked on, white epoxy finish.

G. Vandal-Proof, High-Strength Baffle: For **surface**-mounted speakers, self-aging cast aluminum with tensile strength of 44,000 psi, 0.025-inch minimum thickness; countersunk heat-treated alloy mounting screws; and textured white epoxy finish.

H. Size: 8 inches with 1-inch voice coil and minimum 5-oz. ceramic magnet.

2.12 HORN-TYPE LOUDSPEAKERS/SPEAKER MICROPHONES

A. Speakers shall be all-metal, weatherproof construction; complete with universal mounting brackets.

B. Frequency Response: Within plus or minus 3 dB from 275 to 14,000 Hz.

C. Minimum Power Rating of Driver: 15 W, continuous.

D. Minimum Dispersion Angle: 110 degrees.

E. Line Transformer: Maximum insertion loss of 0.5 dB, power rating equal to speaker's, and at least four level taps.

2.13 CONDUCTORS AND CABLES

A. Conductors: Jacketed, twisted pair and twisted multipair, untinned solid copper. Sizes as recommended by system manufacturer, but no smaller than No. 22 AWG.

B. Insulation: Thermoplastic, not less than 1/32 inch thick.

C. Shielding: For speaker-microphone leads and elsewhere where recommended by manufacturer; No. 34 AWG, tinned, soft-copper strands formed into a braid or equivalent foil.

1. Minimum Shielding Coverage on Conductors: 60 percent.

D. Plenum Cable: Listed and labeled for plenum installation.

2.14 RACEWAYS

A. Educational Intercommunication and Program System Raceways and Boxes: Comply with requirements in Section 16130 "Raceways and Boxes" and Section 16136 “Cable Trays for Communications Systems.”

B. Outlet boxes shall be not less than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

C. Flexible metal conduit is prohibited.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Comply with requirements for raceways and boxes specified in Section 16130 "Raceways and Boxes."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF RACEWAYS

A. Comply with requirements in Section 16130 "Raceways and Boxes" and Section 16136 “Cable Trays for Communications Systems” for installation of conduits and wireways.

B. Install manufactured conduit sweeps and long-radius elbows whenever possible.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements:

1. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminals.
2. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
3. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
6. Cold-Weather Installation: Bring cable to room temperature before de-reeling. Heat lamps shall not be used.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunication spaces with terminating hardware and interconnection equipment.
2. Suspend speaker cable not in a wireway or pathway a minimum of 8 inches above ceiling by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.

D. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.

3.4 INSTALLATION

A. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.

B. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.

C. Weatherproof Equipment: For units that are mounted outdoors, in damp locations, or where exposed to weather, install consistent with requirements of weatherproof rating.

D. Connect wiring according to Section 16120 "Conductors and Cables."

3.5 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes as specified in Section 16060 "Grounding and Bonding."

3.6 SYSTEM PROGRAMMING

A. Programming: Fully brief Owner on available programming options. Record Owner's decisions and set up initial system program. Prepare a written record of decisions, implementation methodology, and final results.

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:

1. Schedule tests with at least seven days' advance notice of test performance.
2. After installing educational intercommunications and program systems and after electrical circuitry has been energized, test for compliance with requirements.
3. Operational Test: Test originating station-to-station, all-call, and page messages at each intercommunication station. Verify proper routing and volume levels and that system is free of noise and distortion. Test each available message path from each station on system.
4. Frequency Response Test: Determine frequency response of two transmission paths, including all-call and paging, by transmitting and recording audio tones. Minimum acceptable performance is within 3 dB from 150 to 2500 Hz.
5. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings as follows:

    a. Disconnect speaker microphone and replace it in the circuit with a signal generator using a 1000-Hz signal. Measure signal-to-noise ratio at speakers.
    b. Repeat test for three speaker microphones, and one master station microphone.

c. Minimum acceptable ratio is 45 dB.

6. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 150, 200, 400, 1000, and 2500 Hz into each intercom, paging, and all-call amplifier. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is 5 percent total harmonics.
7. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five locations in each paging zone. Maximum permissible variation in level is plus or minus 3 dB; in levels between adjacent zones, plus or minus 5 dB.
8. Power Output Test: Measure electrical power output of each paging amplifier at normal gain settings of 150, 1000, and 2500 Hz. Maximum variation in power output at these frequencies is plus or minus 3 dB.
9. Signal Ground Test: Measure and report ground resistance at system signal ground. Comply with testing requirements in Section 16060 "Grounding and Bonding."

C. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging and independent room speaker-line matching transformers.

D. Educational intercommunications and program systems will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service and initial system programming.

1. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.
2. Complete installation and startup checks according to manufacturer's written instructions.

3.9 ADJUSTING

A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.10 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the educational intercommunications and program systems.

1. Train Owner's maintenance personnel on programming equipment for starting up and shutting down, troubleshooting, servicing, and maintaining the system and equipment.

END OF SECTION 16723

SECTION 16730 – GPS WIRELESS CLOCK SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. GPS receiver.
2. Primary transmitter.
3. Analog clocks.

B. Related Sections include the following:

1. Section 16050 – "Basic Electrical Materials and Methods".
2. Section 16735 – "Wireless Bell and Tone Synchronization System".

1.3 DEFINITIONS

A. GPS: Global Positioning System, a worldwide system that employs 24 satellites in an integrated network to determine geographic location anywhere in the world, and which employs and transmits Universal Coordinated Time, the world's most accurate and reliable time.

B. UTC: Universal Coordinated Time

1.4 SUBMITTALS

A. Product Data: For each component, describing physical characteristics and method of installation.

B. Wiring Diagram: Power, signal, and control wiring.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing commercial time system products with a minimum of 30 continuous years of documented experience including 4 years experience producing GPS wireless time systems.

B. Installer: Company with documented experience in the installation of commercial time systems.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NFPA 70.

1.6 WARRANTY

A. Warranty Period for all System Components: One year from date of Substantial Completion.

1.7 REGULATORY REQUIREMENTS

A. Equipment and components furnished shall be of manufacturer's latest model.

B. The end user will hold a license, known as a "Radio Station Authorization" granted by the FCC.

C. This license grants the end user protected use for wireless transmission at the designated frequency.

D. This license will designate a unique "call sign" for each end user.

E. Transmitter and receiver shall comply with Part 90 of FCC rules.

F. Transmitter frequency shall be governed by FCC Part 90.35.

H. Transmitter output power shall be governed by FCC Part 90 257 (b).

1.8 DELIVERY STORAGE AND HANDLING

A. Deliver all components to the site in the manufacturer's original packaging. Packaging shall contain manufacturer's name and address, product identification number, and other related information.

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. Primex Wireless, Inc.

2.2 SYSTEM DESCRIPTION

A. GPS wireless clock system shall continually synchronize clocks throughout the facility, and shall be capable of clock readouts in multiple time zones where desired.

B. The system shall provide wireless time using GPS and be synchronized to UTC. The system shall not require hard wiring. Clocks shall automatically adjust for Daylight Saving Time.

C. Analog Clocks shall be synchronized to within 10 milliseconds 6 times per day, and the system shall have an internal oscillator that maintains plus or minus one second per day between synchronizations, so that clock accuracy shall not exceed plus or minus 0.2 seconds.

D. The system shall include an internal clock reference so that failure of the GPS signal shall not cause the clocks to fail in indicating time.

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E. The system shall incorporate a "fail-safe" design so that failure of any component shall not cause failure of the system. Upon restoration of power or repair of failed component, the system shall resume normal operation without the need to reset the system or any component thereof.

