

PROJECT MANUAL

CONSTRUCTION DOCUMENTS Bid Set

**EAST PROVIDENCE
POLICE DEPT. RENOVATIONS
750 WATERMAN AVENUE
EAST PROVIDENCE, RHODE ISLAND**

JCJ PROJECT #S23036.01

June 21, 2024

JCJ ARCHITECTURE

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STANDARD INSTRUCTIONS TO BIDDERS (SHORT FORM) REQUEST FOR PROPOSALS

THESE INSTRUCTIONS ARE STANDARD FOR ALL REQUEST FOR PROPOSALS ISSUED BY THE PURCHASING DIVISION AND MAY BE DELETED, OR MODIFIED BY INDICATING SUCH CHANGE/S BY "SPECIAL INSTRUCTIONS TO BIDDERS."

1.0 RECEIPT AND OPENING OF PROPOSALS:

Sealed proposals will be received and date stamped East Providence City Hall, Controllers Office, Room 103, Attn: Procurement Specialist 145 Taunton Avenue, East Providence, Rhode Island 02914, until the time and date indicated on the Request for Proposals. No proposal received after that time will be considered. Mark outside bid envelope with item being proposed, and time and date of proposal due date.

2.0 FORM OF PROPOSAL:

Proposals must be submitted on and in accordance with the proposal forms attached hereto, blank places must be filled in as noted, no change shall be made in the phraseology of the proposal form or in the item or items mentioned therein. Additionally, the proposals must contain the name and proper address of the proposing firm, and must be signed by a responsible member of the firm with his signature and official title. Proposals, which are not complete, or contain erasures or alterations, not initiated by the signer, may be rejected. FAXED proposals will not be accepted.

3.0 SUBMISSION OF PROPOSALS:

3.1 Envelopes containing proposals must be sealed and addressed to the East Providence City Hall, Controllers Office, Room 103, Attn: Procurement Specialist 145 Taunton Avenue, East Providence, Rhode Island 02914 and must be marked with the name and address of the proposer, date and time of proposal due date, and name of item being proposed.

3.2 The Procurement Specialist will decide when the specified time has arrived to collect the proposals, and no proposal received thereafter will be considered.

3.3 Any proposer may withdraw his proposal by written request at any time prior to the advertised time for proposal due date. Telephonic proposals, amendments, or withdrawals will not be accepted. Additionally, FAXED bids will not be accepted.

3.4 No proposal may be withdrawn for a period of ninety (90) calendar days from the date and time of proposal due date. The City reserves the right to waive this requirement in order to best serve the interests of the City.

3.5 Negligence on the part of the proposer in preparing the proposal confers no rights for the withdrawal of the proposal after it has been opened.

3.6 Proposals received prior to the time of the due date will be securely kept unopened. No responsibility will attach to an officer or person of the City for the premature opening of a proposal not properly addressed and identified as a proposal.

4.0 ADDENDA

Copies of all Addenda will be posted to the City's Website. It is the Vendor's responsibility to check and download any and all addenda from the City's Website.

4.1 No Addenda will be posted later than four (4) working days prior to the date for receipt of bids except an Addendum, if necessary, postponing the date for receipt of bids or withdrawing the request for bids. Each bidder shall ascertain prior to submitting their bid that they have received all Addenda issued, and shall acknowledge their receipt in his bid.

5.0 QUALIFICATIONS OF PROPOSER

The City may make such investigations as it deems necessary to determine the ability of the proposer to perform the work, and the proposer shall furnish to the City all such information and data for this purpose as the City may request. The City reserves the right to reject any proposal if the evidence submitted by, or investigation of such proposer fails to satisfy the City that such proposer is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein.

6.0 CONTRACT SECURITY

Only when a Contract Security is required in the Request for Proposal, the Contractor shall furnish a Bid Bond in the amount of Five Percent (5%) and a Surety Bond/Performance Bond in an amount equal to at least One Hundred Percent (100%) of the contract price as security for the faithful performance of the contract and for the payment of all persons performing labor on the project under the contract and furnishing materials, equipment and all other incidentals in connection with the contract. The surety on such bonds shall be a duly authorized surety company licensed to bond in the State of Rhode Island, and the cost of same will be paid by the Contractor. Before final acceptance, the bonds must be approved by the City.

The bonding company providing surety must be listed in the Federal Register as issued by the Department of Treasury, Department Circular 570, latest edition, as well as being licensed in the State of Rhode Island to provide surety.

7.0 BID PRICES:

Bidders shall state the proposed price/s in the manner as designated in the Bid Proposal Form. In the event that there is a discrepancy between the unit prices and the extended totals, the unit prices shall govern. In the event there is a discrepancy between the price written in words and in figures, the price written in words shall govern.

8.0 TERMS:

Cash Discounts offered will be considered in determining awards. However, discounts for a period less than twenty (20) days will not be considered. The discount period shall be computed from date of delivery or from date the correct invoice is received by the City Controller, whichever date is later. The date of delivery shall be construed to mean the date on which the bid item is determined to meet the specifications and is therefore acceptable.

9.0 RHODE ISLAND SALES TAX:

The City of East Providence is exempt from the Rhode Island Sales or Use Tax under the 1956 General Laws of the State of Rhode Island, Section 44-18-30, Para. 1, as amended.

10.0 "OR EQUAL" BIDDING:

When the name of a manufacturer, a brand name, or manufacturer's catalogue number is issued as the bid standard in describing an item followed by "Or Approved Equal", this description is used to indicate quality, performance and other essential characteristics of the item required. If bidding on other than the make, model, brand or sample specified, but equal thereto, bidder must so state by giving the manufacturer's name, catalogue number and any other information necessary to prove that his intended substitution of a commodity is equal in all essential respects to the bid standard. Bidder must prove to the satisfaction of the City Manager, or by person or persons designated by him, that the bidders designated substitute is equal to the bid standard; otherwise, his bid will be rejected.

11.0 AWARD AND CONTRACT:

11.1 Unless otherwise specified, the City reserves the right to make award by item, or items, or by total, as may be in the best interest of the City.

11.2 A written award (or acceptance of bid) mailed (or otherwise furnished) to the successful bidder followed by a City Purchase Order, shall be deemed to result in a binding contract without further action by either party.

11.3 It is the intent of the City to award a contract to the lowest responsible bidder in accordance with City Ordinances, Article V. Purchasing, Sec. 2- 243, and provided that the bid has been submitted in accordance with the requirements of the Bidding Documents, is judged to be reasonable, and does not exceed the funds available.

12.0 CONSIDERATION OF PROPOSALS REJECTION OF PROPOSALS

12.1 The City reserves the right to reject the proposal of any proposer who has previously failed to perform properly or complete on time, contracts of a similar nature, or who is not in a position to perform the contract, or who has habitually and without just cause, neglected the payment of bills or disregarded its obligations to sub-contractors, material, or employees.

12.2 The City reserves the right to reject any or all proposals and in particular to reject a proposal not accompanied by any data required by the Bidding Documents or a proposal in any way incomplete or irregular, and to waive any informality in the proposals received, and to accept the proposal or parts thereof deemed to be most favorable to the best interest of the City.

12.3 The City shall have the right to waive any informality or irregularity in any proposal received

12.4 It is the intent of the City, if it accepts any Alternates, to accept them in the order in which they are listed in the proposal form, but the City shall have the right to accept Alternates in any order or combination and to determine the low bidder on the basis of the sum of the Base Bid and the Alternates accepted.

13.0 DELIVERY:

All prices bid must be on the basis of F.O.B. Delivery Point, East Providence, Rhode Island. Therefore, shipping costs are to be included within the prices quoted. Deliveries must consist only of new merchandise or equipment and shall be made between 8:00 A.M. and 4:00 P.M. Prevailing Time, Monday through Friday.

No delivery shall become due or be acceptable without a written Purchase Order, issued by the Procurement Specialist.

14.0 AFFIRMATIVE ACTION REQUIREMENTS
MBE/WBE PARTICIPATION

Any firm or Contractor providing services to or doing business with the City shall adhere to the City's Affirmative Action Plan for MBE/WBE Participation. Said plan is on file with the City's Affirmative Action Officer.

14.1 All bidders are required to submit the MBE/WBE Participation Affidavit.

15.0 INSURANCE REQUIREMENTS:

The Contractor shall carry the following insurance coverages at his own expense:

(a) General: All insurance for this contract shall be written by a company (or companies) acceptable to the city and all policies or certificates shall be submitted to the City for examination prior to commencement of operations by the contractor. In the event any policy or certificate, the amount of the insurance, or the company writing same are not satisfactory to the City, the contractor shall secure other policies or certificates in form and amount with a company satisfactory to the City. The contractor shall not permit policies to be changed, cancelled, or to lapse and all policies shall include a clause to the effect that the policy shall not be subject to cancellation or a reduction in the limits of liability or amounts of insurance until notice has been sent by mail to the city stating when, (not less than 30 days thereafter) such cancellation or reduction shall be effective. All certificates of insurance shall be delivered to the City and contain true transcripts from the policy or policies authenticated by the proper officer of the insurer evidencing in particular those insured, the extent of the insurance, the location and operations to which the insurance applies, the expiration date and the above mentioned notice as to the location and operations involved.

The Contractor is required to list the City of East Providence not only as Certificate Holder but as an Additional Insured as well, on the "Certificate of Insurance".

If any part of the work is sublet, similar insurance shall be provided by or in behalf of the subcontractors to cover their operations. The contractor shall be charged with the responsibility for insurance protection for all his subcontract operations and should the contractor's policy not cover each and every subcontractor, certificates of insurance acceptable to the City covering each and every subcontractor shall be filed with said City prior to the commencement of subcontract operations.

Statutory Workman's Compensation Insurance: shall be provided by the contractor for all labor employed on the project who may come within the protection of such laws, and Employer's General Liability Insurance shall be provided for the benefit of employees not protected by compensation laws. The contractor will be charged with the responsibility for proper and adequate workman's compensation for all subcontract operations.

Contractors Comprehensive General Liability and Property Damage Insurance INCLUDING Owner's Protective: the contractor shall carry the above insurance for a minimum limit of not less than \$1,000,000.00 for all damages arising out of injury to or death of one person and subject to that limit for each person, a total limit of not less than \$1,000,000.00 for all damages arising out of injury to, or death of two or more persons in any one occurrence and Property Damage Liability Insurance providing for a limit of not less than \$1,000,000.00 for all damages arising out of injury to or destruction of property (including loss of use) in any occurrence and subject to that limit per occurrence total limit of \$1,000,000.00 all damages arising out of injury to or destruction of property during the policy period.

Contractor's Liability Insurance: Shall also include all major divisions of coverage and be on a comprehensive general liability basis including:

Premises - Operations

Independent Contractor's protective

Products and completed operations

Blanket Contractual

Owned, non-owned and hired motor vehicles

Broad form coverage for property damage (including explosion, Collapse and underground).

Comprehensive Automobile Liability and Property Damage Insurance: The Contractor shall carry the above insurance covering all owned, hired or non-owned vehicles in the amount of \$300,000.00 for all damages arising out of bodily injuries to death of one person and subject to that limit for each person, a total of \$500,000.00 for all damages arising out of bodily injuries to or death of two or more persons in any one accident and Property Damage coverage in the amount of \$300,000.00 for all damages arising out of injury to or destruction of property.

16.0 OSHA SAFETY AWARENESS PROGRAM

In accordance with R.I.G.L. 28-20-35, all contractors bidding on construction projects of the City with a total project cost of one hundred thousand dollars (\$100,000.) or more, are required to have an OSHA "ten hour construction safety program", for their on-site employees. The training program shall utilize instructors trained by the Occupational Safety and Health Administration, using an OSHA approved curriculum.



MBE/WBE PARTICIPATION AFFIDAVIT

Item Description (as seen on RFP): _____

Prime Bidder: _____

Prime Bidder (Company) Phone Number: _____

Prime Bidder (Company) Zip Code: _____

Which one of the following describes your business' status in terms of Minority and/or Woman-Owned Business Enterprise certification with the State of Rhode Island? _____ MBE _____ WBE _____ Neither MBE nor WBE

By initialing the following sections and signing the bottom of this document in my capacity as the contractor or an authorized representative of contractor, I make this Affidavit:

It is the policy of the City of East Providence that minority business enterprises (MBEs) and women business enterprises (WBEs) should have the maximum opportunity to participate in procurements and projects as prime contractors and vendors. Pursuant to Sec. 21-52 of the Providence Code of Ordinances and Chapter 31-14 et seq. of the Rhode Island General Laws (as amended), MBE and WBE participation goals apply to contracts.

- The goal for Minority Business Enterprise (MBE) participation is 10% of the total bid value.
- The goal for Women's Business Enterprise (WBE) participation is 10% of the total bid value.
- The goal for combined MBE/WBE participation is 20% of the total bid value.

I acknowledge the City of East Providence's goals of supporting MBE/WBE certified businesses. Initial _____

Are you subcontracting with other parties on this project: Yes ___ No ___ if yes fill out page 2, **Subcontractor Disclosure Form.**

Are you using any subcontractors on this job and not meeting the 20% MBE/WBE participation goal: Yes ___ No ___ if yes fill out page 3, **MBE/WBE Waiver Request Form.**

If awarded the contract, I understand that my company must submit to the Minority and Women's Business Coordinator at the City of East Providence (MBE/WBE Office), copies of all executed agreements with the subcontractor(s) being utilized to achieve the participation goals and other requirements of the RI General Laws. **I understand that these documents must be submitted prior to the issuance of a notice to proceed.** Initial _____

I understand that, if awarded the contract, my firm must submit to the MBE/WBE Office canceled checks and reports required by the MBE/WBE Office on a quarterly basis verifying payments to the subcontractors(s) utilized on the contract. Initial _____

If I am awarded this contract and find that I am unable to utilize the subcontractor(s) identified in my Statement of Intent, I understand that I must substitute another certified MBE and WBE firm(s) to meet the participation goals. **I understand that I may not make a substitution until I have obtained the written approval of the MBE/WBE Office.** Initial _____

If awarded this contract, I understand that authorized representatives of the City of East Providence may examine the books, records and files of my firm from time to time, to the extent that such material is relevant to a determination of whether my firm is complying with the City's MBE/WBE participation requirements. Initial _____

I do solemnly declare and affirm under the penalty of perjury that the contents of the foregoing Affidavit are true and correct to the best of my knowledge, information and belief.

Signature of Bidder _____ Printed Name _____

Company Name _____ Date _____

SUBCONTRACTOR DISCLOSURE FORM

Fill out this form only if you WILL SUBCONTRACT with other parties. If you will not subcontract any portion of the proposed bid, do not fill out this form.

Prime Bidder: _____ Primary NAICS Code: _____

Item Description (as seen on RFP): _____

Please List all Subcontractors below. Include the total dollar value that you propose to share with each subcontractor and the dollar amount to be subcontracted. Please check off MBE and WBE where applicable. The directory of all state-certified MBE/WBE firms is located at www.mbe.ri.gov. Business NAICS codes can be found at <http://www.naics.como/search/>

Proposed Subcontractor	MBE	WBE	Primary NAICS Code	Date of Mobilization	\$ Value of Subcontract
					\$
					\$
					\$
					\$
					\$
					\$
A. MBE SUBCONTRACTED AMOUNT:					\$
B. WBE SUBCONTRACTED AMOUNT:					\$
C. NON MBE WBE SUBCONTRACTED AMOUNT:					\$
D. DOLLAR AMOUNT OF WORK DONE BY THE PRIME CONTRACTOR:					\$
E. TOTAL AMOUNT OF BID (SUM OF A, B, C & D):					\$
F. PERCENTAGE OF BID SUBCONTRACTED TO MBEs AND WBEs. (Add A and B. Divide by E and multiply by 100).					%

Please read and initial the following statement acknowledging you understand.

If the percentage of the total amount of the bid being awarded to MBE or WBE vendors is less than 20% (Box F) and the prime contractor is NOT a Rhode Island State-certified MBE or WBE, **you must fill out the MBE/WBE WAIVER REQUEST FORM for consideration by City of East Providence MBE/WBE Outreach Director.** Initial _____

Signature of Prime Contractor

Printed Name

Date Signed

MBE/WBE WAIVER REQUEST FORM

Fill out this form only if you are using subcontractors and did not meet the 20% MBE/WBE participation goal. MBE or WBE Prime Bidders that are certified by the State of Rhode Island are NOT REQUIRED to fill out this form.

Submit this form to the City of East Providence MBE/WBE Outreach Director, Elmer Carvalho-Pina at epina@eastprovidenceri.gov and Procurement Specialist, Jessica Lamprey at jlamprev@eastprovidenceri.gov for review prior to bid submission.

This waiver applies only to the current bid which you are submitting to the City of Providence and does not apply to other bids your company may submit for in the future.

Prime Bidder: _____

Company Trade: _____

Item Description (as seen on RFP): _____

To receive a waiver, you must list the certified MBE and/or WBE companies you contacted, the name of the primary individual with whom you interacted and the reason the MBE/WBE company could not participate on the project.

MBE/WBE Company name	Individual's Name	Company Trade	Why did you choose not to work with this company?

I acknowledge the City of East Providence’s goal of a combined MBE/WBE participation is 20% of the total bid value. I am requesting a waiver of _____% MBE/WBE (20% minus the Value of Box F on the Subcontractor Disclosure Form). If an opportunity is identified to subcontract any task associated with the fulfillment of this contract, a good faith effort will be made to select MBE/WBE certified businesses as partners.

Signature of Prime Contractor

Printed Name

Date Signed

Signature of City of East Providence
MBE/WBE Outreach Director

Printed Name of City of East Providence
MBE/WBE Outreach Director

Date Signed



ANTI-COLLUSION DECLARATION

The Bidder, by virtue of issuing a Bid certifies that Bidder has not divulged, discussed or compared the Bid with other Bidders and has not colluded with any other Bidder of parties to a Bid whomsoever. Bidder further certifies and agrees that premiums, rebates or gratuities are prohibited whether with, prior to, or after any delivery of material or services. Any such violation will result in the cancellation of this contract and the removal of offending parties from all Bid lists.

CONFLICT OF INTEREST

The Bidder and all sub-contractors shall disclose in writing as part of their Bid any possible or potential conflicts of interest which are known to, or reasonably should be known to the Bidder or sub-contractors, which may exist between their firms and the City of East Providence.

All Bidders and their subcontractors and business partners must disclose with their Bid, the name of any officer, director, agent or employee who is also an employee or family member of an employee of the City of East Providence.

Further, the Bidder must disclose the name of any City of East Providence employee or family member or any elected official who owns, directly or indirectly, an investment or other proprietary interest, in the firm or any of its parent company, subsidiaries or affiliates.

The Bidder and all sub-contractors and business partners shall disclose in writing as part of their Bid, any familial, personal or business relationships between members of Bidders, sub-contractor's or business partner's firms and members of the City of East Providence, whether or not there is any belief that the relationship might constitute a possible conflict of interests.

BIDDING FIRM:

SIGNATURE:

DATE:

PRINT NAME:

TITLE:



**City of East Providence
Attn: Procurement Specialist**

ELECTRONIC BID DOCUMENT NOTIFICATION OF RECEIPT

In order to compile a complete listing of all recipients of the initial bid package please return this completed form by e-mail to Controllers@eastprovidenceri.gov

It is the responsibility of all potential bidders to ensure any and all addenda are downloaded from the City website <https://eastprovidenceri.gov/rfp>

The undersigned hereby acknowledges electronic receipt of the bid documents for the procurement specified below.

From:

Company Name: _____

Contact Name: _____

Phone Number: _____

Fax Number: _____

Email Address: _____

Bid No.: _____

Title of Specification received:

Date: _____

Request for Taxpayer Identification Number and Certification

Give Form to the requester. Do not send to the IRS.

▶ Go to www.irs.gov/FormW9 for instructions and the latest information.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.

Print or type.
See Specific Instructions on page 3.

3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only one of the following seven boxes.

- | | | | | |
|---|---------------|---------------|-------------|--------------|
| Individual/sole proprietor or single-member LLC | C Corporation | S Corporation | Partnership | Trust/estate |
| Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ▶ _____ | | | | |
| Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is another LLC that is not disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner. | | | | |
| Other (see instructions) ▶ _____ | | | | |

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any) _____
Exemption from FATCA reporting code (if any) _____
(Applies to accounts maintained outside the U.S.)

2 Business name/disregarded entity name, if different from above

Requester's name and address (optional)

5 Address (number, street, and apt. or suite no.) See instructions.

6 City, state, and ZIP code

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Social security number

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN*, later.

Note: If the account is in more than one name, see the instructions for line 1. Also see *What Name and Number To Give the Requester* for guidelines on whose number to enter.

OR

Employer identification number

Part II Certification

Under penalties of perjury, I certify that:

- The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
- I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
- I am a U.S. citizen or other U.S. person (defined below); and
- The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments

other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here

Signature of U.S. person ▶

Date ▶

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to www.irs.gov/FormW9.

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer

identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)

- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)

- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, later.

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income, and
4. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting, is correct. See *What is FATCA reporting*, later, for further information.

Note: If you are a U.S. person and a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien;
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States;
- An estate (other than a foreign estate); or
- A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax under section 1446 on any foreign partners' share of effectively connected taxable income from such business. Further, in certain cases where a Form W-9 has not been received, the rules under section 1446 require a partnership to presume that a partner is a foreign person, and pay the section 1446 withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid section 1446 withholding on your share of partnership income.