F. The system must operate in accordance with a "Radio Station Authorization", Form FCC 601 – LM, granted by the Federal Communications Commission (FCC). This license will be issued to and held by the end user.

2.3 SEQUENCE OF OPERATION

A. Transmitter Operation: When power is first applied to the transmitter, it checks for and displays the software version. It then checks the position of the switches and stores their position in memory. The transmitter looks for the GPS time signal. Once the transmitter has received the GPS time, it sets its internal clock to that time. The transmitter then starts to transmit its internal time once every second. The transmitter updates its internal clock every time it receives valid time data from the GPS.

B. Analog Clock Operation:

1. Apply power or insert batteries. Follow set up procedures detailed in manufacturer's instructions.
2. After initial setup, the clock will shut off the receiver. Six times each day, the microprocessor will activate the receiver and starting with the stored channel, it will again look for a valid time signal. If necessary, the clocks will resynchronize to the correct time.
3. If the clock has not decoded a valid time signal for a pre-determined number of days, it will go to a step mode. Non signal reception can be caused by low battery voltage. If this occurs, replace the batteries.

2.4 EQUIPMENT

A. General: The clock system shall include a transmitter, a roof mounted GPS receiver, indicating clocks, and all accessories for complete operation.

B. GPS Receiver: GPS roof mounted, with 10 foot cable attached and a 50 foot extension cable.

C. The GPS Receiver shall be a complete GPS receiver including antenna in a waterproof case, designed for roof or outdoor mounting. Provide mounting bracket for attachment to roof structure.

D. The GPS Receiver cable is not required to be plenum rated.

E. Transmitter: Primex Wireless Model 14000E, consisting of wireless transmitter with GPS receiver, a surge suppressor/battery backup, and a mounting shelf. Unit shall obtain current atomic time from satellite. The clock system shall transmit time continuously to all clocks in the system.

1. Transmission:

    a. Frequency Range: 72.100 to 72.400 MHz.
    b. Transmission Power: 1 watt (30dBm) maximum
    c. Radio technology: narrowband FM
    d. Number of channels: 16
    e. Channel bandwidth: 20 kHz maximum
    f. Transition mode: one-way communication
    g. Data rate: 2 KBps
    h. Operating range: 32 degree F to 158 degrees F.

2. Transmitter:

    a. Transmitter output power: +26 to +30 dBm
    b. Frequency deviation: +/- 4 kHz
    c. Transmitter power requirements: 120 VAC 60 Hz
    d. Internal power requirements: 5 VDC
    e. Carrier frequency stability: +/- 20 ppm

3. Transmitter shall have 16 selectable channels to assure interference-free reception.
4. Transmitter shall have the following switches:

    a. Time zone adjustment switches for all time zones in the world.
    b. Daylight Saving Time bypass switch.
    c. 12-hour or 24-hour display.

5. Transmitter housing shall be black metal case, 16-3/4 inches by 12 inches by 1-7/8 inches in size.
6. Antenna shall be 46 inches high, commercial type, mounted on top center of transmitter housing. Antenna gain shall be < 2.2 dB. Antenna polarization shall be vertical.
7. Transmitter housing shall incorporate a display which shall include the following:

    a. Time readout.

b. AM and PM indicator if 12-hour time display is set.
c. Day and date readout.
d. Indicator for daylight savings or standard time.
e. LED which shall flash red in event of reception problem.
f. GPS reception indicator.

8. Transmitter shall contain an internal clock such that failure of reception from the GPS will not disable the operation of the clocks.

9. Power supply (included)

a. Input: 120 volt AC 50/60 Hz, 0.4 amps.
b. Output: 9 volt DC, 1.5 amps.

10. Surge Protector/Battery Backup (included).

a. Input: 120 volt AC 60 Hz +/- 1 Hz.
b. Output: 120 volt AC, 500VA, 300 watts
c. Surge Energy Rating: 365 joules

F. Traditional analog clocks (AC): Analog clocks shall be wall mounted. Clocks shall have polycarbonate frame and polycarbonate lens. Face shall be white. Hour and minute hands shall be black.

1. 12-1/2 inch diameter analog clock, battery powered, Primex Wireless Model 14164.

G. Analog clocks shall be battery powered.

H. Analog clocks shall be capable of adjusting for Daylight Saving Time.

I. Time shall be automatically be updated from the transmitter 6 times per day.

J. If power is interrupted, the clock will stop until power resumes. Upon resumption of power, the clock will self correct to the current time.

K. Clocks shall have a tamper proof/theft resistant clock lock mounting slots.

L. Analog clock receivers shall be as follows:

1. Receiver sensitivity: >-110 dBm
2. Receiver power: 24 VAC or 120 VAC (see model #)
3. Antenna type: internal
4. Antenna gain: -7 dBd

M. If transmitter stops transmitting valid time signals due to power failure, the clocks will continue to function as accurate quartz clocks until a valid time signal is decoded. If signal transmission is not restored after 96 hours, the second hand will “five step” as a visual indicator that the signal has been lost. Should the clocks lose power and signal, the clocks will not function.

N. Wire guards: Provide one for each analog clock as follows:

1. Analog clock wire guard Primex Wireless Model **14131**, 14 by 14 inch size, for nominal 12-1/2 inch diameter analog clocks.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that 120 volt electrical outlet is located within 6 feet of location of transmitter and the outlet is operational and properly grounded.

3.2 INSTALLATION

A. Provide all equipment necessary for a complete and operable system.

B. GPS Unit: Install on roof in location indicated, in clear view of the sky. Install unit in location free from standing water, and above accumulations of leaves or debris. Seal cable connection to GPS with sealant. Any added cable lengths must be protected from outside elements.

C. Transmitter:

1. Locate transmitter where indicated, a minimum of 2 to 3 feet above the floor, away from large metal objects such as filing cabinets, lockers or metal framed walls. Transmitter(s) will be placed at locations indicated below:
2. Attach receiver to transmitter using cable.
3. Connect antenna to transmitter.
4. Connect power supply to the transmitter.
5. Set the channel number on the display to correspond to the FCC license.
6. Plug power supply into electrical outlet.
7. Analog clocks (AC): Perform the following operations with each clock:

    a. Observe clock until valid time signals are received and analog clock adjusts itself to correct time.
    b. Install the analog clock on the wall in the indicated location, plumb, level, and tight against the wall. Attach using clock-lock hanging method and suitable fasteners as approved by clock manufacturer.
    c. Wire guards: Secure to wall, using approved theft-resistant fasteners.

3.3 ADJUSTING

A. Prior to final acceptance, inspect each clock, adjust as required, and replace parts which are found defective.

3.4 CLEANING

A. Prior to final acceptance, clean exposed surfaces of clocks, using cleaning methods recommended by clock manufacturer. Remove temporary labels from clock faces. Do not remove labels from backs of clocks.

3.5 DEMONSTRATION

A. Provide training to Owner's representative on setting and adjusting clocks, and routine maintenance.

3.6 PROTECTION

A. Protect finished installation until final acceptance of the project.

3.7 TESTING

A. Test all devices at their operational location under normal operational conditions to assure reception of signal.

END OF SECTION 16730

SECTION 16735 – WIRELESS BELL AND TONE SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section. The video security system is bid alternate no. 7.

1.2 SUMMARY

A. This Section includes the following:

1. Wireless Tone Generator.
2. Scheduling software.
3. Wireless transceivers.

B. Related Sections include the following:

1. Section 16730 – “GPS Wireless Clock System”.

1.3 DEFINITIONS

A. CD-ROM: Compact disk, read-only memory.

B. GPS: Global Positioning System, a worldwide system that employs 24 satellites in an integrated network to determine geographic location anywhere in the world, and which employs and transmits Universal Coordinated Time, the world’s most accurate and reliable time.

C. UTC Universal Coordinated Time

D. WTG: Wireless Tone Generator.

1.4 SUBMITTALS

A. Product Data: Submit complete catalog data for each component, describing physical characteristics and method of installation.

B. Manufacturer's Instructions: Submit complete installation, set-up and maintenance instructions.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of component through one source from a single manufacturer.

B. Electrical Components, Device, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

D. Manufacturer: Company specializing in manufacturing commercial time systems product with a minimum of 30continuous years of documented experience including 4 years producing wireless time systems.

E. Installer: Company with documented experience in the installation of commercial time systems.

1.6 WARRANTY

A. Warranty period for all system components: One year from date of substantial completion.

1.7 REGULATORY REQUIREMENTS

A. Equipment and components furnished shall be of manufacturer's latest model.

B. The end user will hold a "Radio Station Authorization" license granted by the FCC.

1. This license grants the end user protected use for wireless transmission at the designated frequency.
2. This license will designate a unique "call sign" for each end user.

C. Transmitter and receiver shall comply with Part 15 and Part 90 of FCC rules, as follows:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

D. System shall be installed in compliance with local and state authorities having jurisdiction.

E. Unauthorized changes or modifications to the equipment will void the Owner's authority to operate the equipment.

1.8 DELIVERY STORAGE AND HANDLINE

A. Deliver all components to the site in the manufacturer's original packaging.
B. Packaging shall contain manufacturer's name and address, product identification number, and other related information.

1.9 PROJECT SITE CONDITIONS

A. Verify that a PC having the specified minimum system requirements will be available for use in programming the WTG. See 2.4 below for system requirements

PART 2 – PRODUCTS

2.1 MANUFACTURER

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. Primex Wireless, Inc.

2.2 SYSTEM DESCRIPTION

A. The system shall provide wireless time using GPS and is synchronized to UTC. Each WTG and every other component in the system shall use both precise time and synchronized time.

B. The WTG system shall provide a tone at pre-defined times to an Owner-furnished public address system. The tone and relay shall actuate all devices programmed to operate on receipt of the tone.

C. Timing and operation of the WTG system shall be controlled by software provided by system manufacturer, housed in the transmitter and programmed by an Owner-furnished PC.

D. The system shall not require wiring from the transmitter to the WTG. Initially and at scheduled intervals, the WTG receives the time data and command packets from the transmitter. Using that information, the WTG can send an audio tone to the intercom paging system.

E. The transmitter shall continuously broadcast (transmit) a time data packet and command packets to the WTG. The transmitter shall operate on FCC licensed frequencies that have optimal building penetration and that are regulated by the FCC to minimize interference on the selected channel.

F. The GPS unit shall receive the precise time via satellite from its vantage point with a view of the sky' and continuously provide this precise time to the transmitter.

G. The system shall incorporate fail-safe design so that failure of any component shall not cause failure of the system. Upon restoration of power or repair of failed component, the system shall resume normal operation without the need to reset the system or any component thereof.

H. The system must operate in accordance with a “Radio Station Authorization” Form FCC 601 – LM, granted by the Federal Communications Commission (FCC). This license will be issued to and held by the end user.

2.2 SEQUENCE OF OPERATION

A. WTG Operation: When the WTG receives a signal from the transmitter it shall generate a tone and relay closure to actuate the devices that have been predetermined to operate upon receipt of that tone and closure.

2.3 WIRELESS TONE GENERATOR

A. Primex Wireless Model XRA367, WTG, complete with scheduling software, cables, transceivers, and antenna required for complete installation.

B. Size: Approximately 7-1/4 inches wide by 5 inches long by 1-1/2 inches (32mm) high, not including antenna.

C. WTG shall be housed in a black plastic case.

D. 9 volt switching power supply (fed from 120 volt line)

E. Switching contacts "Form D", two sets: one normally open, one normally closed.

F. Contact ratings: 4 amp, 1/6 hp, 125v, 250v, AC; 4.4 amps, 20 volts DC.

G. DC Break ratings: 30 watt maximum, 1 amp, 30 volts, DC; 2.4 amps, 125 volts DC.

H. Audio Output: Isolation transformer with center tap, 600/150 ohms output impedance.

I. Variable output and line level.

J. Relay output.

K. Test and reset buttons.

L. Signal indicator.

M. 25 switch identification codes.

N. Selectable channels: 16.

O. 96 programmable events with 7 day selectable operations.

P. 12 Selectable tone/closure length for each event.

Q. Selectable daylight saving time bypass.

R. Selectable automatic channel scanning.

S. Computer programmable through transmitter, with automatic backup, and schedule changes which easy to make.

T. Switching information stored in non-volatile memory in the transmitter and broadcast at regular intervals. Each switch retains its instructions in non-volatile memory.

2.4 SOFTWARE

A. Provide Primex Wireless Event Scheduler Pro software for installation and programming by Owner, compatible with the following PC operating systems:

1. Windows 95 with Internet Explorer 5.01 Service Pack 2.
2. Windows 98.
3. Windows ME.
4. Windows NT with Service Pack 6a, Internet Explorer 5.01 Service Pack 2, and valid administrator rights.
5. Windows 2000 with valid administrator rights.
6. Windows XP with valid administrator rights.
7. Software shall be in form of a CD, suitable for operation in standard CD-ROM drives.
8. Provide connecting cables for a completely operational system.

2.6 TRANCEIVERS

A. Transmission:

1. Frequency range: 902 MHz – 923 MHz.
2. Peak power consumption: 200mA typical.
3. Sensitivity: -113 dBm.
4. Range: 200ft. + (indoor-environment dependent).
5. Operating Temperature Range: -40^{o} – 176^{o}F.
6. Humidity: 10% - 90%.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that construction is complete in spaces to receive equipment and those rooms are clean, dry, and permanent air conditioning systems are operating.

B. Verify that 120 volt electrical outlet is located within 6 feet of location of WTG, and that outlet is operational and properly grounded.

C. Verify that a compatible PC, meeting requirements specified above, is available for dedicated use during software installation and system testing.

3.2 INSTALLATION

A. Furnish all equipment necessary for a complete and operational system

B. Install the WTG in location indicated, and secure to base using fasteners of type recommended by manufacturer, and suitable for the surface to which it is attached.

C. Align the antenna vertically.

D. Verify that the channel selector on the outside of the WTG matches the selected channel on the transmitter.

E. Verify the switch ID selector on the outside of the WTG matches the selected switch ID number on the scheduling software.

F. Remove the smaller cover, then the larger cover from the unit for access to the selector switches. Set the dip switches as required for daylight savings time adjustment (if applicable).

G. Adjust WTG volume as required.

H. Confirm proper installation of the WTG and check volume by holding down the test function button.

I. Press the "reset" button to effect any changes in settings.

J. Relay output: If required, connect the relay output to the devices to be controlled. Confirm compatibility between relay output and devices.

K. Connect the WTG to a standard 120 volt outlet.

L. Confirm that the green LED is flashing, to indicate that the WTG is receiving a signal from the transmitter.

3.3 ADJUSTING

A. Prior to final acceptance, inspect each item, adjust as required, modify the software as directed, and replace parts which are found defective.

3.4 DEMONSTRATION

A. Provide training to Owner's representative on installing the software, adjusting and programming the transmitter, setting and adjusting WTG and routine maintenance.