In the cases below, the following person must give Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States.

- In the case of a disregarded entity with a U.S. owner, the U.S. owner of the disregarded entity and not the entity;
- In the case of a grantor trust with a U.S. grantor or other U.S. owner, generally, the U.S. grantor or other U.S. owner of the grantor trust and not the trust; and
- In the case of a U.S. trust (other than a grantor trust), the U.S. trust (other than a grantor trust) and not the beneficiaries of the trust.

Foreign person. If you are a foreign person or the U.S. branch of a foreign bank that has elected to be treated as a U.S. person, do not use Form W-9. Instead, use the appropriate Form W-8 or Form 8233 (see Pub. 515, *Withholding of Tax on Nonresident Aliens and Foreign Entities*).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a "saving clause." Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items.

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.
2. The treaty article addressing the income.
3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.
4. The type and amount of income that qualifies for the exemption from tax.

5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if his or her stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first protocol) and is relying on this exception to claim an exemption from tax on his or her scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity, give the requester the appropriate completed Form W-8 or Form 8233.

Backup Withholding

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS 24% of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, payments made in settlement of payment card and third party network transactions, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester,
2. You do not certify your TIN when required (see the instructions for Part II for details),
3. The IRS tells the requester that you furnished an incorrect TIN,
4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only), or
5. You do not certify to the requester that you are not subject to backup withholding under 4 above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See *Exempt payee code*, later, and the separate Instructions for the Requester of Form W-9 for more information.

Also see *Special rules for partnerships*, earlier.

What is FATCA Reporting?

The Foreign Account Tax Compliance Act (FATCA) requires a participating foreign financial institution to report all United States account holders that are specified United States persons. Certain payees are exempt from FATCA reporting. See *Exemption from FATCA reporting code*, later, and the Instructions for the Requester of Form W-9 for more information.

Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you no longer are tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account; for example, if the grantor of a grantor trust dies.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of \$50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a \$500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Line 1

You must enter one of the following on this line; **do not** leave this line blank. The name should match the name on your tax return.

If this Form W-9 is for a joint account (other than an account maintained by a foreign financial institution (FFI)), list first, and then circle, the name of the person or entity whose number you entered in Part I of Form W-9. If you are providing Form W-9 to an FFI to document a joint account, each holder of the account that is a U.S. person must provide a Form W-9.

a. Individual. Generally, enter the name shown on your tax return. If you have changed your last name without informing the Social Security Administration (SSA) of the name change, enter your first name, the last name as shown on your social security card, and your new last name.

Note: ITIN applicant: Enter your individual name as it was entered on your Form W-7 application, line 1a. This should also be the same as the name you entered on the Form 1040/1040A/1040EZ you filed with your application.

b. Sole proprietor or single-member LLC. Enter your individual name as shown on your 1040/1040A/1040EZ on line 1. You may enter your business, trade, or "doing business as" (DBA) name on line 2.

c. Partnership, LLC that is not a single-member LLC, C corporation, or S corporation. Enter the entity's name as shown on the entity's tax return on line 1 and any business, trade, or DBA name on line 2.

d. Other entities. Enter your name as shown on required U.S. federal tax documents on line 1. This name should match the name shown on the charter or other legal document creating the entity. You may enter any business, trade, or DBA name on line 2.

e. Disregarded entity. For U.S. federal tax purposes, an entity that is disregarded as an entity separate from its owner is treated as a "disregarded entity." See Regulations section 301.7701-2(c)(2)(iii). Enter the owner's name on line 1. The name of the entity entered on line 1 should never be a disregarded entity. The name on line 1 should be the name shown on the income tax return on which the income should be reported. For example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a single owner that is a U.S. person, the U.S. owner's name is required to be provided on line 1. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity's name on line 2, "Business name/disregarded entity name." If the owner of the disregarded entity is a foreign person, the owner must complete an appropriate Form W-8 instead of a Form W-9. This is the case even if the foreign person has a U.S. TIN.

Line 2

If you have a business name, trade name, DBA name, or disregarded entity name, you may enter it on line 2.

Line 3

Check the appropriate box on line 3 for the U.S. federal tax classification of the person whose name is entered on line 1. Check only one box on line 3.

IF the entity/person on line 1 is a(n) . . .	THEN check the box for . . .
• Corporation	Corporation
• Individual • Sole proprietorship, or • Single-member limited liability company (LLC) owned by an individual and disregarded for U.S. federal tax purposes.	Individual/sole proprietor or single-member LLC
• LLC treated as a partnership for U.S. federal tax purposes, • LLC that has filed Form 8832 or 2553 to be taxed as a corporation, or • LLC that is disregarded as an entity separate from its owner but the owner is another LLC that is not disregarded for U.S. federal tax purposes.	Limited liability company and enter the appropriate tax classification. (P= Partnership; C= C corporation; or S= S corporation)
• Partnership	Partnership
• Trust/estate	Trust/estate

Line 4, Exemptions

If you are exempt from backup withholding and/or FATCA reporting, enter in the appropriate space on line 4 any code(s) that may apply to you.

Exempt payee code.

- Generally, individuals (including sole proprietors) are not exempt from backup withholding.
- Except as provided below, corporations are exempt from backup withholding for certain payments, including interest and dividends.
- Corporations are not exempt from backup withholding for payments made in settlement of payment card or third party network transactions.
- Corporations are not exempt from backup withholding with respect to attorneys' fees or gross proceeds paid to attorneys, and corporations that provide medical or health care services are not exempt with respect to payments reportable on Form 1099-MISC.

The following codes identify payees that are exempt from backup withholding. Enter the appropriate code in the space in line 4.

1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2)

2—The United States or any of its agencies or instrumentalities

3—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

4—A foreign government or any of its political subdivisions, agencies, or instrumentalities

5—A corporation

6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a U.S. commonwealth or possession

7—A futures commission merchant registered with the Commodity Futures Trading Commission

8—A real estate investment trust

9—An entity registered at all times during the tax year under the Investment Company Act of 1940

10—A common trust fund operated by a bank under section 584(a)

11—A financial institution

12—A middleman known in the investment community as a nominee or custodian

13—A trust exempt from tax under section 664 or described in section 4947

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 13.

IF the payment is for . . .	THEN the payment is exempt for . . .
Interest and dividend payments	All exempt payees except for 7
Broker transactions	Exempt payees 1 through 4 and 6 through 11 and all C corporations. S corporations must not enter an exempt payee code because they are exempt only for sales of noncovered securities acquired prior to 2012.
Barter exchange transactions and patronage dividends	Exempt payees 1 through 4
Payments over \$600 required to be reported and direct sales over \$5,000 ¹	Generally, exempt payees 1 through 5 ²
Payments made in settlement of payment card or third party network transactions	Exempt payees 1 through 4

¹ See Form 1099-MISC, Miscellaneous Income, and its instructions.

² However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney reportable under section 6045(f), and payments for services paid by a federal executive agency.

Exemption from FATCA reporting code. The following codes identify payees that are exempt from reporting under FATCA. These codes apply to persons submitting this form for accounts maintained outside of the United States by certain foreign financial institutions. Therefore, if you are only submitting this form for an account you hold in the United States, you may leave this field blank. Consult with the person requesting this form if you are uncertain if the financial institution is subject to these requirements. A requester may indicate that a code is not required by providing you with a Form W-9 with "Not Applicable" (or any similar indication) written or printed on the line for a FATCA exemption code.

A—An organization exempt from tax under section 501(a) or any individual retirement plan as defined in section 7701(a)(37)

B—The United States or any of its agencies or instrumentalities

C—A state, the District of Columbia, a U.S. commonwealth or possession, or any of their political subdivisions or instrumentalities

D—A corporation the stock of which is regularly traded on one or more established securities markets, as described in Regulations section 1.1472-1(c)(1)(i)

E—A corporation that is a member of the same expanded affiliated group as a corporation described in Regulations section 1.1472-1(c)(1)(i)

F—A dealer in securities, commodities, or derivative financial instruments (including notional principal contracts, futures, forwards, and options) that is registered as such under the laws of the United States or any state

G—A real estate investment trust

H—A regulated investment company as defined in section 851 or an entity registered at all times during the tax year under the Investment Company Act of 1940

I—A common trust fund as defined in section 584(a)

J—A bank as defined in section 581

K—A broker

L—A trust exempt from tax under section 664 or described in section 4947(a)(1)

M—A tax exempt trust under a section 403(b) plan or section 457(g) plan

Note: You may wish to consult with the financial institution requesting this form to determine whether the FATCA code and/or exempt payee code should be completed.

Line 5

Enter your address (number, street, and apartment or suite number). This is where the requester of this Form W-9 will mail your information returns. If this address differs from the one the requester already has on file, write NEW at the top. If a new address is provided, there is still a chance the old address will be used until the payor changes your address in their records.

Line 6

Enter your city, state, and ZIP code.

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have and are not eligible to get an SSN, your TIN is your IRS individual taxpayer identification number (ITIN). Enter it in the social security number box. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN.

If you are a single-member LLC that is disregarded as an entity separate from its owner, enter the owner's SSN (or EIN, if the owner has one). Do not enter the disregarded entity's EIN. If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note: See *What Name and Number To Give the Requester*, later, for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local SSA office or get this form online at www.SSA.gov. You may also get this form by calling 1-800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at www.irs.gov/Businesses and clicking on Employer Identification Number (EIN) under Starting a Business. Go to www.irs.gov/Forms to view, download, or print Form W-7 and/or Form SS-4. Or, you can go to www.irs.gov/OrderForms to place an order and have Form W-7 and/or SS-4 mailed to you within 10 business days.

If you are asked to complete Form W-9 but do not have a TIN, apply for a TIN and write "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, generally you will have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note: Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon.

Caution: A disregarded U.S. entity that has a foreign owner must use the appropriate Form W-8.

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if item 1, 4, or 5 below indicates otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on line 1 must sign. Exempt payees, see *Exempt payee code*, earlier.

Signature requirements. Complete the certification as indicated in items 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983.

You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983.

You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments made in settlement of payment card and third party network transactions, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), ABLÉ accounts (under section 529A), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account) other than an account maintained by an FFI	The actual owner of the account or, if combined funds, the first individual on the account ¹
3. Two or more U.S. persons (joint account maintained by an FFI)	Each holder of the account
4. Custodial account of a minor (Uniform Gift to Minors Act)	The minor ²
5. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee ¹
b. So-called trust account that is not a legal or valid trust under state law	The actual owner ¹
6. Sole proprietorship or disregarded entity owned by an individual	The owner ³
7. Grantor trust filing under Optional Form 1099 Filing Method 1 (see Regulations section 1.671-4(b)(2)(i)(A))	The grantor ⁴
For this type of account:	Give name and EIN of:
8. Disregarded entity not owned by an individual	The owner
9. A valid trust, estate, or pension trust	Legal entity ⁴ The
10. Corporation or LLC electing corporate status on Form 8832 or Form 2553	corporation
11. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
12. Partnership or multi-	The partnership
13. A broker or registered nominee	The broker or nominee

For this type of account:	Give name and EIN of:
14. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
15. Grantor trust filing under the Form 1041 Filing Method or the Optional Form section 1.671-4(b)(2)(i)(B))	The trust 1099 Filing Method 2 (see Regulations

¹ List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

² Circle the minor's name and furnish the minor's SSN.

³ You must show your individual name and you may also enter your business or DBA name on the "Business name/disregarded entity" name line. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

⁴ List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.) Also see *Special rules for partnerships*, earlier.

***Note:** The grantor also must provide a Form W-9 to trustee of trust.

Note: If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records From Identity Theft

Identity theft occurs when someone uses your personal information such as your name, SSN, or other identifying information, without your permission, to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity or credit report, contact the IRS Identity Theft Hotline at 1-800-908-4490 or submit Form 14039.

For more information, see Pub. 5027, Identity Theft Information for Taxpayers.

Victims of identity theft who are experiencing economic harm or a systemic problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 1-877-777-4778 or TTY/TDD 1-800-829-4059.

Protect yourself from suspicious emails or phishing schemes.

Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to phishing@irs.gov. You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration (TIGTA) at 1-800-366-4484. You can forward suspicious emails to the Federal Trade Commission at spam@uce.gov or report them at www.ftc.gov/complaint. You can contact the FTC at www.ftc.gov/idtheft or 877-IDTHEFT (877-438-4338). If you have been the victim of identity theft, see www.IdentityTheft.gov and Pub. 5027.

Visit www.irs.gov/IdentityTheft to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. commonwealths and possessions for use in administering their laws. The information also may be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payers must generally withhold a percentage of taxable interest, dividend, and certain other payments to a payee who does not give a TIN to the payer. Certain penalties may also apply for providing false or fraudulent information.



AIA® Document A701® – 2018

Instructions to Bidders

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

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

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

TABLE OF ARTICLES

- 1 **DEFINITIONS**
- 2 **BIDDER’S REPRESENTATIONS**
- 3 **BIDDING DOCUMENTS**
- 4 **BIDDING PROCEDURES**
- 5 **CONSIDERATION OF BIDS**
- 6 **POST-BID INFORMATION**
- 7 **PERFORMANCE BOND AND PAYMENT BOND**
- 8 **ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS**

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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

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

ARTICLE 1 DEFINITIONS

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

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

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

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

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

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

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

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

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

ARTICLE 2 BIDDER'S REPRESENTATIONS

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

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

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

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

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

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

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

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

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

§ 3.2 Modification or Interpretation of Bidding Documents

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

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

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

§ 3.3 Substitutions

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

§ 3.3.2 Substitution Process

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

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

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

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

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

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

§ 3.4 Addenda

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

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

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

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

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

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

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

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

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

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

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

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

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

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

§ 4.2 Bid Security

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

(Insert the form and amount of bid security.)

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

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

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

§ 4.3 Submission of Bids

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

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

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

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

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

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

§ 4.4 Modification or Withdrawal of Bid

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

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

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

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

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

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

§ 5.2 Rejection of Bids

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

§ 5.3 Acceptance of Bid (Award)

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

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

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

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

§ 6.2 Owner's Financial Capability

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

§ 6.3 Submittals

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

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

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

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

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

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

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

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

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

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

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

§ 7.2 Time of Delivery and Form of Bonds

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

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

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

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

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

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

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

- .5 Drawings

Number	Title	Date
.6	Specifications	

Section	Title	Date	Pages
.7	Addenda:		

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

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

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

The Sustainability Plan:

Title	Date	Pages
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Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
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.9 Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

Additions and Deletions Report for **AIA® Document A701® – 2018**

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 14:09:49 ET on 06/24/2024.

There are no differences.

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, _____, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 14:09:49 ET on 06/24/2024 under Order No. 2114496892 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A701™ – 2018, Instructions to Bidders, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

GENERAL

- A. These Supplementary Instructions to Bidders modify AIA Document A701, "Instructions to Bidders," 2018 Edition.
- B. Where a portion of the "Instructions to Bidders" is modified or deleted by these Supplementary Instructions to Bidders, the unaltered portions of the "Instructions to Bidders" will remain in effect.

ARTICLE 2 - BIDDER'S REPRESENTATION

Add the following Subparagraphs to Paragraph 2.1:

"2.1.5.1 Additional inspections of the site and building shall be by appointment only. Contact at tel. Keith Mercy at 617-532-6600 x3737, to arrange a time for inspection. No casual, unannounced inspections will be allowed."

ARTICLE 3 - BIDDING DOCUMENTS

3.2 MODIFICATION OR INTERPRETATION OF BIDDING DOCUMENTS:

Add the following to end of Subparagraph 3.2.1:

". . . In case such ambiguity, inconsistency, or error exists and is not noted or resolved at the time Bids are due, the Base Bid Sum shall include, as applicable, the better quality, the greater quantity, and the more costly procedure for the work involved."

ARTICLE 4 - BIDDING PROCEDURES

4.2 BID SECURITY

Add the following to end of Subparagraph 4.2.1:

". . . Each proposal shall be accompanied by a Bid Bond or Certified Check in the amount of 10 percent of the Bid made payable to City of East Providence. No bid will be considered which is not accompanied by such Bid Security. A Bid Bond, if used, shall be executed by a surety company which can comply with State requirements for writing the Payment and Performance Bonds."

ARTICLE 6 - POST BID INFORMATION

6.1 CONTRACTOR'S QUALIFICATION STATEMENT

Add the following Subparagraphs to Paragraph 6.1:

"6.1.1 The Owner will make investigations as he deems necessary to determine the ability of the Bidder to perform the Work. The Bidder shall furnish the Owner all such information and data for this purpose as the Owner may request.

6.1.2 The Owner reserves the right to reject any Bid if evidence or investigation fails to satisfy the Owner that the Bidder is qualified to fulfill the obligations of the Contract and to complete the Work. Conditional bids will not be considered."

ARTICLE 7 - PERFORMANCE BOND AND PAYMENT BOND

7.1 BOND REQUIREMENTS

Add the following sentence to the end of Subparagraph 7.1.1:

". . . A Performance Bond and a Labor and Material Payment Bond shall be furnished in favor of executed by a surety company authorized to do business in Connecticut. The Performance Bond shall be for 100 percent of Contract Sum and the Labor and Material Payment Bond shall be for 100 percent of Contract Sum."

ARTICLE 8 - FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

8.2 RETAINAGE

Add the following new Subparagraph to Paragraph 8.2:

"8.2.1 The Agreement will be written to include a retainage by Owner of five (5) percent of the total amount of each payment due Contractor. That amount to be retained until Project is complete."

END OF SECTION

BID FORM
(submit in duplicate)

BIDDER _____ Name

Address _____

Telephone No. _____

ADDRESSED TO:

Jessica Lamprey
Procurement Specialist
City of East Providence
145 Taunton Avenue
East Providence, RI 02914

BID PROPOSAL FOR:

East Providence Police Dept. Renovations
750 Waterman Avenue
East Providence, Rhode Island

In preparing this Bid, we have carefully examined the Bidding Documents for this Work. We have visited the site and noted the conditions affecting the Work.

The Bidding Documents referred to include Drawings and Project Manual prepared by JCJ Architecture and entitled "East Providence Police Dept. Renovations, 750 Waterman Avenue, East Providence, Rhode Island," dated June 21, 2024.

We acknowledge receiving the following Addenda issued by the Architect.

No. 1 dated _____ No. 2 dated _____ No. 3 dated _____

We propose to perform the Work described in the Bidding Documents, in keeping with the definitions of Article 1 of the Instructions to Bidders, for the Base Bid Sum of:

_____ Dollars \$_____.

ALTERNATES: These sums are not included in the Base Bid Sum.

In accordance with the Section on Alternates, we submit the following dollar amounts for the Alternates listed. These amounts include the costs of modifying and coordinating related work. If the Owner elects to include an Alternate in the Work, the stated cost will be added to or, as the case may be, deducted from the Base Bid Sum.

- No. 1 - Add the replacement of flooring, ceiling and lighting in the upper and lower corridors. Add the finish painting of existing partitions on the lower corridor and add the High Impact Wall Covering and wall guard on the upper corridor. Provide carpeting in the Men's and Women's Locker RoomsAdd/Deduct \$ _____
- No. 2 - Add the replacement rooftop Air Handling Units with associated workAdd/Deduct \$ _____

TIME OF COMPLETION:

We agree that Work of the Contract shall begin within 10 days after award of Contract and receipt of

**EAST PROVIDENCE POLICE DEPT. RENOVATIONS
750 WATERMAN AVENUE
EAST PROVIDENCE, RHODE ISLAND**

notice to proceed. Scheduling of the Work shall be in conformance with the Phasing Diagrams and the Contract Documents. Substantial completion for the entire Work shall be no later than February 28, 2025.

BID ACCEPTANCE:

We agree that this proposal shall not be withdrawn for a period of 60 calendar days after date of submittal. We understand that Owner reserves right to accept any Bid or reject any or all Bids and to waive any informality in the Bidding.

CONTRACT EXECUTION:

Upon notification of acceptance of this proposal, we shall execute a formal contract (AIA Document A101, Standard Form of Agreement between Owner and Contractor) within ten days of the receipt of the agreement for signing.

At the time of execution of the formal contract, we shall furnish a Performance Bond and Labor and Material Payment Bond each in the full amount of the Contract.

ENCLOSURES:

Included with this proposal are:

1. Our bid security in the amount of 10 percent of the Base Bid Sum (Bid bond or certified check)
2. Our completed Qualifications Form.
3. Our Substitution Listing (as applicable).

Firm Name:

Address:

By: _____ Title: _____
(Name Typed)

Signature: _____ Date: _____, 2024

The Bidder is a/an (individual)(partnership)(corporation). Names and titles of other officers or partners are:

(for corporation, give State of incorporation and affix corporate seal).

 **AIA[®] Document A310™ – 2010****Bid Bond****CONTRACTOR:***(Name, legal status and address)***SURETY:***(Name, legal status and principal place of business)***OWNER:***(Name, legal status and address)***BOND AMOUNT: \$****PROJECT:***(Name, location or address, and Project number, if any)*

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

Signed and sealed this day of ,

(Contractor as Principal) *(Seal)*

(Witness)

(Title)

(Surety) *(Seal)*

(Witness)

(Title)



Additions and Deletions Report for **AIA[®] Document A310[™] – 2010**

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 14:11:05 ET on 06/24/2024.

There are no differences.

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, _____, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 14:11:05 ET on 06/24/2024 under Order No. 2114496892 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A310™ – 2010, Bid Bond, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)



AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

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

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

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

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

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

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

Init.