3.5 PROTECTION

A. Protect finished installation until final acceptance of the project.

END OF SECTION 16735

SECTION 16780 – VIDEO SECURITY SYSTEM

PART 1- GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fixed position camera systems. Provide the system as shown on the drawings and described in the specifications with no substitutions.

1.3 SYSTEM DESCRIPTION

A. Provide a digital video security system with fixed cameras where indicated on the plans.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data: For each component specified, including detailed manufacturer's specifications. Include data on features, ratings, and performance. Include dimensioned plan and elevation views of components and enclosures. Show access and work-space requirements.

C. Wiring Diagrams: Detailing internal and interconnecting wiring for power, signal, and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.

D. Maintenance Data: For camera systems to include in the maintenance manuals specified in Division 1. Include the following:
   1. Detailed operating instructions.
   2. Routine maintenance instructions.
   3. Lists of recommended spare parts and replacement components from the manufacturer.

E. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who is an authorized representative of the manufacturer. Installer shall be certified by the manufacturer of the

camera system.

B. Manufacturer Qualifications: Engage firms with 10 years minimum experience in manufacturing systems and equipment similar to those indicated for this Project and that have a record of successful in-service performance.

C. Listing and Labeling:

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
3. Comply with FCC regulations, including Parts 15, 17, 25, and 76.

D. Comply with NFPA 70.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the OWNER of other rights the OWNER may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the CONTRACTOR under requirements of the Contract Documents.

B. Special Warranty: A written warranty, executed by manufacturer and signed by both the manufacturer and Installer, agreeing to repair or replace components of the camera systems that fail in materials or workmanship within the specified warranty period.

1. Warranty Period: 1 year from date of Substantial Completion.

PART 2- PRODUCTS

2.0 GENERAL

A. All equipment and materials used shall be standard components that are regularly manufactured and used in the manufacturer’s system.

B. All systems and components shall have been thoroughly tested and proven in actual use. Exposed parts for cameras and housings to be used outdoors shall be stainless steel or aluminum. No painted steel.

C. All systems and components shall be provided with the availability of a toll-free (U.S. and Canada), 24-hour technical assistance from the manufacturer. The technical assistance shall allow for immediate technical assistance for either the dealer/installer or the end user at no charge for as long as the product is installed.

D. The manufacturer on warranty and non-warranty items shall guarantee the repair and replacement of parts.

2.1 MANUFACTURERS

A. Manufacturers:

1. Pelco, Div. of Schneider Electric.
2. GE Security, Inc.

2.2 DIGITAL VIDEO RECORDER

The Digital Video Recorder with Ethernet connectivity shall require minimal training for the end user. The unit shall operate like a conventional multiplexer and VCR with local display monitor for live and playback viewing while the system continues to record new images. It shall be an integrated security system, capable of time division multiplexing multiple cameras and storing their digitized and compressed images on integral hard disk drives for fast search and retrieval either locally at the unit, or from a remote workstation using a Graphical User Interface (GUI).

A. The DVR shall meet or exceed the following design and performance specifications:

1. Recording: 16 analog video inputs at 30 images per second at 4CIF resolution.
2. Playback: 32 simultaneous streams while supporting 10 simultaneous queries.
3. Expandability: Up to 48 analog video inputs at 30 images per second at 4CIF resolution.
4. Fault tolerance: RAID 5 disk management across multiple hard disk drives. DVR shall be capable of simultaneously meeting the preceding specifications during an error or array rebuild. Drives shall be hot swappable and automatically configured when installed.
5. Power Supplies: 120VAC redundant supplies.
6. Alarm recording: Continuous scheduled alarm/event and motion recording.
    a. Pre- and post-alarm recording.
        i. Programmable on a per channel basis.
7. Video Signing: Digitally signing before being written to the hard disk drives.
8. Mounting: 19” EIA rack.
9. Storage: 1000 Gigabytes of video.
10. Certifications and ratings:
    a. FCC, class A
    b. CE, class A
    c. UL Listed
11. DVR shall be PELCO DVR5104 or approved equal

2.3 CAMERA SYSTEM

The fixed cameras shall be indoor/outdoor, fixed mini dome system with a built-in 100BASE-TX network interface for live streaming MPEG-4 video at 30 images per second. Cameras will be powered by Power of Ethernet (PoE) (IEEE802.3af) and have thermostatically controlled heaters. Cameras shall have alarm inputs and outputs.

A. The camera systems shall meet or exceed the following design and performance specifications:

1. Ports: RJ-45 connector for 100BASE-TX
2. Power consumtion:
   a. Without heater: <7.5 Watts
   b. With heater: < 13 Watts
3. Compression: MPEG-4
4. Resolution: 4CIF, 720(H) x 540(V)
5. Dynamic Range 102 dB typical, 120 dB maximum
6. Minimum Illumination:
   a. Color(day): 0.8 lux
   b. B-W(night): 0.8 lux
7. Gain Control: Auto (33 dB minimum)
8. Day/Night Operation:
   a. Day: Infrared cut filter
   b. Night: No filter
9. Alarm Input: 10 VDC max, 5 mA max
10. Alarm Output: 15 VDC Max, 75 mA max
11. Operating temperature -50^0 to 122^0F; de-icing to 25^0F
12. Angle of View
    a. Horizontal: 100.4^0 to 31.6^0
    b. Diagonal: 131.6^0 to 39.6^0
    c. Vertical: 72.8^0 to 23.8^0
13. Certification and ratings:
    a. CE, Class B
    b. FCC, Class B
    c. UL Listed
    d. IEEE802.3af compliant
    e. NEMA Type 4X and IP66 standard
14. Provide PELCO IP110 fixed cameras or approved equal.

2.4 NETWORK SWITCH

The network switch shall provide 24-port 10/100, 10/100/1000 ports and Power over Ethernet.

A. The network switch shall meet or exceed the following design and performance specifications:

1. Connections
   a. 100BASE-TX: 24 RJ-45
   b. 1000BASE-T : 4 RJ-45
   c. Cabling: CAT 6
2. Power over Ethernet
   a. Power per port: 15 Watts min.
   b. Power output all ports: 180 Watt min.
3. Switching Capacity: 12.8 Gbps, Non-Blocking
4. Mounting: 19” rack mountable
5. Operating Temp: 32^0 to 104^0F

5. Power: 120 VAC
6. Standards:
    a. IEEE801.3 10BASE-T Ethernet
    b. IEEE802.3u 100BASE0TX Fast Ethernet,
    c. IEEE802.3ab 1000BASE-T Gigabit Ethernet
    d. IEEE802.3z Gigabit Ethernet,
    e. IEEE802.3x Flow Control
    f. IEEE802.3 ad LACP
    g. IEEE802.3af POE
    h. IEEE802.1d STP
    i. IEEE802.1Q/p VLAN
    j. IEEE802.1w Rapid STP
    k. IEEE802.1s Multiple STP
    l. IEEE802.1x Port Access Authentication
7. Provide LINKSYS SFE2000P or approved equal.

2.5 OTHER COMPONENTS

Other components of the video security system not described elsewhere in the specification include: equipment rack, cable connectors, camera mounting kits, rack accessories. Provide components that are compatible with the approved video cameras and digital video recorder manufacturer and authorized by the manufacturer where applicable. After market housings, etc, may not be acceptable if they do not provide the functionality, weather proof capabilities, heater, blower, etc. of the specified units. Provide products identified in the plans or approved equal.

2.5 MANUFACTURER'S WARRANTY

Repair or replacement of defective parts shall be for a period of one (1) year from the date of substantial completion, including continuous motion modes.