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User Notes:

(878142514)

TABLE OF ARTICLES

1	THE CONTRACT DOCUMENTS
2	THE WORK OF THIS CONTRACT
3	DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
4	CONTRACT SUM
5	PAYMENTS
6	DISPUTE RESOLUTION
7	TERMINATION OR SUSPENSION
8	MISCELLANEOUS PROVISIONS
9	ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:

(Check one of the following boxes.)

- The date of this Agreement.
- A date set forth in a notice to proceed issued by the Owner.
- Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

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

(Check one of the following boxes and complete the necessary information.)

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

[] By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work

Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be (\$), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item

Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement. *(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)*

Item

Price

Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum: *(Identify each allowance.)*

Item

Price

§ 4.4 Unit prices, if any:

(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item

Units and Limitations

Price per Unit (\$0.00)

§ 4.5 Liquidated damages, if any:

(Insert terms and conditions for liquidated damages, if any.)

§ 4.6 Other:

(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than () days after the Architect receives the Application for Payment. *(Federal, state or local laws may require payment within a certain period of time.)*

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- .1 That portion of the Contract Sum properly allocable to completed Work;
- .2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- .3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- .3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- .4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- .5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner’s prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contract except for the Contractor’s responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner’s final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect’s final Certificate for Payment, or as follows:

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

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

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.

(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:

(Check the appropriate box.)

- Arbitration pursuant to Section 15.4 of AIA Document A201–2017
- Litigation in a court of competent jurisdiction
- Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner’s convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:

(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner’s convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner’s representative:

(Name, address, email address, and other information)

§ 8.3 The Contractor’s representative:

(Name, address, email address, and other information)

§ 8.4 Neither the Owner’s nor the Contractor’s representative shall be changed without ten days’ prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:

(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction
- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date
--------	-------	------

.6 Specifications

Section	Title	Date	Pages
---------	-------	------	-------

.7 Addenda, if any:

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

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:

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

Init.

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[] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

[] The Sustainability Plan:

Title	Date	Pages
-------	------	-------

[] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
----------	-------	------	-------

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor’s bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

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

OWNER *(Signature)*

(Printed name and title)

CONTRACTOR *(Signature)*

(Printed name and title)

Additions and Deletions Report for **AIA® Document A101® – 2017**

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

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There are no differences.

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, _____, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 14:12:15 ET on 06/24/2024 under Order No. 2114496892 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A101™ – 2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)



AIA® Document A305® – 2020

Contractor's Qualification Statement

THE PARTIES SHOULD EXECUTE A SEPARATE CONFIDENTIALITY AGREEMENT IF THEY INTEND FOR ANY OF THE INFORMATION IN THIS A305-2020 TO BE HELD CONFIDENTIAL.

SUBMITTED BY: _____ **SUBMITTED TO:** _____
(Organization name and address.) (Organization name and address.)

TYPE OF WORK TYPICALLY PERFORMED

(Indicate the type of work your organization typically performs, such as general contracting, construction manager as constructor services, HVAC contracting, electrical contracting, plumbing contracting, or other.)

THIS CONTRACTOR'S QUALIFICATION STATEMENT INCLUDES THE FOLLOWING:

(Check all that apply.)

- Exhibit A – General Information
- Exhibit B – Financial and Performance Information
- Exhibit C – Project-Specific Information
- Exhibit D – Past Project Experience
- Exhibit E – Past Project Experience (Continued)

CONTRACTOR CERTIFICATION

The undersigned certifies under oath that the information provided in this Contractor's Qualification Statement is true and sufficiently complete so as not to be misleading.

Organization's Authorized Representative
Signature

Date

Printed Name and Title

NOTARY

State of:

County of:

Signed and sworn to before me this ____ day of _____

Notary Signature

My commission expires: _____

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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(Signed)

(Title)

(Dated)



AIA® Document A312® – 2010

Performance Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

CONSTRUCTION CONTRACT

Date:

Amount: \$ 0.00

Description:

(Name and location)

BOND

Date:

(Not earlier than Construction Contract Date)

Amount: \$

Modifications to this Bond: None See Section 16

CONTRACTOR AS PRINCIPAL

Company: *(Corporate Seal)*

Signature: _____

Name and

Title:

(Any additional signatures appear on the last page of this Performance Bond.)

SURETY

Company: *(Corporate Seal)*

Signature: _____

Name and

Title:

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:**OWNER'S REPRESENTATIVE:**

(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- .2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- .3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 **Balance of the Contract Price.** The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 **Construction Contract.** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 **Contractor Default.** Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 **Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 **Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company: _____
(Corporate Seal)

Signature: _____

Name and Title: _____

Address: _____

SURETY

Company: _____
(Corporate Seal)

Signature: _____

Name and Title: _____

Address: _____

Additions and Deletions Report for **AIA® Document A312® – 2010**

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

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PAGE 1

Amount: \$ 0.00

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, _____, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 16:31:35 ET on 06/24/2024 under Order No. 2114496892 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A312™ – 2010, Performance Bond, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)



AIA[®]

Document A312[®] – 2010

Payment Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

CONSTRUCTION CONTRACT

Date:

Amount: \$ 0.00

Description:

(Name and location)

BOND

Date:

(Not earlier than Construction Contract Date)

Amount: \$

Modifications to this Bond: None See Section 18

CONTRACTOR AS PRINCIPAL

Company: *(Corporate Seal)*

SURETY

Company: *(Corporate Seal)*

Signature: _____

Name and

Title:

(Any additional signatures appear on the last page of this Payment Bond.)

Signature: _____

Name and

Title:

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- .1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- .2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- .5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 **Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 **Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company: _____ *(Corporate Seal)*

Signature: _____
Name and Title: _____
Address: _____

SURETY

Company: _____ *(Corporate Seal)*

Signature: _____
Name and Title: _____
Address: _____

Additions and Deletions Report for **AIA® Document A312® – 2010**

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

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(Signed)

(Title)

(Dated)



AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

TABLE OF ARTICLES

- 1 GENERAL PROVISIONS
- 2 OWNER
- 3 CONTRACTOR
- 4 ARCHITECT
- 5 SUBCONTRACTORS
- 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
- 7 CHANGES IN THE WORK
- 8 TIME
- 9 PAYMENTS AND COMPLETION
- 10 PROTECTION OF PERSONS AND PROPERTY
- 11 INSURANCE AND BONDS
- 12 UNCOVERING AND CORRECTION OF WORK
- 13 MISCELLANEOUS PROVISIONS
- 14 TERMINATION OR SUSPENSION OF THE CONTRACT
- 15 CLAIMS AND DISPUTES

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

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

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

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

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

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

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

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

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and

delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will

specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

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

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

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

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

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

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

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

§ 8.2 Progress and Completion

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

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

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

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

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

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

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

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

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

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

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- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will

promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act

or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 **Failure to Purchase Required Property Insurance.** If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 **Notice of Cancellation or Expiration of Owner's Required Property Insurance.** Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and

approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.



Additions and Deletions Report for **AIA[®] Document A201[®] – 2017**

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 14:16:48 ET on 06/24/2024.

There are no differences.

Certification of Document's Authenticity

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I, _____, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 14:16:48 ET on 06/24/2024 under Order No. 2114496892 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ – 2017, General Conditions of the Contract for Construction, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)

SUPPLEMENTARY CONDITIONS

GENERAL

- A. The following supplements modify the "*General Conditions of the Contract for Construction*", AIA Document A201, 2017 Edition, Electronic Format.
- B. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

ARTICLE 1 - GENERAL PROVISIONS

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following to Subparagraph 1.2.1:

". . . In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities.

- .1 The Agreement.
- .2 Addenda, with those of later date having precedence over those of earlier date.
- .3 The Supplementary Conditions.
- .4 The General Conditions of the Contract for Construction.
- .5 Drawings and Specifications.

In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by addendum, provide the material, equipment or system, as directed by the Architect."

Add the following Subparagraph to Paragraph 1.2:

"**1.2.4** The Sections of Division 1 - General Requirements of the Specifications govern the execution of work of all Sections of the Specifications."

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE.

Add the following subparagraph to Paragraph 1.5.1:

"**1.5.1.1** The Contractor may obtain electronic copies of the Drawings for their use, only for this project. In accepting and utilizing any drawings or other data on any form of electronic media generated and provided by the Architect, the Owner and its agents covenant and agree that all such drawings and data are instruments of service of the Architect, who shall be deemed the author of the drawings and data, and shall retain the common law, statutory law and other rights, including copyrights. The Owner and it's agents further agree not to use these drawings and data, in whole or in part for any purpose or project other than the project indicated. The Owner and it's agents agrees to waive all claims against the Architect, resulting in damage, liability or costs, or loss of any kind, from any unauthorized changes or reuse of the drawings and data for this project or any other project, by anyone other than the Architect. In addition, the Owner and it's agents agrees to the fullest extent permitted by law to indemnify and hold the Architect harmless from any damage, liability or costs, including reasonable attorneys fees and costs of defense arising from any changes made by anyone

other than the Architect or from any reuse of the drawings and data without prior written consent of the Architect.

The cost of providing electronic drawings for this project is \$1,000.00."

ARTICLE 2 - OWNER

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

Add the following Clause to Subparagraph 2.2.3:

"**2.2.4.1** Data concerning site, size, access to site, staging and storing, present obstructions on or near the site, conditions of existing adjacent structures, locations and depths of sewers, conduits or pipes, gas lines, position of sidewalks, curbs and pavements, and other data concerning site conditions, has been obtained from sources Owner believes reliable. Accuracy of such data, however, is not guaranteed and is furnished solely for accommodation of Contractor. Use of such data is made at Contractor's sole risk and expense."

ARTICLE 3 - CONTRACTOR

3.4 LABOR AND MATERIALS

Delete Subparagraph 3.4.2 and substitute the following Subparagraphs:

"**3.4.2** After the Contract has been executed, the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Requirements, Division 1 of the Specifications. By making requests for substitutions, the Contractor:

3.4.2.1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;

3.4.2.2 represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;

3.4.2.3 certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and

3.4.2.4 shall coordinate the installation of the accepted substitution, making such changes as may be required for the Work to be complete in all respects.

3.4.4.4 shall make requests for substitutions within 45 days of execution of contract."

3.5 WARRANTY

Add the following Subparagraphs to 3.5:

"**3.5.3** The Contractor shall submit, prior to the first Application for Payment, the Contractor's Construction Schedule.

3.5.4 The Contractor shall submit, prior to the Application for Payment of that item, statements from materials and systems manufacturer's, that the materials and systems manufacturer's accept the conditions and requirements for warranties for their product or system. Failure to submit

manufacturer's acceptance to special conditions and requirements, approval for payment for materials or system, including labor to install, will be withheld.

3.5.5 Contractor shall obtain written warranty from manufacturer and installer and deliver it to Architect no later than the time at which the work covered by the warranty is delivered and installed.

3.5.6 Unless otherwise specified, the Contractor shall warrant (guaranty) all work against defects resulting from the use of material, workmanship, or equipment which is inferior, defective or not in accordance with the terms of the Contract. This warranty shall be in effect for one year from the date of issuance of the Certificate of Substantial Completion for the Project or designated portions thereof and shall be in addition to, and not a substitute for, any other rights of Owner under the Contract Documents or existing in law."

3.6 TAXES

Add the following to end of Subparagraph 3.6.1:

". . . The Contractor shall include no amount for State Sales Tax on products which are permanently installed or placed in this Project. The Owner will furnish tax exemption number."

3.7 PERMITS, FEES, AND NOTICES

Add the following to end of Subparagraph 3.7.1:

". . . The City of East Providence will waive its fees for the permits and inspections necessary for the proper execution and completion of the Work."

3.8 ALLOWANCES

Delete the last word "and" and the semicolon, and add the following to the end of Subparagraph 3.8.2.2 after the word "following":

". . . except when installation is specified as part of the allowance in the General Requirements, Division 1, of the Specifications; and"

3.17 ROYALTIES, PATENTS AND COPYRIGHTS

Add the following to the end of Subparagraph 3.17:

". . . In the event of legal action arising out of such infringement for which the Contractor is responsible and which action has the effect of stopping the Work, the Owner may require the Contractor to substitute other products of like kind as will make it possible to pursue and complete the Work. Costs and expenses caused thereby shall be borne by the Contractor."

ARTICLE 4 - ARCHITECT

4.2 ADMINISTRATION OF THE CONTRACT

Add the following Clause to Subparagraph 4.2.2:

"4.2.2.1 Where it is stated in the Documents that the Contractor shall pay for services of the Architect, such payment shall be at a rate of two and one half (2.5) times the Architect's Direct Personnel Expense plus any expenses incurred in providing such services. Direct Personnel Expense is defined as the direct salaries of the Architect's personnel engaged on the Project and the portion of the cost of their mandatory and customary contributions and benefits related thereto, such as employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, pensions and similar contributions and benefits."

Delete Subparagraph 4.2.10 and substitute the following:

"4.2.10 A Project Representative may be provided at the site by the Architect. The Project Representative's duties, responsibilities and limitations of authority are as set forth in AIA Document B352, Duties, Responsibilities and Limitations of Authority of the Project Representative."

ARTICLE 5 - SUBCONTRACTORS

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

Add the following sub-subparagraph to Subparagraph 5.2.1:

"5.2.1.1 To facilitate and expedite the investigations of proposed Subcontractors, Sub-subcontractors, fabricators and suppliers of materials and equipment, the Contractor, at the request of the Owner, shall submit a statement in writing in sufficient detail to establish that each has the capability, experience, reliability and uncommitted productive capacity to carry out the Work to be performed pursuant to each such proposed subcontract, sub-subcontract or procurement contract, in a manner consistent with the requirement of this Contract for Construction. All such submittals shall include a fully detailed analysis of principal personnel and organization, financial condition, construction plant, equipment and facilities. Submit a completed AIA Document A305, *Contractors Qualification Statement*" from each subcontractor, and sub-subcontractor.

ARTICLE 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.2 MUTUAL RESPONSIBILITY

Add the following Clause to Subparagraph 6.2.3:

"6.2.3.1 If a separate contractor sues or initiates an arbitration proceeding against the Owner on account of any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor who shall defend such proceedings at the Contractor's expense, and if any judgement or award against the Owner arises therefrom the Contractor shall pay or satisfy it and shall reimburse the Owner for all attorney's fees and court or arbitration costs which the Owner has incurred."

ARTICLE 7 - CHANGES IN THE WORK

7.1 GENERAL

Add the following to end of Subparagraph 7.1.1:

". . . The Contractor's proposal for a change in the Work shall be itemized completely and shall include material costs and quantities; labor wages, time, insurance and pensions; equipment rental, other than small tools. There shall be no extension in the Contract time unless the Contractor can effectively demonstrate that the work delayed is on the critical path of the Project Schedule."

7.2 CHANGE ORDERS

Add the following paragraph to Paragraph 7.2:

"7.2.2 "The Contractor's proposal for a change in the Work shall be completely itemized and shall include material costs and quantities; labor wages, time, insurance and pensions; and equipment rental, other than small tools. Additional material, labor, equipment, overhead and profit or other items not originally included with the Contractor's Proposal shall not be reviewed by the Architect nor accepted by the Owner after the Proposal has been accepted and a Change Order issued for the Work. There shall be no extension in the Contract time unless the Contractor can effectively demonstrate that the scope of work included in the Change has a quantifiable effect (either positively or negatively) on the critical path of the Project Schedule.

- 1) The Change Order will include all of the costs associated with the change in the Work and will include the following language on the Change Order form:

"THE CONTRACTOR AGREES THAT THIS CHANGE ORDER ADJUSTS THE CONTRACT PRICE AND TIME TO REFLECT FAIRLY ALL OVERHEAD, PROFIT, CHARGES, COSTS, EXPENSES, DELAYS, DAMAGES AND OTHER PAYMENTS THAT MAY BE CLAIMED DUE AND OWING TO THE CONTRACTOR AS OF THE ABOVE STATED DATE, AND AGREES THAT THE ACCEPTANCE OF THIS CHANGE ORDER BY THE OWNER SHALL CONSTITUTE A COMPLETE AND FINAL ACCORD AND SETTLEMENT OF CONTRACTOR'S CLAIM AGAINST THE OWNER ON ACCOUNT OF THIS OR ANY PRIOR CHANGE IN THE WORK."

7.3 CONSTRUCTION CHANGE DIRECTIVES

Add the following Subparagraph and Clauses to Paragraph 7.3:

"7.3.11 In Subparagraph 7.3.7, the "reasonable amount" for the combined overhead and profit included in the total cost to the Owner for a change in the Work shall be based on the following schedule:

7.3.11.1 For the Contractor, for work performed by the Contractor's own forces: 15 percent of the net cost.

7.3.11.2 For the Contractor, for work performed by one or more Subcontractors: 10 percent of the combined net cost of additions and deductions of the Subcontractors.

7.3.11.3 For each Subcontractor, for Work performed by the Subcontractor or his Sub-subcontractors: 15 percent of the combined net cost of their Work.

7.3.11.4 In any event, the total allowance for overhead and profit for a Change in the Work shall not exceed 25 percent of the net cost of the Work.

7.3.11.5 For a Change in the Work resulting in a net deduction in costs, there shall be no allowance for overhead and profit.

7.3.11.6 Cost to which overhead and profit is to be applied shall be determined in accordance with

Subparagraph 7.3.3.

7.3.11.7 Proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Include invoices and quotations from material suppliers. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change involving over \$500 be approved without such itemization."

ARTICLE 8 - TIME

8.2 PROGRESS AND COMPLETION

Add the following Subparagraph to Paragraph 8.2:

"8.2.4 Except in the event of emergency, no substantial field operations shall be performed outside of regular working hours without the prior approval of the Architect and the Owner. The Contractor shall not be entitled to additional compensation for work performed outside of regular working hours."

8.3 DELAYS AND EXTENSIONS OF TIME

Add the following Clauses to Subparagraph 8.3.2:

"8.3.2.1 Claims of delay and requests for extension of time shall set forth in detail the circumstances of such claim, the dates upon which claimed delay began and ended, and the number of days' extension of time requested. The Contractor shall provide supporting documentation as the Architect may require, including a revised Construction Schedule indicating the effect of the circumstances which form the basis for the claim.

8.3.2.2 The Contractor shall not be entitled to an extension of time for each and every one of a number of causes which have a concurrent and interrelated effect on the progress of the Work.

8.3.2.3 Claims for extension of time arising out of authorized changes in the Work shall be made in writing prior to or concurrent with the submission of the Contractor's proposal for such change. No extension of time arising out of changes in the Work will be granted after the date upon which the Contractor is authorized to proceed with such change unless specific provision for an extension of time has been incorporated in the authorization.

8.3.2.4 Any additional cost to the Contractor arising from such change shall be included in the amended Contract Sum set forth in such Change Order. No claim for damages for delay, arising from such change in the Work, shall be recognized or be deemed valid."

Add the following Clause to Subparagraph 8.3.3:

"8.3.3.1 Extension of the Contract Time shall be the Contractor's sole and exclusive remedy for delay of any kind. The Contractor expressly waives any and all right to claim damages for any delay."

ARTICLE 9 - PAYMENTS AND COMPLETION

9.3 APPLICATIONS FOR PAYMENT

Add the following sentence to the end of Subparagraph 9.3.1:

". . . Form of Application for Payment shall be a notarized AIA Document G702, Application and Certificate for Payment, supported with AIA Document G703, Continuation Sheet."

Add the following Subparagraph and Clause to Subparagraph 9.3.1:

"9.3.1.3 During progress of the Work the Owner will pay Contractor 95 percent of the total amount of each payment due. The remaining 5 percent will be retained by the Owner until the Work is completed and accepted in accordance with the Contract Documents.

9.3.1.3.1 Retainage for phased work will be paid to the Contractor by the Owner at the completion of the phased of work. Fulfillment of requirements shall be completed in the same manner as if phasing were not included in this Work."

Delete the first two sentences of Subparagraph 9.3.2 and substitute the following:

"Unless otherwise specifically approved, the Owner will pay only for material and equipment delivered and incorporated in the Work. If approved in advance by the Owner, payment may be similarly made for material and equipment suitably stored on site or off site at a location agreed upon in writing."

Add the following Clauses to Subparagraph 9.3.2:

"9.3.2.1 In addition, for consideration of payment for stored products:

- (a) Storage shall be agreed upon in advance, prior to shipment.
- (b) Location of storage shall be agreed upon in advance.
- (c) Contractor shall be responsible for, and pay costs of, the verification and inspection of storage.
- (d) Insurance certificate required for stored items.
- (e) Bill of sale from supplier to verify transfer of goods to the Owner.

9.3.2.2 Schedule of Values and Construction Schedule will be considered in decision on any specific request for payment for storage.

9.3.2.3 Payment for material and equipment delivered and stored shall not relieve Contractor of responsibility for furnishing equipment and material required for the Work in the same manner as if such payment were not made."

Add the following Clause to 9.3.3:

"9.3.3.1 The Contractor shall submit, with each Application for Payment, lien waivers, for the Contractor, subcontractors, material suppliers and other persons or entities which are due payment based on the previous Application for Payment."

9.3.3.2. At the completion of the Work and prior to submission of the final Application for Payment, the Contractor shall certify that the Work is complete and in accordance with the Contract Document and approved Shop Drawings. Certificate for Payment may be adjusted if the

aggregate amount of lien waiver amounts do not agree with previous Application for Payment amounts.”

Add the following Subparagraph and Clauses to 9.3:

"9.3.4 If payment for stored products is approved, Contractor shall furnish with Application for Payment an invoice establishing value of material and equipment stored along with a statement of amount to be paid vendor.

9.3.4.1 Such stored items are subject to prior approval for storage and to inspection by Architect and Owner before payment is recommended.

9.3.4.2 Contractor shall give Owner Certificates of Insurance in accordance with Contract Documents for the full value of the items stored. Insurance to be maintained until items are incorporated in the Work."

9.6 PROGRESS PAYMENTS

Add the following Clause to Subparagraph 9.6.2:

"9.6.2.1 Contractor shall furnish with Application for Payment satisfactory evidence of payment to vendors of products placed in approved storage. This shall be done within 30 days after date of progress payment which includes payment for such stored items. Satisfactory evidence of payment shall be one of the following:

- (a) Contractor's canceled check in correct amount with identification of invoices paid.
- (b) Fully executed Lien Waiver."

9.7 FAILURE OF PAYMENT

Add the following Subparagraph to Paragraph 9.7:

"9.7.1 If Contractor, in Application for Payment, does not submit evidence of payment to vendor for material and equipment stored, the Architect will recommend deduction of the amount previously allowed for the items stored from the current or subsequent Application for Payment."

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.2 SAFETY OF PERSONS AND PROPERTY

Add the following Clauses to Subparagraph 10.2.4:

"10.2.4.1 When there are indications that the use of explosives or other hazardous materials, equipment or unusual methods is necessary, the Contractor shall give the Owner reasonable advance notice of the conditions.

10.2.4.2 The Contractor shall be solely responsible for the handling, storage, and use of explosive or other hazardous materials when their use is permitted.

10.2.4.3 The Contractor shall not bring explosives onto the site or use in the Work without the prior written permission of the Architect. For such use, the Contractor shall obtain necessary permits with copies to the Architect. Contractor shall furnish Owner and Architect with certificates indicating proper and adequate insurance."

10.3 HAZARDOUS MATERIALS

Add the following Subparagraph to 10.3:

"**10.3.7** The Contractor, when providing, using, storing, delivering or disposing of any toxic, hazardous or potentially dangerous materials, shall advise the Owner, in writing, of the condition of such hazardous materials in advance of conducting any Work and is responsible for protecting his own employees, those of the Owner, and all agents from the hazards associated with such materials. The Contractor shall furnish written directions, precautions, or training, provided or made available from the supplier of the materials, or other acceptable source, for use by all persons who may be subject to the hazard. The Contractor shall comply with all applicable regulations and laws. The Contractor shall dispose of any hazardous or toxic substances in accordance with all applicable regulations or laws, including E.P.A and D.O.T., and shall provide the Owner with the appropriate generator E.P.A. number. The Contractor shall perform all required procedures necessary to insure that there will be no discharge, spillage, uncontrolled loss, seepage or filtration of any hazardous or toxic waste on the site caused by his operations. Contractor is responsible for any and all costs and liabilities associated with the clean-up of any such spillage, etc., or as required by regulating authorities having jurisdiction, and holds the Owner and its agents, harmless against any current or future liabilities resulting from such incidents.

10.3.8 All material and equipment furnished under the Contract shall be free of asbestos and polychlorinated biphenyl (PCB). Any material or equipment containing these hazardous materials shall be considered defective and shall be removed by the Contractor at his own expense."

10.4 EMERGENCIES

Add the following Subparagraph to 10.4:

"**10.4.1** The Contractor shall promptly notify insurers as applicable, the Architect and the Owner of the nature of the emergency. Immediately thereafter, the Contractor shall submit to the Architect a written report including description of circumstances of the emergency and details of actions taken."

ARTICLE 11 - INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

Add the following Clause to Subparagraph 11.1.1:

"**11.1.1.1** The Contractor shall provide Liability Insurance covering all major divisions of coverage and be on a comprehensive basis. Insurance coverage and limits will be provided by the Owner.

Add the following Clause to Subparagraph 11.1:

11.1.5 OTHER REQUIREMENTS RELATED TO BONDS AND INSURANCE

1. The Owner and its employees and agents, the Architect and its employees and agents and the Architect's consultants and its employees and agents, shall be indemnified and shall be named additional insured's on the Contractor's General Liability Insurance policy."

Add the following Clauses to Subparagraph 11.1.2:

11.1.2.1 The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds may be obtained through the Contractor's usual source and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to 100 percent of the Contract Sum.

11.1.2.2 The Contractor shall deliver the required bonds to the Owner not later than three days following the date the Agreement is entered into, or if the Work is to be commenced prior thereto in response to a letter of intent, the Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.

11.1.2.3 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney."

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.5 TESTS AND INSPECTIONS

Add the following Clause to Subparagraph 13.5.3:

13.4.3.1 If Architect's observation or if inspection or testing undertaken pursuant to this Paragraph reveals that in any one of a number of identical or similar elements, incorporated in the Work, fails to comply with the regulations or orders of any public authority having jurisdiction, the Architect will have the authority to order inspection and testing of any or all such representative elements as he may consider necessary. The Contractor shall bear costs of testing, correction of the Work and the Architect's additional services made necessary thereby."

Add the following new Paragraph 13.8 to Article 13:

"13.6 EQUAL OPPORTUNITY

13.8.1 The Contractor shall maintain policies of employment as follows:

13.8.1.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

13.8.1.2.1 The Contractor shall also comply with all local, county, state, and federal regulations regarding non-discrimination in the workplace.

13.8.1.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color,

sex or national origin."

ARTICLE 15 CLAIMS AND DISPUTES

15.1 CLAIMS

Add the following Clause to 15.1.6.1:

". . . There shall be no extension of the Contract time for adverse weather conditions unless the number of days of inclement weather is substantially greater or conditions substantially more severe than the average for the calendar period as recorded by a recognized weather observation agency."

Add the following subclauses to Subparagraph 15.1.6.2:

".1 No extension of the Contract Time shall be granted unless Contractor can demonstrate to Architect's satisfaction, that work delayed is on the critical path of the Work.

".2 The Architect shall have the right to defer his decision on any claim made pursuant to the provisions of the Contract, until the actual effect which forms the basis of the claim may be fully assessed."

END OF
SUPPLEMENTARY CONDITIONS

**EAST PROVIDENCE POLICE DEPT. RENOVATIONS
750 WATERMAN AVENUE
EAST PROVIDENCE, RHODE ISLAND**

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May 28, 2024

Captain Michael Rapoza
East Providence Police Department
750 Waterman Avenue
East Providence, RI 02914
Sent via email: mrapoza@eastprovidenceri.gov

**RE: Limited Asbestos Survey & Lead Assessment
East Providence Police Department
750 Waterman Avenue
East Providence, Rhode Island
SAGE Job No. A356**

Dear Capt. Rapoza:

This correspondence is intended to summarize the results of requested environmental services performed by SAGE Environmental, Inc. (SAGE) in support of reconfiguration and renovation work planned at the building located at the referenced property (hereinafter, "Site"). Specifically, the services included:

- A limited survey for **ACMs**¹; and
- Information Limited Lead Assessment.

These services were performed at the Site and results are provided in the following sections.

BACKGROUND AND REASONING

It is SAGE's understanding that renovations and reconfiguration/repurposing of select areas is currently planned in the existing police station building. As part of these planned modifications, the existing shooting range will be reconfigured into new spaces. Lead testing services were requested giving the use of the space as a shooting range for several years. Additionally, asbestos sampling services were recommended to satisfy local, state, and federal pre-renovation regulations. According to the City of East Providence Tax Assessor Database the building was constructed in 1983. Lead based paint and polychlorinated biphenyls (PCBs) were no longer utilized in in paints after 1978 and 1979 respectfully. Given the age of the building sampling for lead based paint and PCBs was not proposed.

¹ **ACM**= Asbestos Containing Materials (i.e., materials identified to contain asbestos at greater than 1%)

SCOPE OF WORK

The sampling approach included bulk sampling for ACM in building materials to be disturbed as part of renovation. Additionally, to assess potential lead remediation needs from lead-based ammunition SAGE proposed, bulk sampling of building materials for lead in the firing range, surface wipe samples in areas which may be impacted by the ammunition, as well as a composite bulk sample of building masonry for toxicity characteristic leaching procedure (TCLP) analysis. TCLP analysis is required to determine if lead impacted materials require disposal as hazardous waste under the United States Resource Conservation and Recovery Act (RCRA) regulations. This sampling approach was developed to determine potential handling and disposal needs of materials located in the shooting range as well as potential worker protection considerations.

Samples were collected from accessible areas and destructive sampling was limited to inconspicuous areas. This work was completed by Michael Gagne an **EPA**²-accredited and **RIDOH**³ licensed asbestos inspector (License Number AI01083) who is also 40-hour **OSHA**⁴ **HAZWOPER**⁵ trained. The survey was conducted on April 16, 2024. Sample locations are depicted on the annotated drawings in **Attachment 1**.

ASBESTOS BULK SAMPLING AND ANALYTICAL RESULTS

The asbestos survey was completed in general accord with the **RIDOH**⁶, **EPA NESHAP**⁷, and **OSHA**⁸ asbestos regulations. Suspect ACMs were surveyed throughout the building areas slated for renovation. The scope of SAGE's assessment work was to satisfy pre-renovation survey requirements as it relates to the specific scope of work and was not a building wide survey. Applicable asbestos regulations relating to the survey include but are not limited to the following:

- EPA NESHAP - National Emission Standards for Hazardous Air Pollutants, 40 CFR 61 Subpart M - National Emission, Standard for Asbestos.
- OSHA asbestos regulation - 29 CFR 1926.1101 - Asbestos - OSHA's Asbestos Standard for the Construction Industry; and
- RIDOH Rules and Regulations for Asbestos Control [R23-24.5-ASB], as amended.

Building materials identified within the proposed work area and having potential to be disturbed based on the April 16, 2024, included the following:

- White Sheetrock
- White Joint Compound
- Yellow Carpet Glue
- Tan & Brown 12x12 Vinyl Floor Tile (VFT)
- Tan Glue
- Black Cove Base
- White Square Acoustical Ceiling Tile (ACT)

² EPA = U.S.A. Environmental Protection Agency.

³ RIDOH = Rhode Island Department of Health.

⁴ OSHA = U.S. Dept. of Labor, Occupational Health and Safety Administration.

⁵ HAZWOPER = Hazardous Waste Operations and Emergency Response guidelines from OSHA to meet the requirements of OSHA regulations including 1910.120(a)(1)(i-v) and 1926.65(a)(1)(i-v).

⁶ RIDOH = Rhode Island Department of Health, Rules and Regulations for Asbestos Control [R23-24.5-ASB], as amended.

⁷ EPA NESHAP = Environmental Protection Agency NESHAP regulation 40 CFR 61 Subpart M—National Emission Standard for Asbestos.

⁸ OSHA = US Dept. of Labor, Occupational Health and Safety Administration - 29 CFR 1926.1101 Asbestos.

- Brown 12x12 VFT with Red Smudge
- Sticky Brown Glue
- Black Mastic
- Gray 12x12 VFT
- Gray Caulk
- Gray Grout
- White Grout
- Clear Caulk
- Brown Adhesive

A total of sixty-four (64) bulk samples were collected from suspect materials, of which twenty-eight (28) homogenous material groups were formed. The bulk samples were submitted to Asbestos Identification Lab, of Woburn, Massachusetts, an EPA-accredited and RIDOH-licensed analytical laboratory for analysis for asbestos by **PLM**⁹.

Materials collected were grouped into homogeneous material types (i.e., areas of materials that are uniform in color and texture, and typically also similar in type and application). Once one sample, in a homogeneous group, tests positive, all the materials of the homogeneous group are considered to be ACM.

Of the sixty-four (64) bulk samples collected, zero (0) samples collected were found to be ACM positive stop (i.e. >1% asbestos).

The laboratory certificates of analysis associated with these samples, including Chain-of-Custody documentation, are included in **Attachment 2**.

LEAD SAMPLING AND ANALYTICAL RESULTS

SAGE's inspector conducted inspection and lead sampling of areas potential impacted by the shooting range operations on April 16, 2024. The sampling approach and results are summarized below. The lead sampling is for informational purposes. Bulk samples were collected with a utility knife, hammer and flathead screwdriver. Knife blades were changed between samples and the screwdriver was wet wiped between uses.

Bulk Sampling of Building Materials for Lead and Results

SAGE collected bulk samples of building materials which were most likely impacted by lead containing ammunition over the years. These materials included the vinyl floor tile system, concrete slab, concrete masonry unit (CMU) block wall, noise dampening panels, and the acoustical ceiling tile system.

A total of five (5) bulk samples were submitted to EMSL Analytical, Inc., of Cinnaminson, New Jersey, an EPA-accredited and RIDOH-licensed analytical laboratory for lead analysis *via* EPA Method 846-3050B/7000B (Flame AAS). The laboratory limit of detection (**LOD**) was 40 mg/kg. The laboratory certificates of analysis associated with these samples, including Chain-of-Custody documentation, are included in **Attachment 3**. Results of bulk samples are summarized in **Table 1** below.

⁹ **PLM** = Polarized Light Microscopy (EPA 600/R-93/116 Method).

The Housing and Urban Development (HUD) Agency/EPA standard for lead-based paint (LBP) is 0.5% by weight or 5,000 parts per million (ppm) or mg/kg by weight, as defined by Title X of the 1992 Housing and Community Development Act. Given the age of the building, post 1978, "Lead Based Paint" was unlikely to be present, however these standards were applied as a guide. In addition to the LBP, standard OSHA regulates lead in dust regardless of the levels identified in the paint. This data is for informational purposes and is intended to provide a baseline understanding of the levels of lead that may be present and to assist in contractor selection and proper means and methods.

Table 1
Bulk Sample Results
750 Waterman Avenue
East Providence, Rhode Island

Sample ID	B-1	B-2	B-3	B-4	B-5	EPA Lead Based Paint Criteria (mg/kg)
Date	4/16/2024	4/16/2024	4/16/2024	4/16/2024	4/16/2024	
Material/Location	Gray Vinyl Floor Tile - Shooting Range	Concrete Slab - Shooting Range	CMU Wall - Shooting Range	Noise Dampening Panel - Shooting Range	ACT - Shooting Range	
Lead (mg/kg)						
Lead	280	1600	40	150	200	5,000

Cells with this color

indicate:

Cases where the analyte was detected but is within the limits provided.

<x: Indicates analyte concentration not detected at or above specified laboratory reporting limit (x)

NE: Standard not established for this substance

Lead was detected in all of the bulk samples collected. For comparison, lead levels in all samples were below the EPA definition of LBP. As noted above, this is not a direct comparison as the standard was intended to be utilized for assessing risk and management for paint that contains lead, not necessarily materials impacted by leaded materials (such as ammunition impact).

Lead Surface Wipe Sampling and Results

The intent of the wipe sampling was to evaluate surface contamination on the various building materials that are likely to have been impacted by the shooting range activities and the planned disturbance of these materials. Wipe sampling results are for informational purposes and provide a baseline understanding of surface contamination prior to disturbance. For comparative purposes EPA and HUD utilizes the following standards for determined lead abatement clearance in residential regulated facilities. These are only for reference purposes as the facility is not a “regulated” facility, in regards to residential lead laws.

EPA clearance standards for residual lead dust:

- Floors: 10 micrograms per square foot ($\mu\text{g}/\text{ft}^2$);
- Interior windowsills: 100 $\mu\text{g}/\text{ft}^2$; and
- Window troughs: 400 $\mu\text{g}/\text{ft}^2$.

Wipe samples were provided directly by EMSL Laboratory Analytical, Inc. of North Cinnaminson, New Jersey. Wipes were collected from existing ductwork, the vinyl flooring, on the shooting lane divides, concrete floor, metal target backstop, and the CMU wall. Results of wipe testing are summarized in **Table 2**. The laboratory certificates of analysis associated with these samples, including Chain-of-Custody documentation, are included in **Attachment 3**.

Table 2
Lead Surface Wipe Sample Results
750 Waterman Avenue
East Providence, Rhode Island

Sample ID	L-1	L-2	L-3	L-4	L-5	L-6	L-7	L-8	L-9	L-10
Date	4/16/2024	4/16/2024	4/16/2024	4/16/2024	4/16/2024	4/16/2024	4/16/2024	4/16/2024	4/16/2024	4/16/2024
Material/Location	Wipes Sample - In Metal Ductwork Next to Door	Wipes Sample - On Sheets of Ductwork near Entrance	Wipes Sample - On Gray VFT Floor	Wipes Sample - On Tan Shooting Lane Divider - S	Wipes Sample - Range Concrete Floor 10' from Lanes	Wipes Sample - Range Concrete Floor 10' from Target	Wipes Sample - Metal Target Backstop	Wipes Sample - Inside Metal Exhaust Ductwork	Wipes Sample - From CMU Wall – Half-way	Wipes Sample - From Target Re Setter Tread
Lead (ug/ft2)	9400	17000	5200	3300	1900	18000	20000	21000	14000	19000

Cells with this color indicate:

Cases where the analyte was detected.

<x: Indicates analyte concentration not detected at or above specified laboratory reporting limit (x)

NE: Standard not established for this substance

Based on the above results, lead dust was detected at levels ranging from 1,900 ug/ft² on the concrete floor 10' from the shooting lanes to 21,000 ug/ft² within the metal exhaust ductwork. The surface contamination indicates that migrated dust has accumulated on surfaces within the shooting range and requires cleaning.

RCRA Waste Analysis for Lead

To determine potential disposal needs of chips of concrete slab and the CMU block wall were collected and homogenized to form a composite sample. The composite sample was submitted to EMSL Laboratory for TCLP analysis. The EPA Toxicity limit for lead is 5mg/L which would require disposal as hazardous waste. The results of the TCLP analysis are summarized below in **Table 3**.

**Table 3
TCLP Lead Results
750 Waterman Avenue
East Providence, Rhode Island**

Sample ID/Date	SLAB + CMU WALL	EPA Toxicity Characteristics
	4/16/2024	
Analyte	Sample Result	
Metals, TCLP		
TCLP Lead (mg/L)	82.3	5
Result Exceeds Criteria		

The TCLP analysis was limited to the accessible concrete and CMU. Any planned disposal of excess building material waste should be budgeted and planned for as hazardous waste disposal. However, given the limited TCLP analysis and upon development of final renovation plans, additional TCLP sampling of the actual project waste load should be conducted prior to off-site disposal. Depending on the contractor chosen facility, additional characterization may be necessary. TCLP analysis was limited to lead, additional analytes may be required for analysis based on the disposal facility parameters. Given the known history of area subject to sampling it is unlikely that other contaminants are present. The laboratory certificates of analysis associated with these samples, including Chain-of-Custody documentation, are included in **Attachment 3**.

SUMMARY OF FINDINGS

Materials Containing Asbestos

ACM was not detected in any of the sixty-four (64) bulk samples analyzed. The sampling was limited to the building materials most likely to be disturbed during the renovation activity. If additional materials are discovered during work, work must stop, and the material should be properly characterized and sampled to rule out the potential for ACM.

Lead Impacted Building Materials

The primary concern with lead exposure and construction activities is related to the release of lead particles which can be toxic to workers and the general public. The only acceptable method to measure

any release of toxic levels of lead into the environment is by means of on-site ambient air sampling. Neither XRF nor AAS sampling methods can determine if lead particle levels in air are within acceptable levels. Given the above, bulk samples were below the EPA definition of Lead Based Paint, however surface wipe sampling indicated that lead dust has accumulated on the majority of building material surfaces in the shooting range and additionally the exhaust duct work. Any future sampling and compliance with the below typical construction requirements should be conducted and adhered to by a selected contractor performing any future work that may disturb painted surfaces.

The following regulations may apply to this project:

- OSHA 29 CFR 1926-Construction Industry Standards;
- 29 CFR 1926.62-Construction Industry Lead Standards;
- 29 CFR 1910.1200-Hazard Communication;
- 40 CFR 261-EPA Regulations also apply; and
- EPA Resource Conservation and Recovery Act (RCRA) [Disposal].

Planned demolition work should be conducted in accordance with the EPA Renovation, Repair, and Painting (RRP) rule and by a trained and certified contractor. Additionally, all OSHA and RCRA disposal regulations must be followed. Additionally, it is recommended that the existing ductwork be cleaned by a properly trained and certified contractor. Engineering controls are to be established to limit migration of dust from the shooting range area during disturbance of materials. Upon completion of all work, any components which remain should be adequately cleaned and removed of any residual lead dust.

LIMITATIONS AND CONDITIONS

Other hazardous materials: No inspection, sample collection or laboratory analysis for other regulated materials was included within the scope of work. Some examples of other sources of hazardous materials that may be found in this building include:

- Interior and exterior vapor and neon type lights and signs.
- Fluorescent light tubes that may contain mercury.
- Thermostats that may contain mercury float switches.

The building was occupied during this inspection and the investigation was limited to accessible areas and areas proposed for disturbance only. Lead testing was limited to the shooting range area. This report has been completed based on visual and physical observations made and information available at the time of the Site visit. This report is intended to be used as a summary of available information on existing conditions with conclusions based on a reasonable and knowledgeable review of evidence found in accordance with normally accepted industry standards, state and federal protocols, and within the scope and budget established by the Client. Any additional data obtained by further review must be reviewed by SAGE, and the conclusions presented herein may be modified accordingly.