2.6 CERTIFICATIONS AND RATINGS

A. CE and FCC, Class B (models with color cameras only)
B. UL Listed
C. UL Listed to Canadian safety standards
D. Meets NEMA Type 4X and IP66 standards
E. Tested in accordance with MIL-STD 810D as follows:
    1. Shock test; Section 516.4
    2. Humidity test; Sections 520.1 and 507.3
    3. Vibration test; Section 514.4
F. ASTM Shipping Standard
G. ISTA Shipping Standard

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with requirements for installation tolerances, power characteristics, and other conditions affecting performance of camera systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Install cameras in the locations indicated on the Plans.

C. Provide an experienced, certified installer to set up each camera and the digital video recorder. Coordinate with the owner to set up the camera's pan, tilt, and zoom at each location.

D. Program the DVR to provide all of its features to the owner. Program all functionality and features of the system. Coordinate with owner to determine video retention times, resolution, and images per second. Program record on motion per owner requirements. Provide all software and additional equipment required to provide an operational system. Aim and adjust camera positioning as necessary.

E. Provide at least 8 hours of training to owner's staff on basic setup, troubleshooting, programming and other standard training topics.

F. Set up the system per the owner's requirements two weeks prior to substantial completion. Adjust the cameras, motion detection parameters, and other features and functions per the owner's requests and to eliminate false alarms during this two week period.

END OF SECTION 16780

SECTION 16851 – FIRE ALARM

PART 1 - GENERAL

1.1. SUMMARY

A. This Section covers fire alarm systems, including initiating devices, notification appliances, controls, and supervisory devices.

B. Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.

C. The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:

1. Fire alarm system detection and notification operations.
2. Control and monitoring of smoke control equipment, door hold-open devices, fire suppression systems, emergency power systems, and other equipment as indicated in the drawings and specifications.

1.2. DEFINITIONS

A. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.3. SCOPE OF WORK

A. The drawings and specifications detail the construction of a complete fire alarm system for the Gastineau Elementary School. All existing fire alarm equipment and devices shall be removed. An entirely new system shall be provided as shown and specified herein. This work incorporates all devices and equipment necessary for a fully functional fire alarm system. In addition, all necessary fire alarm device testing and code compliance requirements detailed elsewhere in the drawings and specifications shall be performed.

1.4. ACCEPTABLE EQUIPMENT AND SERVICE PROVIDERS

A. 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. Simplex Grinnell

B. Being listed as an acceptable Manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications.

C. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.

D. The equipment and service provider shall be a nationally recognized company specializing in fire alarm and detection systems. This provider shall employ factory trained and NICET certified technicians. The equipment and service provider shall have a

minimum of 10 years experience in the fire protective signaling systems industry.

1.5. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

B. The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply:

1. Division 16: "Basic Electrical Materials and Methods."
2. Division 16: "Conductors and Cables."
3. Division 16: "Raceways and Boxes."
4. Division 16: "Wiring Devices."
5. Division 16: "Grounding."
6. Division 16: "Disconnect Switches and Circuit Breakers."

C. The system and all associated operations shall be in accordance with the following:

1. Requirements of the following Model Building Code: IBC, 2006 Edition
2. NFPA 72, National Fire Alarm Code, 2002 Edition
3. NFPA 70, National Electrical Code, 2008 Edition
4. Local Jurisdictional Adopted Codes and Standards
5. ADA Accessibility Guidelines

1.6. SYSTEM DESCRIPTION

A. General: Provide a complete, non-coded addressable, microprocessor-based fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein. Provide multiplexed signal transmission dedicated to fire alarm service only.

B. The fire alarm system shall consist of all necessary hardware and software programming to perform the following functions:

1. Fire alarm system detection and notification operations.
2. Control and monitoring of smoke control equipment, door hold-open devices, fire suppression systems, emergency power systems, and other equipment as indicated in the drawings and specifications.

C. System Supervision: Automatically detect and report open circuits, shorts, and grounds of wiring for all initiating device, signaling line, and notification-appliance circuits.

D. Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory. System shall be capable of storing dual configuration programs with one

active and one in reserve. Panel shall be capable of full system operation during a new configuration download.

E. History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.

F. Recording of Events: Record all alarm, supervisory, and trouble events by means of system printer. The printout shall include the type of signal (alarm, supervisory, or trouble) the device identification, date and time of the occurrence. The printout differentiates alarm signals from all other printed indications.

G. Wiring/Signal Transmission:

1. Transmission shall be hard-wired, using separate individual circuits for each zone of alarm operation as required or addressable signal transmission, dedicated to fire alarm service only.
2. System connections for initiating device circuits shall be Class B, Style C, signaling line circuits shall be Class B, Style 4 and notification appliance circuits shall be Class B, Style Y.
3. Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.

H. Remote Access:

1. FACP shall have the capability to provide Remote Access through a Dial-Up Service Modem.
2. A personal computer or technician's laptop, configured with terminal emulation software shall have the ability to access the FACP for diagnostics, maintenance reporting and information gathering.
3. FACP shall have the capability to provide third party access through a serial interface connection and be agency listed for specific interfaces and for the purpose.
4. FACP shall have the capability to provide remote access via an Internet/Intranet Interface. The Internet interface shall provide an alternative access to system information using the familiar interface of a standard Internet browser. A remotely located fire professional can use this access to analyze control panel status during non-alarm conditions and can also use this information to assist local fire responders during alarm conditions.

I. Required Functions: The following are required system functions and operating features:

1. Priority of Signals: Fire alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Priority Two, Supervisory and Trouble events have second-, third-, and fourth-level priority, respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.
2. Noninterfering: An event on one zone does not prevent the receipt of signals from any other zone. All zones are manually resettable from the FACP after the initiating

device or devices are restored to normal. The activation of an addressable device does not prevent the receipt of signals from subsequent addressable device activations.

3. Transmission to an approved Supervising Station: Automatically route alarm, supervisory, and trouble signals to an approved supervising station service provider. Coordinate with the Juneau School District to connect to the monitoring system used at each school.

4. Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP and the remote annunciator, indicating the type of device, the operational state of the device (i.e alarm, trouble or supervisory) and shall display the custom label associated with the device.

5. General Alarm: A system general alarm shall include:

   a) Indication of alarm condition at the FACP and the annunciator(s).

   b) Identification of the device /zone that is the source of the alarm at the FACP and the annunciator(s).

   c) Operation of audible and visible notification appliances until silenced at FACP.

   d) Closing doors normally held open by magnetic door holders.

   e) Shutting down supply and return fans serving zone where alarm is initiated.

   f) Closing smoke dampers on system serving zone where alarm is initiated.

   g) Transmission of signal to the supervising station.

   h) Initiation of elevator Phase I functions (recall, shunt trip, illumination of indicator in cab, etc.) in accordance with ASME/ANSI A17.1, when specified detectors or sensors are activated, as appropriate.

6. Supervisory Operations: Upon activation of a supervisory device such as a fire pump power failure, low air pressure switch, and tamper switch, the system shall operate as follows:

   a) Activate the system supervisory service audible signal and illuminate the LED at the control unit and the remote annunciator.

   b) Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.

   c) Record the event in the FACP historical log.

   d) Transmission of supervisory signal to the supervising station.

   e) Restoring the condition shall cause the Supervisory LED to clear and restore the system to normal.

7. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible alarm signals shall cease operation.

8. Visual notification appliances shall remain activated upon silencing-switch operation until the system is reset.

9. System Reset: all devices are manually resettable from the FACP after initiating

devices are restored to normal.

a) The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-alarming the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."

b) Should an alarm condition continue, the system will remain in an alarmed state.