This report and attachments, prepared for the exclusive use of Client in an limited evaluation of the Site, are an integral part of the inspection, and opinions should not be formulated without reading the report in its entirety. No part of this report may be altered, used, copied or relied upon without prior written permission from SAGE, except that this report may be conveyed in its entirety to parties associated with the project for this subject study.

SAGE will not be held responsible, however, for the discovery of additional regulated materials that may be located in areas that are not reasonably accessible for inspection. This report represents sampling efforts of suspect building materials, which are likely to be disturbed during proposed renovations. This report does not qualify compliance by current or past owners with federal, state, or local regulations in regard to management or acknowledgment of hazardous materials at the property presently or in the past. This report does not claim that all potential hazardous materials have been detected or elect that the building is free of these materials or has been fully characterized of all suspect materials.

All samples obtained and information provided in this report were based on the current condition of the Site buildings at the time of inspection and does not account for potential changes in existing conditions of prior conditions at the property. Should current conditions change and new discoveries be made at the Site which warrant additional investigation, modifications and additional analytical reports should be furnished accordingly for the property.

If we can be of further assistance or should you have any questions pertaining to the information provided in this summary report, please contact either of the undersigned.

Sincerely,
SAGE Environmental, Inc.

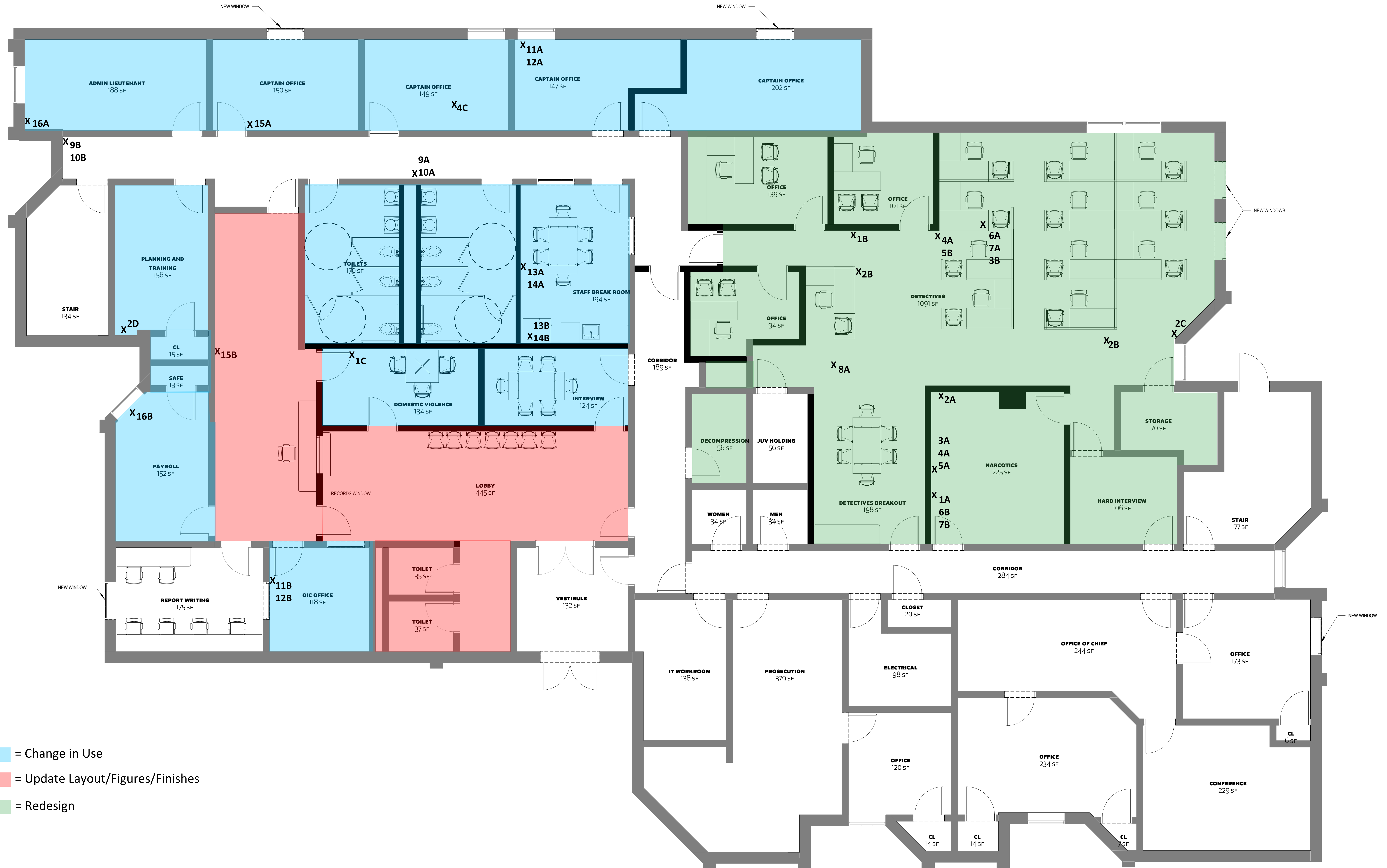

Jeffrey D'Arrigo
Project Manager
Asbestos Inspector #AAC-0853

JD/jpl

Attachments:

- Attachment 1 – Annotated Drawings
- Attachment 2 – Asbestos Analytical Results
- Attachment 3 – Lead Analytical Results

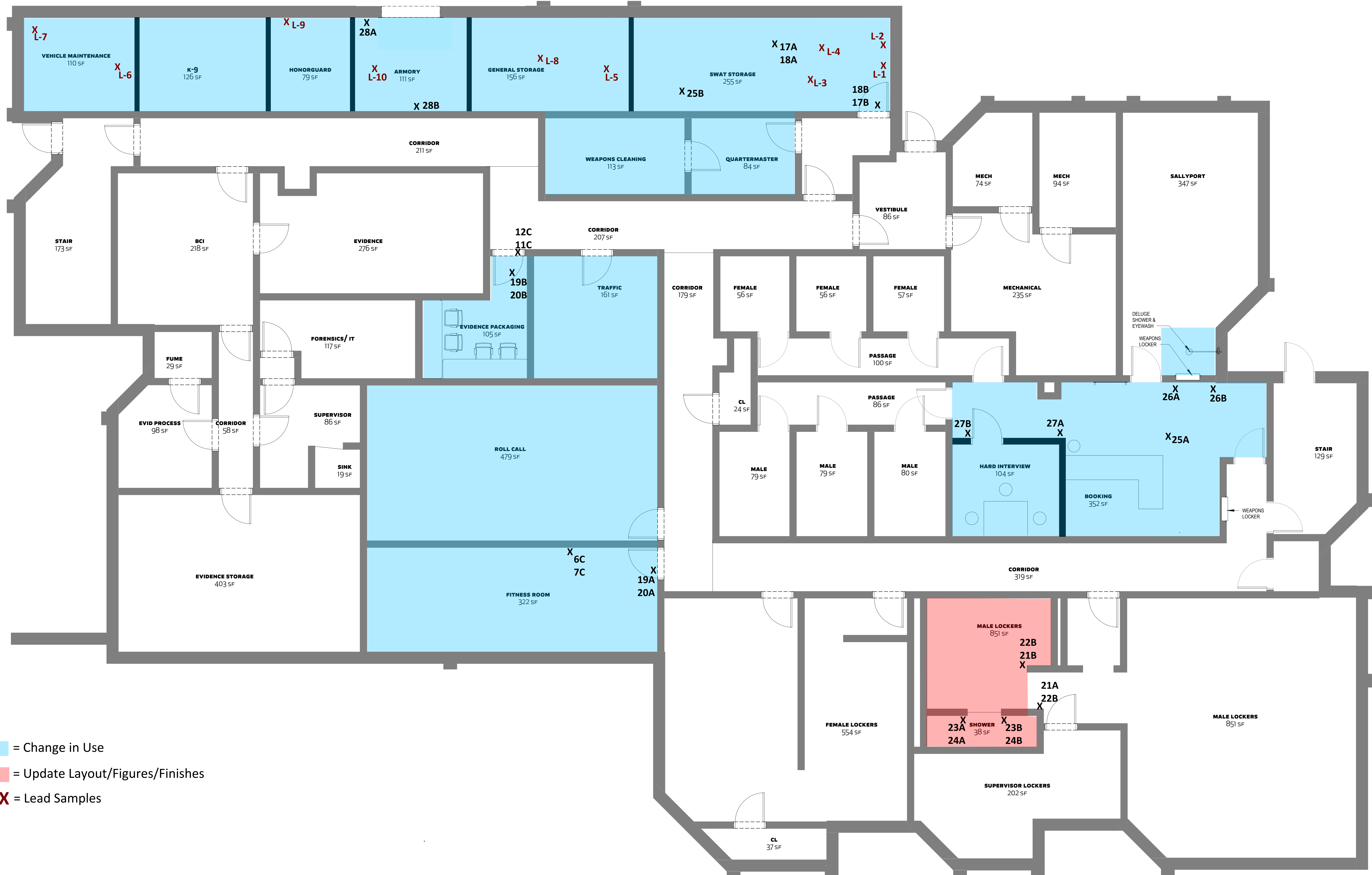
ATTACHMENT 1



- = Change in Use
- = Update Layout/Figures/Finishes
- = Redesign

MAIN FLOOR PLAN

EAST PROVIDENCE PD PROPOSED RENOVATIONS



- = Change in Use
- = Update Layout/Figures/Finishes
- X = Lead Samples

LOWER FLOOR PLAN
 EAST PROVIDENCE PD PROPOSED RENOVATIONS

ATTACHMENT 2



Asbestos Identification Laboratory.

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com Email:
mikemanning@asbestosidentificationlab.com



Batch: 115378

Project Information

A366

750 Waterman Ave.,
E. Providence,
RI

Method: BULK PLM ANALYSIS,
EPA/600/R-93/116

Jeffrey D'Arrigo
Sage Environmental, Inc.
301 Friendship St.
Providence, RI 02903

Dear Jeffrey D'Arrigo,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project. The Analysis Method is BULK PLM ANALYSIS, EPA/600/R-93/116. The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Information provided by the customer can affect the validity of results. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. All customer information will be maintained in confidentiality. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Jeffrey D'Arrigo for your business.

Michael Manning
Owner/Director

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
1A 1272593	White Sheetrock (SR)	Main Floor Wall (Green Area)	white	Cellulose 5 Non-Fibrous 95	None Detected
1B 1272594	White SR	Main Floor Wall (Green Area) Detective Area Corner Wall	white	Cellulose 5 Non-Fibrous 95	None Detected
2A 1272595	White JC	Detective Area Corner Wall	white	Non-Fibrous 100	None Detected
2B 1272596	White JC	Detective Area Corner Wall	white	Non-Fibrous 100	None Detected
2C 1272597	White JC	Detective Area Corner Wall	white	Non-Fibrous 100	None Detected
3A 1272598	Yellow Carpet Glue	Under Reddish Brown Carpet	yellow	Non-Fibrous 100	None Detected
3B 1272599	Yellow Carpet Glue	Under Reddish Brown Carpet	yellow	Non-Fibrous 100	None Detected
4A 1272600	Tan and Brown Pattern 12x12 VCT	Under Red / Brown Carpet Detective Area	multi	Non-Fibrous 100	None Detected
4B 1272601	Tan and Brown Pattern 12x12 VCT	Under Red / Brown Carpet Detective Area	multi	Non-Fibrous 100	None Detected
5A 1272602	Tan Glue	Under Tan / Brown 12x12 VFT on Concrete	tan	Non-Fibrous 100	None Detected
5B 1272603	Tan Glue	Under Tan / Brown 12x12 VFT on Concrete	tan	Non-Fibrous 100	None Detected
6A 1272604	Black Cove Base (CB)	Detective Area Office	black	Non-Fibrous 100	None Detected
6B 1272605	Black CB	Main Detective Room Office	black	Non-Fibrous 100	None Detected
7A 1272606	Light Tan Glue	On 6A	tan	Non-Fibrous 100	None Detected
7B 1272607	Light Tan Glue	On 6B	tan	Non-Fibrous 100	None Detected
8A 1272608	White Square ACT	Detective Area Ceiling	gray	Fiberglass 40 Mineral Wool 10 Cellulose 40 Non-Fibrous 10	None Detected

Sampled: April 16, 2024 Received: April 18, 2024 Analyzed: April 19, 2024

Monday 22 April 2024

Analyzed by:

Jonathan Chann

Batch: 115378

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
8B 1272609	White Square ACT	Detective Area Ceiling	gray	Fiberglass 40 Mineral Wool 10 Cellulose 40 Non-Fibrous 10	None Detected
1C 1272610	White SR	Disparten Room Wall next to Bathroom	white	Cellulose 5 Non-Fibrous 95	None Detected
2D 1272611	White JC	Room next to Storage Main Floor next to Window	white	Non-Fibrous 100	None Detected
4C 1272612	Tan & Brown Pattern 12x12 VCT	Office Floor on Concrete	multi	Non-Fibrous 100	None Detected
9A 1272613	Tall Black CB	Hallway CB	black	Non-Fibrous 100	None Detected
9B 1272614	Tall Black CB	Hallway CB	black	Non-Fibrous 100	None Detected
10A 1272615	Tan Glue	On 9A	tan	Non-Fibrous 100	None Detected
10B 1272616	Tan Glue	On 9B	tan	Non-Fibrous 100	None Detected
11A 1272617	Tan Cove Base	Main Floor Office CB	tan	Non-Fibrous 100	None Detected
11B 1272618	Tan CB	Main Floor Storage CB	tan	Non-Fibrous 100	None Detected
12A 1272619	Tan Glue	On 11A	tan	Non-Fibrous 100	None Detected
12B 1272620	Tan Glue	On 11B	tan	Non-Fibrous 100	None Detected
13A 1272621	Hard Brown W/ Red Smudge 12x12 VFT	On Metal Floor Dispatch Area	multi	Non-Fibrous 100	None Detected
13B 1272622	Hard Brown W/ Red Smudge 12x12 VFT	On Metal Floor Dispatch Area	multi	Non-Fibrous 100	None Detected
14A 1272623	Sticky Brown Glue	On 13A	brown	Non-Fibrous 100	None Detected
14B 1272624	Sticky Brown Glue	On 13B	brown	Non-Fibrous 100	None Detected

Sampled: April 16, 2024 Received: April 18, 2024 Analyzed: April 19, 2024

Monday 22 April 2024

Analyzed by:

Jonathan Chann

Batch: 115378

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
15A 1272625	Gray Pattern 12x12 VFT	Main Floor Office Floor / Hall on Tan / Brown Tiles	gray	Non-Fibrous 100	None Detected
15B 1272626	Gray Pattern 12x12 VFT	Main Floor Hall	gray	Non-Fibrous 100	None Detected
16A 1272627	Gray Caulk	Main Floor around Window Frame a & Block	gray	Non-Fibrous 100	None Detected
16B 1272628	Gray Caulk	Main Floor around Window Frame a & Block	gray	Non-Fibrous 100	None Detected
17A 1272629	Gray Pattern 12x12 VFT	Shooting Range Floor	gray	Non-Fibrous 100	None Detected
17B 1272630	Gray Pattern 12x12 VFT	Shooting Range Floor	gray	Non-Fibrous 100	None Detected
18A 1272631	Tan Glue	On 17A	tan	Non-Fibrous 100	None Detected
18B 1272632	Tan Glue	On 17B	tan	Non-Fibrous 100	None Detected
19A 1272633	Brown & Tan Pattern 12x12 VFT	Lower Level Office Floor	multi	Non-Fibrous 100	None Detected
19B 1272634	Brown & Tan Pattern 12x12 VFT	Lower Level Office Floor	multi	Non-Fibrous 100	None Detected
20A 1272635	Black Mastic	On 19A	black	Non-Fibrous 100	None Detected
20B 1272636	Black Mastic	On 19B	black	Non-Fibrous 100	None Detected
11A 1272637	Tan Cove Base	Lower Level Office CB	tan	Non-Fibrous 100	None Detected
12C 1272638	Tan Glue	On 11C	tan	Non-Fibrous 100	None Detected
6C 1272639	Black Cove Base	Lower Lever Office CB	black	Non-Fibrous 100	None Detected
7C 1272640	Tan Glue	On 6C	tan	Non-Fibrous 100	None Detected

Sampled: April 16, 2024

Received: April 18, 2024

Analyzed: April 19, 2024

Monday 22 April 2024

Analyzed by:

Jonathan Chann

Batch: 115378

Page 4 of 5

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
21A 1272641	Gray Grout	Between Small Ceramic Bathroom Wall Tiles	gray	Non-Fibrous 100	None Detected
21B 1272642	Gray Grout	Between Small Ceramic Bathroom Wall Tiles	gray	Non-Fibrous 100	None Detected
22A 1272643	Brown Adhesive	On Back of Small Ceramic Bathroom Wall Tiles	brown	Non-Fibrous 100	None Detected
22B 1272644	Brown Adhesive	On Back of Small Ceramic Bathroom Wall Tiles	brown	Non-Fibrous 100	None Detected
23A 1272645	Tan Glue	On Back of Shower Tiles	tan	Non-Fibrous 100	None Detected
23B 1272646	Tan Glue	On Back of Shower Wall Tiles	tan	Non-Fibrous 100	None Detected
24A 1272647	White Grout	Between Shower Tiles	white	Non-Fibrous 100	None Detected
24B 1272648	White Grout	Between Shower Tiles	white	Non-Fibrous 100	None Detected
25A 1272649	Newer Square ACT	Basement Ceiling	gray	Fiberglass 40 Mineral Wool 10 Cellulose 40 Non-Fibrous 10	None Detected
25B 1272650	Newer Square ACT	Basement Ceiling	gray	Fiberglass 40 Mineral Wool 10 Cellulose 40 Non-Fibrous 10	None Detected
26A 1272651	Black Caulk	Small Window Cell Block	black	Non-Fibrous 100	None Detected
26B 1272652	Black Caulk	Small Window Cell Block	black	Non-Fibrous 100	None Detected
27A 1272653	Gray Caulk	Around Cell Doors	gray	Non-Fibrous 100	None Detected
27B 1272654	Gray Caulk	Around Cell Doors	gray	Non-Fibrous 100	None Detected
28A 1272655	Clear Caulk	Expansion Joints, shooting Range CMU Wall	clear	Non-Fibrous 100	None Detected
28B 1272656	Clear Caulk		clear	Non-Fibrous 100	None Detected

Sampled: April 16, 2024 Received: April 18, 2024 Analyzed: April 19, 2024

Monday 22 April 2024

Analyzed by:

Mathew Chann

Batch: 115378

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celsius = _____	Stereo Scope					Optical Properties								Non-Asbestos Percentage (%)							
			Material / Location	% of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI	Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
01	4B	Material Same as 4A Location ↓	0	mn	n	ln		Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite															100
02	5A	Material tan grey Location under pool houses next VPT on concrete	0	T	y	ln		Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite															100
03	5B	Material Same as 5A Location ↓	0	T	y	ln		Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite															100
04	6A	Material black Cove base Location deceptive over appra	0	BK	y	ln		Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite															100
05	6B	Material Black CB Location deceptive main room appra	0	BK	y	ln		Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite															100

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius =	Stereo Scope					Asbestos Minerals	Optical Properties							Non-Asbestos Percentage (%)					
			% of Asbestos	Color	Homogeneity	Texture	Friable		Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI	Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other
11	2D	Material: White SE Location: room next to spans main floor next to window	0	W	Y	G	Y	Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite													100
12	4C	Material: Tan & brown pattern blk VPT Location: office floor on concrete.	0	M	N	G	N	Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite													100
13	9A	Material: Tall black CB Location: hallway CB	0	Blk	Y	G	N	Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite													100
14	9B	Material: Tan black CB Location: hallway CB	0	Blk	Y	G	N	Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite													100
15	15A	Material: tan blue Location: on 9A	0	T	Y	G	N	Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite													100

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = _____	Stereo Scope					Asbestos Minerals	Optical Properties						Non-Asbestos Percentage (%)								
			Material / Location	% of Asbestos	Color	Homogeneity	Texture		Friable	Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI	Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
16	10B	Material Synthetic Tan glue Location on QB		OTY	G	N	Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite															100	
17	11A	Material Tan coue base Location Main floor office CB		OTY	G	N	Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite																100
18	11B	Material Tan glue Location Main floor storage CB		OTY	G	N	Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite																100
19	12A	Material Tan glue Location on 11A		OTY	G	N	Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite																100
20	12B	Material Tan glue Location on 11B		OTY	G	N	Chrysotile Amosite Crocidolite Tremolite Anthophyllite Actinolite																100

Lab ID# (Lab Use Only)		Field ID/ (Client Reference)		Temp in Celcius = _____	Stereo Scope					Optical Properties						Non-Asbestos Percentage (%)												
Material / Location				% of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals						Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI	Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
51	13A	Material hard brown w/ red sawdust VP-12 Location on metal plate dispatch area.		0	M	N	G	N	Chrysotile																		100	
22	13B	Material Same as 13A Location ↓		0	M	N	G	N	Chrysotile																		100	
23	14A	Material sticky brown Location on 13A		0	B	Y	G	N	Chrysotile																		100	
24	14B	Material Same as 14A Location on 13B		0	B	Y	G	N	Chrysotile																		100	
25	15A	Material grey pattern 12x11 Location main floor area Ploof hall - on tan brown TMS-		0	G	N	G	N	Chrysotile																		100	

Lab ID# (Lab Use Only)		Field ID/ (Client Reference)	Temp in Celsius =		Stereo Scope					Optical Properties								Non-Asbestos Percentage (%)											
Material / Location			% of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals								Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI	Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
31	16A	Material rain glue Location on 17A	0	T	Y	G	N	Chrysotile	Amosite	Crocidolite	Tremolite	Anthophyllite	Actinolite																100
32	16B	Material rain glue Location on 17B	0	T	Y	G	N	Chrysotile	Amosite	Crocidolite	Tremolite	Anthophyllite	Actinolite																100
33	19A	Material brown & tan particles Location inner level street floor	0	M	N	G	N	Chrysotile	Amosite	Crocidolite	Tremolite	Anthophyllite	Actinolite																100
34	19B	Material same as 19A Location	0	M	N	G	N	Chrysotile	Amosite	Crocidolite	Tremolite	Anthophyllite	Actinolite																100
35	20A	Material black waste Location on 19A	0	B	Y	G	N	Chrysotile	Amosite	Crocidolite	Tremolite	Anthophyllite	Actinolite																100

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = _____	Stereo Scope					Optical Properties							Non-Asbestos Percentage (%)								
			Material / Location	% of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI	Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
36	20B		Material blush mastic Location on 19B	0	Black	Y	Grain	Asbestos Minerals															100
37	11C		Material tan core base Location lower level office EB	0		Y	Grain	Asbestos Minerals															100
38	12C		Material tan glue Location on 11C	0		Y	Grain	Asbestos Minerals															100
39	6C		Material black core base Location lower level office EB	0		Y	Grain	Asbestos Minerals															100
40	7C		Material tan glue Location on 6C	0		Y	Grain	Asbestos Minerals															100

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celsius = _____	Material / Location	Stereo Scope					Asbestos Minerals	Optical Properties							Non-Asbestos Percentage (%)							
				% of Asbestos	Color	Homogeneity	Texture	Friable		Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	RI	Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous	
46	23B		Material tan grt Location on back of shower between tiles	OTY	W			Chrysotile																100
47	24A		Material White grout Location between shower tiles	GWY	W			Chrysotile																100
48	24B		Material White grout Location between shower tiles	GWY	W			Chrysotile																100
49	25A		Material Neuron Square ACF Location balcony crevice	0GW	N	Y		Chrysotile																100
50	25B		Material Soft as 25A Location ↓	0GW	N	Y		Chrysotile																100

JC
4/19/24

ATTACHMENT 3

**EMSL Analytical, Inc.**

200 Route 130, Cinnaminson, NJ, 08077
 Telephone: 856-858-4800 Fax:856-786-5974
 EMSL-CIN-01

EMSL Order ID: 012415137
LIMS Reference ID: AC15137
EMSL Customer ID: SAGE53

Attention: Mike Gagne
 Sage Environmental, Inc. [SAGE53]
 301 Friendship St
 Providence, RI 02903
 (401) 723-9900
 mgagne@sage-enviro.com

Project Name: Proj #A356 // 750 Waterman Ave., E
 Providence, RI
Customer PO: A356
EMSL Sales Rep: David Prince
Received: 04/24/2024 09:30
Reported: 05/01/2024 12:59

Analytical Results

Analyte	Results	RL	Weight(g)	Prep Date & Tech	Prep Method	Analysis Date & Analyst	Analytical Method	Q	DF
Client Sample ID: B - 1/Gray Vinyl Floor Tile - Shooting Range							Date Sampled: 04/16/24		
Matrix: Solid							LIMS Reference ID: AC15137-11		
Lead	280 mg/kg	40 mg/kg	0.5148	04/30/24 PL	SW-846 3050B	04/30/24 PMx	SW846-7000B	1	
Sample Comments:									
Client Sample ID: B - 2/Concrete Slab - Shooting Range							Date Sampled: 04/16/24		
Matrix: Solid							LIMS Reference ID: AC15137-12		
Lead	1600 mg/kg	40 mg/kg	0.5395	04/30/24 PL	SW-846 3050B	04/30/24 PMx	SW846-7000B	1	
Sample Comments:									
Client Sample ID: B - 3/CMU Wall - Shooting Range							Date Sampled: 04/16/24		
Matrix: Solid							LIMS Reference ID: AC15137-13		
Lead	40 mg/kg	40 mg/kg	0.5426	04/30/24 PL	SW-846 3050B	04/30/24 PMx	SW846-7000B	1	
Sample Comments:									
Client Sample ID: B - 4/Noise Dampning Panel - Shooting Range							Date Sampled: 04/16/24		
Matrix: Solid							LIMS Reference ID: AC15137-14		
Lead	150 mg/kg	40 mg/kg	0.5421	04/30/24 PL	SW-846 3050B	04/30/24 PMx	SW846-7000B	1	
Sample Comments:									
Client Sample ID: B - 5/ACT - Shooting Range							Date Sampled: 04/16/24		
Matrix: Solid							LIMS Reference ID: AC15137-15		
Lead	200 mg/kg	40 mg/kg	0.5356	04/30/24 PL	SW-846 3050B	04/30/24 PMx	SW846-7000B	1	
Sample Comments:									

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 Sage Environmental, Inc. [SAGE53]
 301 Friendship St
 Providence, RI 02903
 (401) 723-9900
 mgagne@sage-enviro.com

Project Name: Proj #A356 // 750 Waterman Ave., E
 Providence, RI
Customer PO: A356
EMSL Sales Rep: David Prince
Received: 04/24/2024 09:30
Reported: 05/01/2024 12:59

Analytical Results (Continued)

Analyte	Results	RL	Area(in ²)	Prep Date & Tech	Prep Method	Analysis Date & Analyst	Analytical Method	Q	DF
Client Sample ID: L - 1/Wipes Sample - in Metal Ductwork next to Door						Date Sampled: 04/16/24			
Matrix: Wipe						LIMS Reference ID: AC15137-01			
Lead	9400 µg/ft ²	500 µg/ft ²	144	04/29/24 LP	SW-846 3050B	04/29/24 PMx	SW846-7000B	D	50
Sample Comments:									
Client Sample ID: L - 2/Wipes Sample - On Sheets of Ductwork near Entrance						Date Sampled: 04/16/24			
Matrix: Wipe						LIMS Reference ID: AC15137-02			
Lead	17000 µg/ft ²	1000 µg/ft ²	144	04/29/24 LP	SW-846 3050B	04/29/24 PMx	SW846-7000B	D	100
Sample Comments:									
Client Sample ID: L - 3/Wipes Sample - On Gray VFT Floor						Date Sampled: 04/16/24			
Matrix: Wipe						LIMS Reference ID: AC15137-03			
Lead	5200 µg/ft ²	250 µg/ft ²	144	04/29/24 LP	SW-846 3050B	04/29/24 PMx	SW846-7000B	D	25
Sample Comments:									
Client Sample ID: L - 4/Wipes Sample - On Tan Shooting Lande Devided - S						Date Sampled: 04/16/24			
Matrix: Wipe						LIMS Reference ID: AC15137-04			
Lead	3300 µg/ft ²	100 µg/ft ²	144	04/29/24 LP	SW-846 3050B	04/29/24 PMx	SW846-7000B	D	10
Sample Comments:									
Client Sample ID: L - 5/Wipes Sample - Range Concrete Floor 10' from Lanes						Date Sampled: 04/16/24			
Matrix: Wipe						LIMS Reference ID: AC15137-05			
Lead	1900 µg/ft ²	50 µg/ft ²	144	04/29/24 LP	SW-846 3050B	04/29/24 PMx	SW846-7000B	D	5
Sample Comments:									
Client Sample ID: L - 6/Wipes Sample - Range Concrete Floor 10' from Target						Date Sampled: 04/16/24			
Matrix: Wipe						LIMS Reference ID: AC15137-06			
Lead	18000 µg/ft ²	1000 µg/ft ²	144	04/29/24 LP	SW-846 3050B	04/29/24 PMx	SW846-7000B	D	100
Sample Comments:									
Client Sample ID: L - 7/Wipes Sample - Metal Target Backstop						Date Sampled: 04/16/24			
Matrix: Wipe						LIMS Reference ID: AC15137-07			
Lead	20000 µg/ft ²	1000 µg/ft ²	144	04/29/24 LP	SW-846 3050B	04/29/24 PMx	SW846-7000B	D	100
Sample Comments:									
Client Sample ID: L - 8/Wipes Sample - Inside Metal Exhaust Ductwork						Date Sampled: 04/16/24			
Matrix: Wipe						LIMS Reference ID: AC15137-08			
Lead	21000 µg/ft ²	1000 µg/ft ²	144	04/29/24 LP	SW-846 3050B	04/29/24 PMx	SW846-7000B	D	100
Sample Comments:									
Client Sample ID: L - 9/Wipes Sample - From CMU Wall - Halframe						Date Sampled: 04/16/24			
Matrix: Wipe						LIMS Reference ID: AC15137-09			
Lead	14000 µg/ft ²	1000 µg/ft ²	144	04/29/24 LP	SW-846 3050B	04/29/24 PMx	SW846-7000B	D	100
Sample Comments:									



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Providence, RI
Customer PO: A356
EMSL Sales Rep: David Prince
Received: 04/24/2024 09:30
Reported: 05/01/2024 12:59

**Analytical Results
(Continued)**

Analyte	Results	RL	Area(in ²)	Prep Date & Tech	Prep Method	Analysis Date & Analyst	Analytical Method	Q	DF
Client Sample ID: L - 10/Wipes Sample - From Target Re Setter Tread							Date Sampled: 04/16/24		
Matrix: Wipe							LIMS Reference ID: AC15137-10		
Lead	19000 µg/ft ²	1000 µg/ft ²	144	04/29/24 LP	SW-846 3050B	04/29/24 PMx	SW846-7000B	D	100
Sample Comments:									

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 EMSL-CIN-01

EMSL Order ID: 012415137
LIMS Reference ID: AC15137
EMSL Customer ID: SAGE53

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 Providence, RI
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EMSL Sales Rep: David Prince
Received: 04/24/2024 09:30
Reported: 05/01/2024 12:59

Certified Analyses included in this Report

Analyte	Certifications
SW846-7000B in Solid	
Lead	AIHA LAP
SW846-7000B in Wipe	
Lead	AIHA LAP

List of Certifications

Code	Description	Number	Expires
NJDEP	New Jersey Department of Environmental Protection	03036	06/30/2024
AIHA LAP	EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC-ELLAP Accredited	100194	01/01/2025
NYSDOH	New York State Department of Health	10872	04/01/2025
California ELAP	California Water Boards	1877	06/30/2024
A2LA	A2LA Environmental Certificate	2845.01	07/31/2024
PADEP	Pennsylvania Department of Environmental Protection	68-00367	11/30/2024
MADEP	Massachusetts Department of Environmental Protection	M-NJ337	06/30/2024
CTDPH	Connecticut Department of Public Health	PH-0270	06/23/2024

Please see the specific Field of Testing (FOT) on www.emsl.com <<http://www.emsl.com>> for a complete listing of parameters for which EMSL is certified.



EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
Telephone: 856-858-4800 Fax:856-786-5974
EMSL-CIN-01

EMSL Order ID: 012415137
LIMS Reference ID: AC15137
EMSL Customer ID: SAGE53

Attention: Mike Gagne
Sage Environmental, Inc. [SAGE53]
301 Friendship St
Providence, RI 02903
(401) 723-9900
mgagne@sage-enviro.com

Project Name: Proj #A356 // 750 Waterman Ave., E
Providence, RI

Customer PO: A356
EMSL Sales Rep: David Prince

Received: 04/24/2024 09:30
Reported: 05/01/2024 12:59

Notes and Definitions

Item	Definition
D	Analyte was reported from a dilution run.
(Dig)	For metals analysis, sample was digested.
[2C]	Reported from the second channel in dual column analysis.
DF	Dilution Factor
MDL	Method Detection Limit.
ND	Analyte was NOT DETECTED at or above the detection limit.
Q	Qualifier
RL	Reporting Limit For paint chips, the RL is 0.008% by wt. (equiv. to 80 mg/kg, or ppm) based upon a minimum sample weight of 0.25 grams. For soils, the RL is 40 mg/kg (ppm) based upon a minimum sample weight of 0.5 grams. For dust wipes, the RL is 10 µg/wipe; reporting units of µg/sq. ft. are not validated by the lab based upon data provided by non-lab personnel.

Measurement of uncertainty and any applicable definitions of method modifications are available upon request. Per EPA NLLAP policy, sample results are not blank corrected.

Owen McKenna Laboratory Manager or other approved signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. QC sample results are within quality control criteria and met method specifications unless otherwise noted.

AC15137



SAMPLE DATA SHEET

Property/Survey Area: 750 Waterman Ave, E Providence, RI PURCHASE ORDER #: A356

SAMPLED BY: Michael Gagne SAGE PROJECT NUMBER: A356

DATE: 4/16/24 PAGE 1 OF 1

Line	Sample #	Description	Location	TYPE/Condition
1	L-1	wipe sample	in metal ductwork next to door	wipe samples
2	L-2		on seats of ductwork near entrance	
3	L-3		on grey VFT floor	
4	L-4		on tan shooting lane divider	
5	L-5		range concrete floor 10' from lanes	
6	L-6		range concrete floor 10' from target	
7	L-7		metal target backstop	
8	L-8		inside metal exhaust ductwork	
9	L-9		from CMU wall - half range	
10	L-10		from target re-setter track	
11	B-1	Grey vinyl floor tile	" Shooty Range	Bulk samples
12	B-2	Concrete slab		
13	B-3	CMU wall		
14	B-4	noise dampening panel		
15	B-5	ACT		
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

COMMENTS:

- A. (1) Analysis = PLM, Asbestos (EPA 600/R-93/116); PLM NOB; _____ point count; TEM NOB
- (2) TAT = _____ hour - day - week; (3) No. samples submitted = _____; (4) Y or N - Positive stop by Homogeneous # shown
- B. (1) Analysis = Pb paint chips % by wt. (EPA SW-846-7080B); (2) TAT = 1 hour - day - week
- C. (1) Analysis = PCB caulk (EPA 3540C/8082A); (2) TAT = _____ hour - day - week
- D. Email report to data@sage-enviro.com

RELINQUISHED BY: (SIGNATURE) Michael A. Gagne DATE 4/16/24 RECEIVED BY: (SIGNATURE) Edwin EFX 9:30 DATE 4-24-24

AC15137



SAMPLE DATA SHEET

Property/Survey Area: 750 Waterman Ave, E Providence, RI PURCHASE ORDER #: A356

SAMPLED BY: Michael Gagne SAGE PROJECT NUMBER: A356

DATE: 4/16/24 PAGE 1 OF 1

Line	Sample #	Description	Location	TYPE/Condition
1	L-1	wipe sample	in metal ductwork next to door	wipe samples
2	L-2		on skirts of ductwork near entrance	
3	L-3		on grey VFT floor	
4	L-4		on tan shooting lane divider	
5	L-5		range concrete floor 10' from lanes	
6	L-6		range concrete floor 10' from target	
7	L-7		metal target backdrop	
8	L-8		inside metal exhaust ductwork	
9	L-9		from CMU wall - half range	
10	L-10		from target re setter track	
11	B-1	Grey vinyl floor tile	"Shooting Range"	Bulk samples
12	B-2	Concrete slab		
13	B-3	CMU wall		
14	B-4	Noise dampening panel		
15	B-5	ACT		
16				
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26				
27				
28				
29				
30				

*Hold for "Solid" Cont. EQ"

4-26-24 9am EQ
 X Client OK

COMMENTS:

- A. (1) Analysis = PLM, Asbestos (EPA 600/R-93/116); PLM NOB; _____ point count; TEM NOB
 (2) TAT = _____ hour - day - week; (3) No. samples submitted = _____; (4) Y or N - Positive stop by Homogeneous # shown
- B. (1) Analysis = Pb paint chips by wt. (EPA SW846-7080B); (2) TAT = 1 hour - day - week
- C. (1) Analysis = PCB caulk (EPA 3540C/8082A); (2) TAT = _____ hour - day - week
- D. Email report to data@sage-enviro.com

15

RELINQUISHED BY: (SIGNATURE) <u>Michael A. Gagne</u>	DATE <u>4/16/24</u>	RECEIVED BY: (SIGNATURE) <u>Edwin EFX</u>	DATE <u>4-24-24</u>
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AC15137



SAMPLE DATA SHEET

Property/Survey Area: 750 Waterman Ave, E Providence, RI PURCHASE ORDER #: A356

SAMPLED BY: Michael Ogan SAGE PROJECT NUMBER: A356

DATE: 4/16/24 PAGE 1 OF 1

Line	Sample #	Description	Location	TYPE/Condition
1	L-1	wipe sample	in metal ductwork next to door	wipe sample
2	L-2		on skirts of ductwork near entrance	
3	L-3		on grey VFT floor	
4	L-4		on tan shooting lane divider	
5	L-5		range concrete floor 10' from lanes	
6	L-6		range concrete floor 10' from target	
7	L-7		metal target backstop	
8	L-8		inside metal exhaust ductwork	
9	L-9		from CMU wall - hallway	
10	L-10		from target re-setter track	
11	B-1	Grey vinyl floor tile	Shooting Range	Bulk Sample
12	B-2	Concrete slab		
13	B-3	CMU wall		
14	B-4	Noise dampening panel		
15	B-5	ACT		
16				
17		*Hold for "Solid" Cont. EQ"		
18				
19		4-26-24 9am EQ		
20		X Client OK		
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

COMMENTS:

- A. (1) Analysis = PLM, Asbestos (EPA 600/R-93/116); PLM NOB; _____ point count; TEM NOB
- (2) TAT = _____ hour - day - week; (3) No. samples submitted = _____; (4) Y or N - Positive stop by Homogeneous # shown
- B. (1) Analysis = Pb paint chips % by wt. (EPA SW846-7080B); (2) TAT = _____ hour - day - week
- C. (1) Analysis = PCB caulk (EPA 3540C/8082A); (2) TAT = _____ hour - day - week
- D. Email report to data@sage-enviro.com

15

RELINQUISHED BY: (SIGNATURE) <u>Michael A. Ogan</u>	DATE <u>4/16/24</u>	RECEIVED BY: (SIGNATURE) <u>Edwin EFX</u>	DATE <u>4-24-24</u>
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Thursday, April 25, 2024

Attn:
Sage Environmental Inc.
301 Friendship Street
Providence RI 02903

Project ID: 750 WATERMAN AVE, E. PROVIDENCE, RI
SDG ID: GCQ57799
Sample ID#s: CQ57799

This laboratory is in compliance with the NELAC requirements of procedures used except where indicated.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory. This report is incomplete unless all pages indicated in the pagination at the bottom of the page are included.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Sincerely yours,

A handwritten signature in black ink that reads "Phyllis Shiller". The signature is written in a cursive style.

Phyllis Shiller
Laboratory Director

NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #M-CT007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B

NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
VT Lab Registration #VT11301



Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

Sample Id Cross Reference

April 25, 2024

SDG I.D.: GCQ57799

Project ID: 750 WATERMAN AVE, E. PROVIDENCE, RI

Client Id	Lab Id	Matrix
SLAB + CMU WALL	CQ57799	BULK



Environmental Laboratories, Inc.

587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

Analysis Report

April 25, 2024

FOR: Attn: Sage Environmental Inc.
301 Friendship Street
Providence RI 02903

Sample Information

Matrix: BULK
Location Code: SAGE
Rush Request: Standard
P.O.#: A356

Custody Information

Collected by: MC
Received by: SR1
Analyzed by: see "By" below

Date

04/16/24
04/23/24

Time

13:00
15:55

Laboratory Data

SDG ID: GCQ57799
Phoenix ID: CQ57799

Project ID: 750 WATERMAN AVE, E. PROVIDENCE, RI
Client ID: SLAB + CMU WALL

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
TCLP Lead	82.3	0.10	mg/L	1	04/24/24	CPP	SW846 1311/6010
TCLP Metals Digestion	Completed				04/24/24	AL/HL	SW3010A
TCLP Extraction for Metals	Completed				04/23/24	AL	SW1311

RL/PQL=Reporting/Practical Quantitation Level ND=Not Detected BRL=Below Reporting Level

Comments:

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Phyllis Shiller, Laboratory Director

April 25, 2024

Reviewed and Released by: Ethan Lee, Project Manager



Environmental Laboratories, Inc.
 587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
 Tel. (860) 645-1102

QA/QC Report

April 25, 2024

QA/QC Data

SDG I.D.: GCQ57799

Parameter	Blank	Blk RL	Sample Result	Dup Result	Dup RPD	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
QA/QC Batch 728282 (mg/L), QC Sample No: CQ51460 (CQ57799)													
<u>ICP Metals - TCLP Extraction</u>													
Lead	BRL	0.10	3.05	3.83	22.7	106	107	0.9	117			80 - 120	20 r


Comment:

Additional Criteria: LCS acceptance range is 80-120% MS acceptance range 75-125%.

r = This parameter is outside laboratory RPD specified recovery limits.