10. A manual evacuation (drill) switch shall be provided to operate the notification appliances without causing other control circuits to be activated.

11. WALKTEST: The system shall have the capacity of 8 programmable pass code protected one person testing groups, such that only a portion of the system need be disabled during testing. The actuation of the "enable one person test" program at the control unit shall activate the "One Person Testing" mode of the system as follows:

a) The city circuit connection and any suppression release circuits shall be bypassed for the testing group.

b) Control relay functions associated with one of the 8 testing groups shall be bypassed.

c) The control unit shall indicate a trouble condition.

d) The alarm activation of any initiating device in the testing group shall cause the audible notification appliances assigned only to that group to sound a code to identify the device or zone.

e) The unit shall automatically reset itself after signaling is complete.

f) Any opening of an initiating device or notification appliance circuit wiring shall cause the audible signals to sound for 4 seconds indicating the trouble condition.

g) Removal of an alarm-initiating device or a notification appliance initiates the following:

1. A “trouble” signal indication at the FACP and the annunciator for the device involved.
2. Recording of the event by the system printer.
3. Transmission of trouble signal to remote alarm receiving station.

12. All initiating device circuits and signaling line circuits shall not exceed 80 percent of circuit capacity. Provide additional panel capacity as necessary in order to meet this requirement.

J. Analog Smoke Sensors:

1. Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.

2. Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.

3. Programmable Sensitivity: Photoelectric Smoke Sensors shall have several selectable sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP.

4. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be viewed on a CRT Display or printed for annual recording and logging of the calibration maintenance schedule.

5. The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to automatically indicate when a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate if a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a sensor approaching dirty without creating a trouble in the system. If this indicator is ignored and the second level is reached, a "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported . The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit.

6. The FACP shall continuously perform an automatic self-test on each sensor that will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.

7. Multi-Sensors shall combine photoelectric smoke sensing and heat sensing technologies. An alarm shall be determined by either smoke detection, with selectable sensitivity from 0.2 to 3.7 %/ft obscuration; or heat detection, selectable as fixed temperature or fixed with selectable rate-of-rise; or based on an analysis of the combination of smoke and heat activity.

8. Programmable bases. It shall be possible to program relay and sounder bases to operate independently of their associated sensor.

9. Magnet test activation of smoke sensors shall be distinguished by its label and history log entry as being activated by a magnet.

K. Smoke Detectors: A maintenance and testing service providing the following shall be included with the base bid:

1. Biannual sensitivity reading and logging for each smoke sensor.

2. Scheduled biannual threshold adjustments to maintain proper sensitivity for each smoke sensor.

3. Threshold adjustment to any smoke sensor that has alarmed the system without the presence of particles of combustion.

4. Scheduled biannual cleaning or replacement of each smoke detector or sensor within the system.
5. Semi-annual functional testing of each smoke detector or sensor using the manufacturer's calibrated test tool.
6. Written documentation of all testing, cleaning, replacing, threshold adjustment, and sensitivity reading for each smoke detector or sensor device within the system.
7. The initial service included in the bid price shall provide the above listed procedures for a period of one year after owner acceptance of the system.

L. Audible Alarm Notification: By horns in areas as indicated on drawings.

M. Fire Suppression Monitoring:

1. Water flow: Activation of a water flow switch shall initiate general alarm operations.
2. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.
3. WSO: Water flow switch and sprinkler valve tamper switch shall be capable of existing on the same initiating zone. Activation of either device shall distinctly report which device is in alarm on the initiating zone.

N. Power Requirements

1. The control unit shall receive AC power via a dedicated fused disconnect circuit.
2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal AC power in a normal supervisory mode for a period of 24 hours with 5 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.
3. All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control unit.
4. The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green "power on" LED shall be displayed continuously at the user interface while incoming power is present.
5. The system batteries shall be supervised so that a low battery or a depleted battery condition, or disconnection of the battery shall be indicated at the control unit and displayed for the specific fault type.
6. The system shall support NAC Lockout feature to prevent subsequent activation of Notification Appliance Circuits after a Depleted Battery condition occurs in order to make use of battery reserve for front panel annunciation and control.
7. The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.
8. Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

1.7. SUBMITTALS

A. General: Submit the following according to Conditions of Contract.

1. Product data: For each type of product. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.
2. Wiring diagrams from manufacturer. Differentiate between manufacturer-installed and field-installed wiring.
3. Shop drawings showing system details including location of FACP, all devices, circuiting and details of graphic annunciator. Provide schematic diagrams indicating how the individual devices are to be wired into the system. Provide the type and gauge of wire that is to be used to wire the system. This shall be performed by a NICET Level III certified technician.
4. System power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate in accordance with the prescribed backup time periods and under all voltage conditions per UL and NFPA standards. This shall be performed by a NICET Level III certified technician.
5. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of IDC, SLC, NAC, relay, sensor, and auxiliary control circuits.
6. Operating instructions for FACP.
7. Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type product, including all features and operating sequences, both automatic and manual. Provide the names, addresses, and telephone numbers of service organizations.
8. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.
9. Record of field tests of system.
10. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.
11. On a set of plan sheets showing floor plans with all devices shown in their installation locations a point-to-point wiring diagram indicating the end of line (EOL) location, the order that the devices are connected into the system, and the zone they are included in. This shall be performed by a NICET Level III certified technician.
12. Provide a riser diagram with the quantity and type of devices per circuit/zone. This shall be performed by a NICET Level III certified technician.
13. Provide quantity of signaling devices, current consumption, and EOL voltage for each circuit. Determine candela requirements for all strobes and horn strobes. Show candela rating on wiring diagram. This shall be performed by a NICET Level III certified technician.

14. Provide six sets of bound, indexed, and tabbed fire alarm submittals.

15. Provide a complete list of all device “names” that will be used on the annunciator panels. Show names on plan sheets so OWNER can verify appropriate names. Change names as directed by OWNER.

B. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions, if required, to make clarifications or revisions to obtain approval.

1.8. QUALITY ASSURANCE

A. Installer Qualifications: A factory authorized installer is to perform the work of this section.

B. Each and every item of the Fire Alarm System shall be listed under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

C. Source Limitations: Obtain all fire alarm system components through one source from a single manufacturer.

1.9. MAINTENANCE SERVICE

A. Maintenance Service Contract: Provide maintenance of fire alarm systems and equipment for a period of 12 months, using factory-authorized service representatives.

B. Basic Services: Systematic, routine maintenance visits on a quarterly basis at times scheduled with the Owner. In addition, respond to service calls within 24 hours of notification of system trouble. Adjust and replace defective parts and components with original manufacturer's replacement parts, components, and supplies.

C. Additional Services: Perform services within the above 12-month period not classified as routine maintenance or as warranty work when authorized in writing. Compensation for additional services must be agreed upon in writing prior to performing services.

D. Renewal of Maintenance Service Contract: No later than 60 days prior to the expiration of the maintenance services contract, deliver to the Owner a proposal to provide contract maintenance and repair services for an additional one-year term. Owner will be under no obligation to accept maintenance service contract renewal proposal.

1.10. EXTRA MATERIALS

A. General: Furnish extra materials, packaged with protective covering for storage, and identified with labels clearly describing contents as follows:

1. Break Rods for Manual Stations: Furnish quantity equal to 15 percent of the number of manual stations installed; minimum of 6 rods.

2. Notification Appliances: Furnish quantity equal to 10 percent of each type and number of units installed, but not less than one of each type.