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

- RPD - Relative Percent Difference
- LCS - Laboratory Control Sample
- LCSD - Laboratory Control Sample Duplicate
- MS - Matrix Spike
- MS Dup - Matrix Spike Duplicate
- NC - No Criteria
- Intf - Interference


 Phyllis Shiller, Laboratory Director
 April 25, 2024

Thursday, April 25, 2024

Criteria: None

State: RI

Sample Criteria Exceedances Report

GCQ57799 - SAGE

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units
CQ57799	TCLP-PB	TCLP Lead	EPA / 40 CFR 261.24 / Toxicity Characteristics	82.3	0.10	5	5	mg/L

Phoenix Laboratories does not assume responsibility for the data contained in this exceedance report. It is provided as an additional tool to identify requested criteria exceedences. All efforts are made to ensure the accuracy of the data (obtained from appropriate agencies). A lack of exceedence information does not necessarily suggest conformance to the criteria. It is ultimately the site professional's responsibility to determine appropriate compliance.



Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823



Analysis Comments

April 25, 2024

SDG I.D.: GCQ57799

The following analysis comments are made regarding exceptions to criteria not already noted in the Analysis Report or QA/QC Report: None.



CT/MA/RI CHAIN OF CUSTODY RECORD

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: makrina@phoenixlabs.com Fax (860) 645-0823
Client Services (860) 645-1102

Cooler: Yes No
Coolant: IPK ICE
Temp: 5 °C Pg 1 of 1

Data Delivery/Contact Options:

Fax:
Phone:
Email:

Project P.O.: A 356

Project: 750 Waterman Ave., E Providence, RI

Report to: Sage & Sage - Enviro. Con.

Invoice to: S&S

Quote #

This section MUST be completed with Bottle Quantities.

Customer: Sage Environmental
Address: 801 Broad Ship St Providence, RI

Client Sample Information - Identification

Sampler's Signature: Michael A. Coy Date: 4/16/24

Matrix Code:
DW=Drinking Water GW=Ground Water SW=Surface Water WM=Waste Water
RW=Raw Water SE=Sediment SL=Sludge S=Soil SD=Solid W=Wipe OIL=Oil
B=Bulk L=Liquid X = _____ (Other)

PHOENIX USE ONLY:
SAMPLE # 57799 Customer Sample Identification Slab + CMU wall Date Sampled 4/16/24 Time Sampled 1300

MS/MSD (Mer de billete et analyse)

PHOENIX USE ONLY	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	RI	CT	MA	Data Format
57799	Slab + CMU wall	B	4/16/24	1300	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Excel
								<input type="checkbox"/> PDF
								<input type="checkbox"/> GIS/Key
								<input type="checkbox"/> EQUIS
								<input type="checkbox"/> Other
								<input type="checkbox"/> Tier II Checklist*
								<input type="checkbox"/> Full Data Package*
								<input type="checkbox"/> Phoenix Std
								<input type="checkbox"/> Other

Relinquished by: [Signature] Accepted by: [Signature] Date: 4/23/24 Time: 09:50
Turnaround Time: 1 Day* Standard Other
 2 Days* 3 Days* 4 Days* 5 Days*

Comments, Special Requirements or Regulations:

*MS/MSD are considered site samples and will be billed as such in accordance with the prices quoted.

* SURCHARGES MAY APPLY

State where samples were collected: RI * SURCHARGE APPLIES

To:

Project Name:

JCJ Project No.

Date:

Architect:

DIGITAL DATA TRANSMITTAL, AGREEMENT AND LIMITED LICENSE FOR USE

The Digital Data transmitted or provided (or to be transmitted or provided) by the Architect to the Addressee is:

INSERT FILE NAME / DESCRIPTION / PROGRAM / TRANSMITTAL METHOD

For good and valuable consideration, the receipt and sufficiency of which is acknowledged, in accepting and utilizing any Building Information Model (BIM) files, AutoCAD (CAD) files, drawings or other data and in any form of electronic media generated and provided by the Architect to the Addressee and as identified above (collectively "Digital Data"), the Addressee covenants and agrees that all such Digital Data are Instruments of Service of the Architect, who shall be deemed the author of the Digital Data and Architect shall retain all common law, statutory law and other rights, including copyrights. Under no circumstances shall the Architect's transfer of Digital Data to Addressee be deemed a publication in derogation of the reserved rights of the Architect. Further, nothing in this Digital Data Transmittal, Agreement and License for Use shall be construed to convey any ownership right or grant any license to Addressee in the software used to generate the content contained in the Digital Data.

The Digital Data submitted by the Architect to the Addressee is submitted for an acceptance period of twenty-four (24) hours for the Addressee to determine if there are any technical defects (i.e. corrupt or incomplete files) which make the Digital Data unreadable and report same to the Architect for verification and, if applicable, correction. Any and all technical defects detected in the Digital Data after the acceptance period will be the sole responsibility of the Addressee.

The Addressee acknowledges that the Digital Data may become unusable after a period of time due to software changes, hardware changes, file degradation or other causes and the Addressee agrees to the fullest extent permitted by law to indemnify and hold the Architect harmless from any damage, liability or costs, including reasonable attorney's fees and costs of defense, arising from any degradation, incompatibility, or un-usability of the Digital Data. Unless the Architect and Addressee are parties to a separate agreement or protocol defining the format for digital data on the Project the Architect provides the Digital Data in an "as-is" condition and in the file format used by the Architect. The Addressee is solely responsible for any and all conversions or translations of the Digital Data to a different format.

The Architect hereby grants a limited, non-exclusive license to the Addressee to use the Digital Data solely and exclusively for the Addressee to perform services for, or construction of, the Project. Except for the license granted herein, no other license or right shall be deemed granted or implied under this Digital Data Transmittal, Agreement and License for Use. The Addressee shall not assign, delegate, sublicense, pledge or otherwise transfer the license granted herein to another party except in the furtherance of providing services for or constructing the Project. Addressee may not use the Digital Data, in whole or in part, for any purpose or on any project other than the purpose and Project identified herein.

Unless the Architect and Addressee are parties to a separate agreement or protocol defining the use of digital data on the Project, any use, modification, transmission or reliance on the Digital Data is at the sole risk of the

Addressee. The Architect makes no representations as to the accuracy, completeness, Level of Development, or sufficiency of any content included in the Digital Data.

The Addressee, to the fullest extent permitted by law, agrees to indemnify and hold harmless the Architect from all costs and expenses, including all attorney's fees and costs of defense, related to claims or causes of action asserted by any third person or entity to the extent such claim, cause of action, costs and expenses arise from the Addressee's 1) use of the Digital Data on this Project, 2) any unauthorized use or transfer of the Digital Data by Addressee on this Project or, 3) any use or transfer of the Digital Data by Addressee for any other project. In the event the Addressee modifies any of the content contained in the Digital Data, the Addressee hereby waives and forever releases the Architect from all claims and causes of action arising from such modifications to the Digital Data.

Nothing in this Digital Data Transmittal, Agreement and License for Use shall be construed as a sale by the Architect and the Architect makes no warranties, expressed or implied, and expressly disclaims same, with respect to the Digital Data's merchantability or fitness for any particular purpose.

Accepted by: _____
Duly Authorized

Print Name / Date

Sign, date and return to JCJ Architecture

SECTION 012300 - ALTERNATES

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

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

1.03 DEFINITIONS

- A. 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 or deducted from the base bid amount if the 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. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.04 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other Work of the Contract.
- C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

1.05 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

**EAST PROVIDENCE POLICE DEPT. RENOVATIONS
750 WATERMAN AVENUE
EAST PROVIDENCE, RHODE ISLAND**

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF ALTERNATES

A. **Alternate No. 1:** Corridor Finishes:

1. Base Bid: Do not include the new finishes for the flooring, ceiling and lighting in the upper and lower corridors, the finish painting of existing partitions on the lower corridor and add the High Impact Wall Covering, wall guard on the upper corridor, not the carpeting in the Men's and Women's Locker Rooms as indicated on Drawings.
2. Alternate: Add the replacement of flooring, ceiling and lighting in the upper and lower corridors. Add the finish painting of existing partitions on the lower corridor and add the High Impact Wall Covering and wall guard on the upper corridor. Provide carpeting in the Men's and Women's Locker Rooms as indicated on Drawings.

B. **Alternate No. 2:** Roof Top Air Handling Units:

1. Base Bid: Do not include the replacement roof top Air Handling Units and associated work.
2. Alternate: Provide the replacement roof top Air Handling Units with associated work.

END OF SECTION 012300

**EAST PROVIDENCE POLICE STATION RENOVATION
750 WATERMAN AVENUE
EAST PROVIDENCE, RHODE ISLAND**

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Procedural requirements for proposed substitutions.

1.03 RELATED REQUIREMENTS

- A. Section 012100 - Allowances, for products selected under an allowance.
- B. Section 012300 - Alternates, for products selected under an alternate.
- C. Section 012501 - Substitution Requests During Bidding: Required form for substitution requests made prior to award of contract (During procurement).
- D. Section 012502 - Substitution Requests After Bidding: Required form for substitution requests made after award of contract (During construction).
- E. Section 013300 - Submittal Procedures: for submittal procedures, coordination.
- F. Section 016000 - Product Requirements for requirements for submitting comparable product submittals for products by listed manufacturers.
- G. Section 016116 - Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints, And Coatings: Restrictions on emissions of indoor substitute products.

1.04 DEFINITIONS

- A. Definitions used below are not intended to change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions". The following are not considered substitutions.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
 - 3. Revisions to Contract Documents requested by the General Contractor, Construction Manager, and Project Architect.
 - 4. Specified options of products and construction methods included in Contract Documents.

**EAST PROVIDENCE POLICE STATION RENOVATION
750 WATERMAN AVENUE
EAST PROVIDENCE, RHODE ISLAND**

5. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.05 REFERENCE STANDARDS

1.06 SUBMITTALS

- A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 1. Substitution Request Form: Use form provided in Project Manual, that is part of web-based Project Management software, or acceptable to Architect.
 2. Documentation: Show compliance with requirements for substitutions.
- B. Substitution Request Submittal:
 1. Requests for substitution will be considered if received within 90 days after phased completion of design. Requests received more than 90 days after phased completion of design may be considered or rejected at the discretion of the Architect.
 2. Submit 3 copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.
 3. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawings numbers.
 4. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable
 - 1) A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution.
Indicate the effect of the proposed substitution on overall Contract Time.
 - b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include elements, such as performance, weight, size, durability, performance and visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. Certification by the Contractor that the substitution proposed is equal-to or better in every aspect to that required by the Contract Documents, and that it will perform in the application indicated.
 - h. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
 - i. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - j. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.

**EAST PROVIDENCE POLICE STATION RENOVATION
750 WATERMAN AVENUE
EAST PROVIDENCE, RHODE ISLAND**

- k. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - l. Cost information, including a proposal of change, if any, in the Contract Sum.
 - m. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated.
 - n. Include the Contractor's waiver of rights to additional payment or extension of time, that may subsequently become necessary because of the failure of the substitution to perform adequately.
5. Architect's Action:
- a. Within one week of receipt of the request for substitution, the Architect will request additional information or documentation necessary for evaluation of the request.
 - b. Within 2 weeks of receipt of the request, or one week of receipt of the additional information or documentation, whichever is later, the Architect will notify the Contractor of acceptance or rejection of the proposed substitution.
 - c. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name.
 - d. Acceptance will be in the form of a Change Order.
 - 1) Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - 2) Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.07 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.08 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.09 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 or _____ days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Extensive revisions to Contract Documents are not required.
 - b. Requested substitution is consistent with the Contract Documents and will produce indicated results.

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- c. Requested substitution provides sustainable design characteristics that specified product provided for compliance with LEED, USGBC LEED v4-BD+C, or _____ requirements.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of Authorities Having Jurisdiction.
 - g. Requested substitution is compatible with other portions of the Work.
 - h. Requested substitution has been coordinated with other portions of the Work.
 - i. Requested substitution provides specified warranty.
 - j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitution for Convenience is not permitted.
- C. The Contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012500

Project: _____ Substitution Request Number: _____
 _____ From: _____
 To: _____ Date: _____
 _____ A/E Project Number: _____
 Re: _____ Contract For: _____

Specification Title: _____ Description: _____
 Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
 Manufacturer: _____ Address: _____ Phone: _____
 Trade Name: _____ Model No.: _____

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly defined.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Submitted by: _____
 Signed by: _____
 Firm: _____
 Address: _____

 Telephone: _____

A/E REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: _____

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____

(After the Bidding/Negotiating Stage)

Project: _____ Substitution Request Number: _____
 _____ From: _____
 To: _____ Date: _____
 _____ A/E Project Number: _____
 Re: _____ Contract For: _____

Specification Title: _____ Description: _____
 Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
 Manufacturer: _____ Address: _____ Phone: _____
 Trade Name: _____ Model No.: _____
 Installer: _____ Address: _____ Phone: _____
 Trade Name: _____ Model No.: _____
 History: New Product 1-4 years old 5-10 years old More than 10 years old

Differences between proposed substitution and specified product: _____

Point- by point comparative data attached - REQUIRED BY A/E

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Architect: _____
 Address: _____ Owner: _____
 _____ Date Installed: _____

Proposed substitution affects other parts of Work: No Yes; explain _____

Savings to Owner for accepting substitution: _____ (\$ _____).

Proposed substitution changes Contract Time: No Yes [Add] [Deduct] _____ days.

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____

SUBSTITUTION REQUEST

(After the Bidding/Negotiating Stage - Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
 - Same warranty will be furnished for proposed substitution as for specified product.
 - Same maintenance service and source of replacement parts, as applicable, is available.
 - Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
 - Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
 - Proposed substitution does not affect dimensions and functional clearances.
 - Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
 - Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.
-

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments: _____

A/E REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: _____

Additional Comments: Contractor Subcontractor Supplier Manufacturer A/E _____

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.03 RELATED REQUIREMENTS:

- A. Section 012100 - Allowances for administrative procedures for handling allowances.
- B. Section 012200 - Unit Prices for administrative procedures for handling unit prices.
- C. Section 012500 - Substitution Procedures for administrative procedures for handling requests for substitutions made after the Contract award.
- D. Section 013100 - Project Management And Coordination for requirements for forms for contract modifications provided as part of web-based Project management software.

1.04 REFERENCE STANDARDS

- A. AIA G701 - Change Order.
- B. AIA G710 - Architect's Supplemental Instructions.
- C. AIA G714 - Construction Change Directive.

1.05 MINOR CHANGES IN THE WORK

- A. Architect will issue through Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA G710 Architect's Supplemental Instructions.

1.06 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Construction Manager will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Construction Manager are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

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- a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms provided as part of web-based Project Management software.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Construction Manager.
1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 4. Include costs of labor and supervision directly attributable to the change.
 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 6. Comply with requirements in Section 012500 - Substitution Procedures if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Use forms provided as part of web-based Project Management software.

1.07 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 012100 - Allowances for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
- B. Unit-Price Adjustment: See Section 012200 - Unit Prices for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.08 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Construction Manager will issue a Change Order for signatures of Owner and Contractor on AIA G701.

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1.09 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Construction Manager may issue a Construction Change Directive on AIA G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 012600

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.03 RELATED SECTIONS

- A. Section 012600 - Contract Modification Procedures for administrative procedures for handling changes to the Contract.
- B. Section 013200 - Construction Progress Documentation for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
- C. Section 017700 - Closeout Procedures for additional requirements.

1.04 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.05 REFERENCE STANDARDS

- A. AIA G702 - Application and Certificate for Payment.
- B. AIA G703 - Continuation Sheet.
- C. AIA G706 - Contractor's Affidavit of Payment of Debts and Claims.
- D. AIA G706A - Contractor's Affidavit of Release of Liens.
- E. AIA G707 - Consent of Surety to Final Payment.

1.06 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Correlate line items in the schedule of values with items required under administrative schedules and forms, including:
 - a. Contractor's construction schedule
 - b. Application for payment form with Continuation Sheets
 - c. List of subcontractors
 - d. List of products

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- e. List of principal suppliers and fabricators
 - f. Schedule of submittals
 - 2. Submit the schedule of values to Architect at earliest possible date, but no later than ten days before the date scheduled for submittal of initial Application for Payment.
 - 3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
 - 4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
- 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Owner's Project number.
 - c. Name of Architect.
 - d. Architect's Project number.
 - e. Contractor's name and address.
 - f. Date of submittal.
 - 2. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
 - a. Generic name
 - b. Related Specification Section.
 - c. Change Orders (numbers) that affect value.
 - d. Dollar value.
 - e. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.
 - 3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 - 4. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.
 - 5. For each part of the Work where an Application for Payment may include products purchased or fabricated and stored, but not yet installed, provide a separate line item on the Schedule of Values for the initial cost of the product, for each subsequent stage of completion, and for total installed value of that part of the Work.
 - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
 - 6. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment.
 - a. Each item in the Schedule of Values and Applications for Payment shall be complete including its total cost and proportionate share of general overhead and profit margin.
 - b. Schedule of Values shall include line items for closeout documents.
 - 7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
 - 8. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.

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9. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
10. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
11. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
12. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.07 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and Construction Manager and paid by Owner.
- B. Payment Application Times: The date for each progress payment shall be as indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Submit Application for Payment to Architect by the 25th day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
 1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.
 2. Official Copy: Provide required number of copies, including supportive data and other requirements, to the Architect within the time limit established by the requirements stated above. After review and acceptance of Application for Payment, Contractor will forward submission to Owner for payment.
- D. Application for Payment Forms: Use AIA G702 and AIA G703 as form for Applications for Payment.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.

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2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- G. Transmittal: Submit signed and notarized original copies, the number as determined by the Pre-Construction Conference, of each Application for Payment to Architect by means ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit with a transmittal form listing attachments and recording appropriate information about application in a manner acceptable to Architect and Construction Manager.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
 - a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- I. Initial Application for Payment: Administrative actions and submittals that shall precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. List of principal suppliers and fabricators.
 3. Schedule of values.
 4. Contractor's construction schedule (preliminary if not final).
 5. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 6. Products list (preliminary if not final).
 7. Sustainable design action plans, including preliminary project materials cost data.
 8. Schedule of unit prices.
 9. Submittal schedule (preliminary if not final).
 10. List of Contractor's staff assignments.
 11. List of Contractor's principal consultants.
 12. Copies of building permits.
 13. Copies of authorizations and licenses from Authorities Having Jurisdiction for performance of the Work.
 14. Initial progress report.

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15. Report of preconstruction conference.
 16. Certificates of insurance and insurance policies.
 17. Performance and payment bonds, if required.
 18. Data needed to acquire Owner's insurance.
 19. Initial settlement survey and damage report, if required.
- J. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 - Closeout Procedures.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
 3. Administrative actions and submittals that shall precede or coincide with submittal of this application include:
 - a. Occupancy permits and similar approvals
 - b. Warranties (guaranties) and maintenance agreements
 - c. Test/adjust/balance records
 - d. Maintenance instructions
 - e. Meter readings
 - f. Start-up performance reports
 - g. Change-over information related to Owner's occupancy, use, operation and maintenance
 - h. Final cleaning
 - i. Application for reduction of retainage, and consent of surety
 - j. Advice on shifting insurance coverages
 - k. Final progress photographs
 - l. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion
- K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of contract closeout requirements.
 2. Completion of items specified for completion after Substantial Completion.
 3. Transmittal of required project construction records to Owner.
 4. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 5. Updated final statement, accounting for final changes to the Contract Sum.
 6. AIA G706, "Contractor's Affidavit of Payment".
 7. AIA G706A, "Contractor's Affidavit of Release of Liens."
 8. Removal of temporary facilities and services.
 9. Removal of surplus materials, rubbish and similar elements.
 10. Change door locks to Owner's access.
 11. AIA G707, "Consent of Surety to Final Payment."
 12. Evidence that claims have been settled.
 13. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

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14. Final liquidated damages settlement statement.
15. Waivers and releases.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Requests for Information RFIs.
 - 4. Digital project management procedures.
 - 5. Web-based Project management software package.
 - 6. Project meetings.
 - 7. Administrative and supervisory personnel.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor or subcontractor.

1.03 RELATED SECTIONS INCLUDE THE FOLLOWING:

- A. Section 011200 - Multiple Contract Summary for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
- B. Section 012600 - Contract Modification Procedures
- C. Section 013200 - Construction Progress Documentation for preparing and submitting Contractor's construction schedule.
- D. Section 013300 - Submittal Procedures
- E. Section 017300 - Execution for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
- F. Section 017700 - Closeout Procedures for coordinating closeout of the Contract.
- G. Section 019113 - General Commissioning Requirements for coordinating the Work with Owner's Commissioning Authority.

1.04 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request from Owner, Construction Manager, Architect , or Contractor seeking information or clarifications of the Contract Documents.

1.05 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in Project meeting room, in temporary field office, in web-based Project software directory, and in prominent location in each or the built facility. Keep list current at all times.

1.06 GENERAL COORDINATION PROCEDURES

- A. Coordination: Each subcontractor shall coordinate its construction operations with those of other subcontractors and entities to ensure efficient and orderly installation of each part of the Work. Each subcontractor shall coordinate its operations with operations included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other subcontractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

- B. Coordination of Multiple Contracts: Each contractor shall cooperate with Project coordinator, who shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its own operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.

- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

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1. Prepare similar memoranda for Owner and separate Contractors or Subcontractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other subcontractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of subcontractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
 9. Project closeout activities.
- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.07 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:

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1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Plenum Space: Indicate subframing for support of ceiling, raised access floor, and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 8. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 9. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
 10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 - Submittal Procedures.
- C. Coordination Drawing Process: Prepare coordination drawings in the following manner:
1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
 2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
 3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
 4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
 5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.