3. Smoke Detectors or Sensors, Fire Detectors, and Flame Detectors: Furnish quantity equal to 10 percent of each type and number of units installed but not less than one of each type.
4. Detector or Sensor Bases: Furnish quantity equal to 2 percent of each type and number of units installed but not less than one of each type.
5. Circuit Interface Modules: Furnish quantity equal to 10 percent of each type and number of units installed, but not less than one of each type.
6. Device Wire Guards: Furnish quantity equal to 10 percent of number of units installed, but not less than one of each type.
7. Tamper Alarm Shields: Furnish quantity equal to 10 percent of each type and number of units installed, but not less than one of each type.
8. Fire Alarm Panel Keys: Furnish five sets of keys for each type of panel installed at each project location.
9. Magnetic Testing Device: Furnish quantity equal to 10 percent of each type of smoke detector and number of units installed, but not less than one of each type.

PART 2 – PRODUCTS

2.1. FIRE ALARM CONTROL PANEL (FACP)

A. General: Comply with UL 864, "Control Units and Accessories for Fire Alarm Systems".

B. The following FACP hardware shall be provided:

1. Power Limited base panel with red cabinet and door, 120 VAC input power.
2. 500 point capacity where (1) point equals (1) monitor (input) or (1) control (output).
3. 500 points of Network Annunciation at FACP Display when applied as a Network Node.
4. From all battery charging circuits in the system provide battery voltage and ammeter readouts on the FACP LCD Display.
5. Municipal City Circuit Connection with Disconnect switch, 24VDC Remote Station (reverse polarity), local energy, shunt master box, or a form "C" contact output.
6. One Auxiliary electronically resettable fused 2A @24VDC Output, with programmable disconnect operation for 4-wire detector reset.
7. One Auxiliary Relay, SPDT 2A @32VDC, programmable as a trouble relay, either as normally energized or de-energized, or as an auxiliary control.
8. Three (3) Class B or A (Style Y/Z) Notification Appliance Circuits (NAC; rated 3A@24VDC, resistive).
9. Four (4) form "C" Auxiliary Relay Circuits (Form C contacts rated 2A @ 24VDC, resistive), operation is programmable for trouble, alarm, supervisory of other fire response functions. Relays shall be capable of switching up to ½ A @ 120VAC, inductive.
10. The FACP shall support (6) RS-232-C ports and one service port.

11. Remote Unit Interface: supervised serial communication channel for control and monitoring of remotely located annunciators and I/O panels.
12. Programmable DACT for either Common Event Reporting or per Point Reporting.
13. Service Port Modem for dial in passcode access to all fire control panel information.

C. Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control unit, provide exactly matching modular unit enclosures. Identify individual components and modules within cabinets with permanent labels.

D. Alphanumeric Display and System Controls: Panel shall include an 80 character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands. Specifications:

1. The system shall include the necessary hardware to provide expanded content, multi-line, operator interface displays. The expanded content multi-line displays shall be Quarter-VGA (QVGA) or larger and be capable of supporting a minimum of 854 standard ASCII characters to minimize or eliminate the levels of navigation required for access to information when responding to critical emergencies and abnormal system conditions. The QVGA operator interface shall provide operator prompts and six context sensitive soft-keys for intuitive operation.

a) Expanded content, multi-line operator interfaces shall be capable of providing the following functions:

(a) Activity display choices for:

(i) First 8 Events.

(ii) First 5 Events and Most Recent Event (with first and most recent event time and date stamps).

(iii) First Event and Most Recent Event (with first and most recent event time and date stamps).

(iv) General Event Status (alarm, priority 2, supervisory, or trouble in system)

(v) Site Plan

(b) Equal or hierarchal priority assignment. In systems with two or more operator interfaces, each operator interface shall be programmable to allow multiple operator interfaces to have equal operation priority or to allow hierarchal priority control to be assigned to individual operator interfaces (locations).

(c) Up to 50 custom point detail messages for providing additional point specific information in detailed point status

screens.

(d) Bitmap file import for operator interface display of site plan and background watermark images.

2.2. REMOTE CRTS, PC ANNUNCIATOR AND PRINTERs

A. Fire Alarm Control Unit shall be capable of operating remote CRT's and/or printers; output shall be ASCII from an RS-232-C connection with an adjustable baud rate.

B. Fire Alarm Control Unit shall be capable of operating a PC Annunciator which provides status annunciation and limited system control using a convenient and familiar Microsoft Windows7 Pro operating system based interface. PC Annunciator shall provide the following functions:

1. Login/logout password protection with time duration selectable automatic logout.
2. Display Alarm, Supervisory, Priority 2, and Trouble conditions with numerical tallies for each.
3. Display first and last alarms.
4. Different event types have separate visible indicators with a common audible indicator.
5. Event logs can be searched and printed.
6. View and/or print alarm status reports and service reports (printing requires an available local or network printer).
7. Alarm Silence; System Reset; and Priority 2 Reset.
8. Global and individual point acknowledge.
9. Set system time and date and clear event log.
10. Individual point access for control or parameter revisions.
11. WALKTEST system test is supported for service convenience.

C. Each RS-232-C port shall be capable of supporting and supervising a remote Printer; the FACP shall support as many as two (2) remote displays. The Fire Alarm Control Panel shall support five (5) RS-232-C ports.

2.3. REMOTE ANNUNCIATOR - LCD TYPE

A. Provide a remote LCD annunciator with the same “look and feel” as the FACP operator interface. The remote LCD annunciator shall use the same primary acknowledge, silence, and reset keys; status LEDs and LCD display as the FACP.

B. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with four (4) programmable control switches and associated LEDs.

C. Under normal conditions the LCD shall display a “SYSTEM IS NORMAL” message and the current time and date.

D. Should an abnormal condition be detected the appropriate LED (alarm, supervisory, or trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.

E. The LCD shall display the following information relative to the abnormal condition of a point in the system:

1. 40 character custom location label.
2. Type of device (e.g., smoke, pull station, waterflow)
3. Point status (e.g., alarm, trouble).

F. Operator keys shall be key switch enabled to prevent unauthorized use. The key shall only be removable in the disabled position. Acknowledge, silence, and reset operations shall be the same as the FACP.

2.4. SYSTEM PRINTER

A. General: Provide an inkjet or laser jet printer as an integral part of the fire alarm system at Gastineau Elementary. Coordinate location with OWNER. Provide shelf and associated hardware to mount the printer on.

2.5. EMERGENCY POWER SUPPLY

A. General: Components include battery, charger, and an automatic transfer switch.

B. Battery: Sealed lead-acid or nickel cadmium type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm notification devices in alarm mode for a period of 5 minutes.

C. Battery Charger: Solid-state, fully automatic, variable-charging rate type. Provide capacity for 150 percent of the connected system load while maintaining batteries at full charge. If batteries are fully discharged, the charger recharges them completely within four hours. Charger output is supervised as part of system power supply supervision.

D. Integral Automatic Transfer Switch: Transfer the load to the battery without loss of signals or status indications when normal power fails.

2.6. ADDRESSABLE MANUAL PULL STATIONS

A. Description: Addressable single- or double-action type, red LEXAN, with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units. Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.

B. Protective Shield: Where required, as indicated on the drawings, provide a tamperproof, clear LEXAN shield and red frame that easily fits over manual pull stations. When shield is lifted to gain access to the station, a battery powered piercing warning horn shall be

activated. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 95dB at 1 feet and shall be powered by a 9 VDC battery.

2.7. SMOKE SENSORS

A. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:

1. The address for each smoke detector shall be programmed in the base of each smoke detector, not in the device itself. A device shall be able to be replaced without having to perform any programming.
2. Factory Nameplate: Serial number and type identification.
3. Operating Voltage: 24 VDC, nominal.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.
5. Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.
6. Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.
7. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
8. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.
9. The sensor's electronics shall be immune from nuisance alarms caused by EMI and RFI.
10. Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.
11. Removal of the sensor head for cleaning shall not require the setting of addresses.

B. Type: Smoke sensors shall be of the photoelectric type.

C. Bases: Relay output, sounder and isolator bases shall be supported alternatives to the standard base.

2.8. HEAT SENSORS

A. The address for each heat detector shall be programmed in the base of each heat detector,

not in the device itself. A device shall be able to be replaced without having to perform any programming.

B. Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.

C. Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.

D. Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and programmable to operate at 135-deg F or 155-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACP for either 15-deg F or 20-deg F per minute.

E. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.

F. Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.

G. Removal of the sensor head for cleaning shall not require the setting of addresses.

2.9. ADDRESSABLE CIRCUIT INTERFACE MODULES (CIM)

A. Addressable Circuit Interface Modules: Provide modules as integrated input / output devices for controlling and monitoring non-addressable fire alarm devices. Arrange to monitor or control one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of waterflow, valve tamper, hood exhaust systems, non-addressable devices, and for shut down of AHU systems. All new smoke and heat detectors, duct detectors, and manual pull stations shall be addressable.

B. Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the initiating device circuit, signaling line circuit or a separate two wire pair running from an appropriate power supply, as required.

C. All Circuit Interface Modules shall be supervised and uniquely identified by the control panel. Module identification shall be transmitted to the control panel for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the FACP. The LEDs shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.

2.10. ALARM NOTIFICATION APPLIANCES

A. Horn: Piezoelectric type horn shall be listed to UL 464. The horn shall have a minimum sound pressure level of 85 dBA at 10 feet @ 24VDC. The horn shall mount directly to a standard single gang, double gang or 4" square electrical box, without the use of special

adapter or trim rings.

B. Visible/Only: Strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. V/O appliances shall be provided with minimum flash intensity of 75cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific Visible/Only appliance. Provide horn strobes with candela rating as required to meet NFPA 72 requirements for the location the strobe is being installed.

C. Audible/Visible: Provide minimum flash intensity 75cd horn strobes. Provide horn strobes with candela rating as required to meet NFPA 72 requirements for the location the strobe is being installed. Combination Audible/Visible (A/V) Notification Appliances shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. Provide a label inside the strobe lens to indicate the listed candela rating of the specific strobe. The horn shall have a minimum sound pressure level of 85 dBA at 10 feet @ 24VDC. The audible/visible enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings.

D. Notification Appliance Circuit provides synchronization of strobes at a rate of 1Hz and operates horns with a Temporal Code Pattern operation. The circuit shall provide the capability to silence the audible signals, while the strobes continue to flash, over a single pair of wires. The capability to synchronize multiple notification appliance circuits shall be provided.

E. Accessories: The contractor shall furnish any necessary accessories.

2.11. DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Listed and labeled under UL 864 and NFPA 72.

B. Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP panel, and automatically captures one or two telephone lines and dials a preset number for a remote central station. When contact is made with the central station(s), the signal is transmitted. The unit supervises up to two telephone lines. Where supervising two lines, if service on either line is interrupted for longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. When telephone service if restored, the unit automatically reports that event to the central station. If service is lost on both telephone lines, the local trouble signal is initiated.

C. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.

D. Self Test: Conducted automatically every 24 hours with report transmitted to the central station.

PART 3 – EXECUTION

3.1. INSTALLATION, GENERAL

A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.

B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:

1. Factory trained and certified personnel.
2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.
3. Personnel licensed or certified by state or local authority.

3.2. EQUIPMENT INSTALLATION

A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.

B. Equipment Removal: Disconnect and remove the existing fire alarm equipment and devices as they are replaced during construction. Restore damaged surfaces as equipment and devices are replaced and installed. Package operational fire alarm and detection equipment that has been removed and deliver to the OWNER. Remove from the site and legally dispose of the remainder of the existing material. Restore all damaged surfaces.

C. Water-Flow and Valve Supervisory Switches: Connect for each sprinkler valve required to be supervised.

D. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.

E. Install manual station with operating handle 48 inches (1.22 m) above floor. Install wall mounted audible and visual notification appliances not less than 80 inches (2.03 m) above floor to bottom of lens and not greater than 96 inches (2.44 m) above floor to bottom of lens. Replace existing devices at their current location unless noted otherwise.

F. Ceiling-Mounted Smoke Detectors: Not less than 4 inches (100 mm) from a side wall to the near edge. On smooth ceilings, install not more than 30 feet (9 m) apart in any direction.

G. Wall-Mounted Smoke Detectors: At least 4 inches (100 mm), but not more than 12 inches (300 mm), below the ceiling.

H. Smoke Detectors near Air Registers: Install no closer than 60 inches (1520 mm)

I. Duct Smoke Detectors: Comply with manufacturer’s written instructions.

1. Verify that each unit is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
2. Install sampling tubes so they extend the full width of the duct.

J. Mount outlet box for electric door holder to withstand 80 pounds pulling force.

K. Make conduit and wiring connections to door release devices, sprinkler flow switches, sprinkler valve tamper switches, fire suppression system control panels, and duct smoke detectors. Add addressable circuit interface modules at each device.

L. Automatic Detector Installation: Conform to NFPA 72.

3.3. PREPARATION

A. Coordinate work of this Section with other affected work.

3.4. WIRING INSTALLATION

A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction, shall be as shown on the drawings, and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC). Install wiring in metal raceway according to Division 16 Section 16130 “Raceways and Boxes.” Conceal raceway except in unfinished spaces and as indicated.

B. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.

C. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.

D. Mount end-of-line device in box with last device or separate box adjacent to last device for Class "B" supervision.

3.5. FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

B. Service personnel shall be qualified and experienced in the installation inspection, testing, and maintenance of fire alarm systems, with the following qualifications:

1. Factory trained and certified on the system to be installed.
2. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified, Level II.

3. Licensed by State of Alaska to perform fire alarm installations.

C. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting.

D. Inspection:

1. Inspect equipment installation, interconnection with system devices, mounting locations, and mounting methods.

2. Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.

E. Acceptance Operational Tests:

1. Perform operational system tests to verify conformance with specifications:

a) Each alarm initiating device installed shall be operationally tested. Each device shall be tested for alarm and trouble conditions. Contractor shall submit a written certification that the Fire Alarm System installation is complete including all punch-list items. Test battery operated emergency power supply. Test emergency power supply to minimum durations specified. Test Supervising Station Signal Transmitter. Coordinate testing with Supervising Station monitoring firm/entity.

b) Test each Notification Appliance installed for proper operation. Submit written report indicating sound pressure levels at specified distances.

c) Test Fire Alarm Control Panel and Remote Annunciator.

2. Provide minimum 10 days notice of acceptance test performance schedule to Owner, and local Authority Having Jurisdiction.

F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Use NFPA 72 Forms for documentation.

H. Final Test, Record of Completion, and Certificate of Occupancy:

1. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy. Provide completed NFPA 72 Record of Completion form to Owner and AHJ.

3.6. CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.

B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound pressure levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to

the site for this purpose.

3.7. TRAINING

A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.

1. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8 hours' training.
2. Schedule training with the Owner at least seven days in advance.
3. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid.

END OF SECTION 16851