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6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
 7. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.
- D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format:
 - a. Same digital data software program, version, and operating system as original Drawings.
 - b. DWG, DXF, DGN, RVT, or _____, Version , operating in Microsoft Windows or Apple Macintosh operating system.
 2. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
 3. BIM File Incorporation: Construction Manager will incorporate Contractor's coordination drawing files into Building Information Model established for Project.
 - a. Perform or Construction Manager will perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
 4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files. Level of Design by Architect is _____. Level of Design by Contractor is _____.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
 - b. Digital Data Software Program: Drawings are available in .
 - c. Contractor shall execute a data licensing agreement in the form of Agreement included in this Project Manual.
- E. Exterior Envelope Coordination: Provide coordinated drawings demonstrating the interface of two or more materials where those materials are provided by separate subcontractors, and acceptance of those drawings by all pertinent subcontractors and General Contractor/Construction Manager, by use of a stamp of approval on the drawings.
1. Drawing shall show all materials used on the exterior walls, from top of structural foundation up to all exposed roofing materials, including but not limited to the following:
 - a. Exterior skin materials
 - b. Masonry products, metal or other composite material panel systems.
 - c. Exterior insulation finishing systems, stucco, other siding materials.
 - d. Substrates or integrated support systems
 - e. Weather resistant barriers
 - f. Air and/or moisture barriers
 - g. Sheathing materials
 - h. Metal or wood framing systems
 - i. Masonry or concrete wall systems
 - j. Insulation types, layers and fastening systems.
 - k. Various system accessories
 - l. Flashing materials
 - m. Curtainwall, storefront, window, louver, and door openings.
 - n. Joint sealants

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- o. Cold formed metal framing and/or masonry back-up
- p. Interior finish material on exterior walls
- q. Roofing materials and roof edge metal trim and copings
- r. Other roof accessories.

1.08 REQUEST FOR INFORMATION (RFI)

- A. Procedure: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, and if not possible to request interpretation at a Project meeting, prepare and submit an RFI in the form specified.
 - 1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 - 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Owner name.
 - 3. Owner's Project number.
 - 4. Name of Architect, Construction Manager, General Contractor, Contractor, and _____.
 - 5. Architect's Project number.
 - 6. Date.
 - 7. Name of Contractor.
 - 8. RFI number, numbered sequentially.
 - 9. RFI subject.
 - 10. Specification Section number and title and related paragraphs, as appropriate.
 - 11. Drawing number and detail references, as appropriate.
 - 12. Field dimensions and conditions, as appropriate.
 - 13. Contractor's suggested resolution. If Contractor's suggested solution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 14. Contractor's signature.
 - 15. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

- C. Architect's, Construction Manager's, or _____ Action: Architect, Construction Manager, or _____ will review each RFI, determine action required, and return it. Allow three, five, seven, or _____ days for Architect's response for each RFI. RFIs received by Architect, Construction Manager, or _____ after 1:00 p.m. will be considered as received the following working day.
 - 1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.

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- g. Incomplete RFIs or inaccurately prepared RFIs.
 - 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect, Construction Manager, and _____ of additional information.
 - 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 - Contract Modification Procedures.
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect, Construction Manager, or _____ in writing within five or _____ days of receipt of the RFI response.
- D. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of web-based Project management software., Include the following:, or Software log with not less than the following:
- 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Architect, Construction Manager, General Contractor, Contractor, and _____.
 - 4. RFI number, including RFIs that were returned without action or withdrawn.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Architect's, Construction Manager's, General Contractor's, Contractor's, and _____ response was received.
 - 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 - 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- E. On receipt of Architect's, Construction Manager's, or _____ action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect, Construction Manager, or _____ within three, seven, or _____ days if Contractor disagrees with response.

1.09 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Architect's Data Files Not Available: Architect will not provide Architect's BIM model, CAD drawings, and _____ digital data files for Contractor's use during construction.
- B. Use of Architect's Digital Data Files: Digital data files of Architect's BIM model, CAD drawings, and _____ will be provided by Architect for Contractor's use during construction.
 - 1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project Record Drawings.
 - 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 - 3. Digital Drawing Software Program: Contract Drawings are available in .
 - 4. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual.
 - a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement included in this Project Manual.
 - 5. The following digital data files will be furnished for each appropriate discipline:
 - a. Floor plans.

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- b. Reflected ceiling plans.
 - c. _____.
- C. Web-Based Project Management Software Package: Provide, administer, and use Architect's, Owner's, Construction Manager's, or _____ web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.
- 1. Web-based Project management software includes, at a minimum, the following features:
 - a. Compilation of Project data, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
 - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
 - c. Document workflow planning, allowing customization of workflow between project entities.
 - d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
 - e. Track status of each Project communication in real time, and log time and date when responses are provided.
 - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
 - g. Processing and tracking of payment applications.
 - h. Processing and tracking of contract modifications.
 - i. Creating and distributing meeting minutes.
 - j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
 - k. Management of construction progress photographs.
 - l. Mobile device compatibility, including smartphones and tablets.
 - m. .
 - 2. Provide up to seven or _____ Project management software user licenses for use of Owner, Owner's Commissioning Authority, Construction Manager, Architect, Architect's consultants, and _____. Provide eight or _____ hours of software training at Architect's office for web-based Project software users.
 - 3. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
- D. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
- 1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.10 ADMINISTRATIVE AND SUPERVISORY PERSONNEL:

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.11 PROJECT MEETINGS

- A. General: The General Contractor shall, Construction Manager will, or _____ schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, Architect, and _____, within three or _____ days of the meeting.
- B. Preconstruction Conference: Architect, Construction Manager, or _____ will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner, Architect, General Contractor, and _____, but no later than 15 or _____ days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Construction Manager, Architect, their consultants, and _____; General Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - l. Distribution of the Contract Documents.
 - m. Submittal procedures.
 - n. Sustainable design requirements.
 - o. Preparation of Record Documents.
 - p. Use of the premises, existing building, and _____.
 - q. Work restrictions.
 - r. Working hours.
 - s. Owner's occupancy requirements.
 - t. Responsibility for temporary facilities and controls.
 - u. Procedures for moisture and mold control.
 - v. Procedures for disruptions and shutdowns.
 - w. Construction waste management and recycling.
 - x. Parking availability.
 - y. Office, work, and storage areas.
 - z. Equipment deliveries and priorities.
 - aa. First aid.

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- bb. Security.
 - cc. Progress cleaning.
 - 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Sustainable Design Requirements Coordination Conference: Owner, Construction Manager, or _____ will schedule and conduct a sustainable design coordination conference before starting construction, at a time convenient to Owner, Construction Manager, Architect, Contractor, and _____.
- 1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Construction Manager, Architect, their consultants, and ____; Contractor and its superintendent and sustainable design coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Discuss items of significance that could affect meeting sustainable design requirements, including the following:
 - a. Sustainable design Project checklist.
 - b. General requirements for sustainable design-related procurement and documentation.
 - c. Project closeout requirements and sustainable design certification procedures.
 - d. Role of sustainable design coordinator.
 - e. Construction waste management.
 - f. Construction operations and sustainable design requirements and restrictions.
 - 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- D. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity required by other Sections and when required for coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Owner, Owner's Commissioning Authority, Construction Manager, Architect, their consultants, and _____ of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Sustainable design requirements.
 - i. Review of mockups.
 - j. Possible conflicts.
 - k. Compatibility requirements.
 - l. Time schedules.
 - m. Weather limitations.
 - n. Manufacturer's written instructions.
 - o. Warranty requirements.
 - p. Compatibility of materials.

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- q. Acceptability of substrates.
 - r. Temporary facilities and controls.
 - s. Space and access limitations.
 - t. Regulations of authorities having jurisdiction.
 - u. Testing and inspecting requirements.
 - v. Installation procedures.
 - w. Coordination with other work.
 - x. Required performance results.
 - y. Protection of adjacent work.
 - z. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- E. Project Closeout Conference: Schedule and conduct or Construction Manager will schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 or _____ days prior to the scheduled date of Substantial Completion.
- 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 - 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Construction Manager, Architect, their consultants, and _____; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Requirements for completing sustainable design documentation.
 - f. Requirements for preparing operations and maintenance data.
 - g. Requirements for delivery of material samples, attic stock, and spare parts.
 - h. Requirements for demonstration and training.
 - i. Preparation of Contractor's punch list.
 - j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - k. Submittal procedures.
 - l. Coordination of separate contracts.
 - m. Owner's partial occupancy requirements.
 - n. Installation of Owner's furniture, fixtures, and equipment.
 - o. Responsibility for removing temporary facilities and controls.
 - 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- F. Progress Meetings: Conduct or Construction Manager will conduct progress meetings at weekly, biweekly, monthly, regular, or _____ intervals determined by General Contractor,

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Construction Manager, and Architect.

1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority, Construction Manager, Architect, their consultants, _____, each subcontractor, and supplier concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Status of sustainable design documentation.
 - 6) Deliveries.
 - 7) Off-site fabrication.
 - 8) Access.
 - 9) Site utilization.
 - 10) Temporary facilities and controls.
 - 11) Work hours.
 - 12) Hazards and risks.
 - 13) Progress cleaning.
 - 14) Quality and work standards.
 - 15) Status of correction of deficient items.
 - 16) Field observations.
 - 17) Status of RFIs.
 - 18) Status of Proposal Requests.
 - 19) Pending changes.
 - 20) Status of Change Orders.
 - 21) Pending claims and disputes.
 - 22) Documentation of information for payment requests.
 4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- G. Coordination Meetings: Conduct, Construction Manager will conduct, or Project Coordinator will conduct Project coordination meetings at weekly, biweekly, monthly, regular, or _____ intervals determined by Construction Manager, Project Coordinator, or General Contractor. Project coordination meetings are in addition to specific meetings held for other

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purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority, Construction Manager, General Contractor, Contractor, Architect, each contractor, _____, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Resolution of BIM component conflicts.
 - 4) Status of submittals.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site utilization.
 - 9) Temporary facilities and controls.
 - 10) Work hours.
 - 11) Hazards and risks.
 - 12) Progress cleaning.
 - 13) Quality and work standards.
 - 14) Status of RFIs.
 - 15) Proposal Requests.
 - 16) Change Orders.
 - 17) Pending changes.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 013100

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To: **JCJARCHITECTURE** Request For Information (RFI) No: _____
21 West 3rd Street Date: _____
Boston, MA 02127
Attn: _____

Project: East Providence Police Dept. Initiated By: _____
Renovation Response requested by (Date): _____
750 Waterman Avenue Design Consultants Affected: _____
East Providence, Rhode Island

Description of Clarification or Information Requested (Attach Data as Required):

Proposed Solution:

Signed: _____ Initiator Date: _____

AE Response:

Signed: _____ Date: _____
JCJ/Design Consultant

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 1. Startup construction schedule.
 2. Contractor's Construction Schedule.
 3. Construction schedule updating reports.
 4. Daily construction reports.
 5. Material location reports.
 6. Site condition reports.
 7. Special reports.

1.03 RELATED SECTIONS:

- A. Section 011000 - Summary
- B. Section 011200 - Multiple Contract Summary for preparing a combined Contractor's Construction Schedule.
- C. Section 012900 - Payment Procedures for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.
- D. Section 013100 - Project Management And Coordination
- E. Section 013300 - Submittal Procedures for submitting schedules and reports.
- F. Section 014000 - Quality Requirements for schedule of tests and inspections.

1.04 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 2. Predecessor Activity: An activity that precedes another activity in the network.
 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations

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determine the critical path of Project and when activities can be performed.

- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time belongs to Owner or is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.05 REFERENCE STANDARDS

1.06 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file.
 - 2. PDF file.
 - 3. Two or _____ paper copies, of sufficient size to display entire period or schedule, as required.
- B. Startup construction schedule.
 - 1. Submittal of cost-loaded startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 - 1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
 - 2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
 - 3. Total Float Report: List of activities sorted in ascending order of total float.

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- 4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work, the Notice to Proceed, or _____ until most recent Application for Payment.
- F. Construction Schedule Updating Reports: Submit with Applications for Payment.
- G. Daily Construction Reports: Submit at weekly, monthly, or _____ intervals.
- H. Material Location Reports: Submit at weekly, monthly, or _____ intervals.
- I. Site Condition Reports: Submit at time of discovery of differing conditions.
- J. Special Reports: Submit at time of unusual event.
- K. Qualification Data: For scheduling consultant.

1.07 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 - Project Management And Coordination. Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.
 - 2. Verify availability of qualified personnel needed to develop and update schedule.
 - 3. Discuss constraints, including phasing, work stages, area separations, interim milestones, partial Owner occupancy, and _____.
 - 4. Review delivery dates for Owner-furnished products.
 - 5. Review schedule for work of Owner's separate contracts.
 - 6. Review submittal requirements and procedures.
 - 7. Review time required for review of submittals and resubmittals.
 - 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
 - 9. Review time required for Project closeout and Owner startup procedures, including commissioning activities and _____.
 - 10. Review and finalize list of construction activities to be included in schedule.
 - 11. Review procedures for updating schedule.

1.08 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.09 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 - 1. Use Microsoft Project, Primavera, Meridian Prolog, scheduling component of Project management software package specified in Section 013100 - Project Management and Coordination, or _____ for current Windows operating system.

- B. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting, using CPM scheduling.
 - 1. In-House Option: Owner may waive requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
 - 2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

- C. Time Frame: Extend schedule from date established for commencement of the Work, the Notice of Award, the Notice to Proceed, or _____ to date of Substantial Completion, Final Completion, or _____.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

- D. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than seven, 20, or _____ days, unless specifically allowed by Architect.
 - 2. Temporary Facilities: Indicate start and completion dates for the following as applicable:
 - a. Securing of approvals and permits required for performance of the Work.
 - b. Temporary facilities.
 - c. Construction of mock-ups, prototypes and samples.
 - d. Owner interfaces and furnishing of items.
 - e. Interfaces with Separate Contracts.
 - f. Regulatory agency approvals.
 - g. Punch list.
 - 3. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - a. .
 - 4. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 - Submittal Procedures in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 - 5. Startup and Testing Time: Include no fewer than seven, 15, or _____ calendar days for startup and testing.
 - 6. Commissioning Time: Include no fewer than 15 or _____ calendar days for commissioning.
 - 7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
 - 8. Punch List and Final Completion: Include not more than 15, 30, or _____ calendar days for completion of punch list items and Final Completion.

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- E. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 - Summary. Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 - Summary. Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use-of-premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Building flush-out.
 - m. Startup and placement into final use and operation.
 - n. Commissioning.
 8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
 9. Other Constraints: .

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- F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion., Final Completion, and the following interim milestones:, or _____
1. Temporary enclosure and space conditioning.
- G. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
1. See Section 012900 - Payment Procedures for cost reporting and payment procedures.
- H. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and the Contract Time.
- I. Contractor's Construction Schedule Updating: At weekly, monthly, or _____ intervals, update schedule to reflect actual construction progress and activities. Issue schedule two calendar days, one week, or _____ before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate Final Completion percentage for each activity.
- J. Recovery Schedule: When periodic update indicates the Work is seven, 14, or _____ or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- K. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.10 STARTUP CONSTRUCTION SCHEDULE

- A. Gantt, Bar-Chart, or _____ Schedule: Submit startup, horizontal, Gantt, Bar-Chart, or _____-type construction schedule within seven or _____ calendar days of date established for commencement of the Work, the Notice to Proceed, the notice of Award, or _____.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 or _____ days of construction. Include skeleton diagram for the remainder of the Work and a

cash requirement prediction based on indicated activities.

1.11 GANTT-CHART CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 15, 30, or _____ calendar days of date established for commencement of the Work, the Notice to Proceed, the notice of Award, or _____.
 - 1. Base schedule on the startup construction schedule and additional information received since the start of Project.

- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 5, ten, or _____ percent increments within time bar.

1.12 CPM SCHEDULE REQUIREMENTS

- A. Prepare network diagrams using AON (activity-on-node) format.

- B. Startup Network Diagram: Submit diagram within 14 or _____ days of date established for commencement of the Work, the Notice to Proceed, the notice of Award, or _____. Outline significant construction activities for the first 90 or _____ days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

- C. CPM Schedule: Prepare Contractor's Construction Schedule using a cost-and resource-loaded, time-scaled CPM network analysis diagram for the Work.
 - 1. Develop network diagram in sufficient time to submit CPM schedule, so it can be accepted for use no later than 60 or _____ days after date established for commencement of the Work, the Notice to Proceed, the notice of Award, or _____.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.
 - 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 - 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 - 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.

- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.

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- g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and inspection.
 - j. Commissioning.
 - k. Punch list and Final Completion.
 - l. Activities occurring following Final Completion.
2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
- a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, sustainable design documentation, and demonstration and training (if applicable), in the amount of five or _____ percent of the Contract Sum.
- a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
 - b. Total cost assigned to activities shall equal the total Contract Sum.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
- 1. Contractor or subcontractor and the Work or activity.
 - 2. Description of activity.
 - 3. Main events of activity.
 - 4. Immediate preceding and succeeding activities.
 - 5. Early and late start dates.
 - 6. Early and late finish dates.
 - 7. Activity duration in workdays.
 - 8. Total float or slack time.
 - 9. Average size of workforce.
 - 10. Dollar value of activity (coordinated with the schedule of values).
- G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
- 1. Identification of activities that have changed.
 - 2. Changes in early and late start dates.
 - 3. Changes in early and late finish dates.
 - 4. Changes in activity durations in workdays.
 - 5. Changes in the critical path.
 - 6. Changes in total float or slack time.

7. Changes in the Contract Time.

- H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
 1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
 2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
 3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
 4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
 - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
 - b. Submit value summary printouts one week or ____ before each regularly scheduled progress meeting.

1.13 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Testing and inspection.
 8. Accidents.
 9. Meetings and significant decisions.
 10. Unusual events (see special reports).
 11. Stoppages, delays, shortages, and losses.
 12. Meter readings and similar recordings.
 13. Emergency procedures.
 14. Orders and requests of authorities having jurisdiction.
 15. Change Orders received and implemented.
 16. Construction Change Directives received and implemented.
 17. Services connected and disconnected.
 18. Equipment or system tests and startups.
 19. Partial completions and occupancies.
 20. Substantial Completions authorized.

- B. Material Location Reports: At weekly, monthly, or _____ intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
 1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.

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- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

- D. Special Reports
 - 1. General: Submit special reports directly to Owner within one calendar day of an occurrence. Distribute copies of report to parties affected by the occurrence.
 - 2. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 1. Preconstruction photographs.
 2. Concealed Work photographs.
 3. Periodic construction photographs.
 4. Final Completion construction photographs.
 5. Preconstruction video recordings.
 6. Periodic construction video recordings.
 7. Construction webcam.

1.03 RELATED SECTIONS

- A. Section 017700 - Closeout Procedures for submitting photographic documentation as Project Record Documents at Project closeout.
- B. Section 017900 - Demonstration and Training for submitting video recordings of demonstration of equipment and training of Owner's personnel.
- C. Section 024116 - Structure Demolition for photographic documentation before building demolition operations commence.
- D. Section 024119 - Selective Demolition for photographic documentation before selective demolition operations commence.
- E. Section 311000 - Site Clearing for photographic documentation before site clearing operations commence.

1.04 REFERENCE STANDARDS

1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For photographer.
- B. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph, video recording, and _____. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- C. Digital Photographs: Submit image files within three or _____ calendar days of taking photographs.
 1. Submit photos on CD-ROM or thumb-drive, by uploading to web-based Project management software site, or _____. Include copy of key plan indicating each

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- photograph's location and direction.
2. Identification: Provide the following information with each image description in file metadata tag, in web-based Project management software site, or _____:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect and Construction Manager.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of location, vantage point, and direction (by compass point), and elevation or story of construction.
 - g. Unique sequential identifier keyed to accompanying key plan.
- D. Printed Photographs: Submit two or _____ sets of prints of each photographic view within seven or _____ days of taking photographs.
1. Format: 8-by-10-inch (203-by-254-mm) smooth-surface matte prints on single-weight, paper; enclosed back to back in clear plastic sleeves punched for three-ring binder. Include copy of key plan indicating each photograph's location and direction. Provide one binder for each set of prints.
 2. Identification: On back of each print, label with the following information:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect and Construction Manager.
 - d. Name of Contractor.
 - e. Date photograph was taken if not date stamped by camera.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - g. Unique sequential identifier keyed to accompanying key plan.
- E. Video Recordings: Submit video recordings within seven or _____ days of recording.
1. Submit video recordings on CD-ROM or thumb-drive, by uploading to web-based Project management software site, or _____. Include copy of key plan indicating each video's location and direction.
 2. Identification: With each submittal, provide the following information in file metadata tag or on web-based Project management software site:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Name of Architect and Construction Manager.
 - d. Name of Contractor.
 - e. Date video recording was recorded.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 3. Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in three-ring binders. Provide label on front and spine. Include a cover sheet with label information. Include name of Project and date of video recording on each page.
- F. Time-Lapse Video: Submit time-lapse sequence video recordings within days of recording.
1. Submit time-lapse sequence video recordings monthly or _____ on CD-ROM or thumb-drive, by uploading to web-based Project management software site, or _____.
 2. Identification: For each recording, provide the following information in file metadata tag or on web-based Project management software site:

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- a. Name of Project.
- b. Name and contact information for photographer.
- c. Name of Architect and Construction Manager.
- d. Name of Contractor.
- e. Date(s) and time(s) video recording was recorded.
- f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.06 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.
- B. Construction Webcam Service Provider: A firm specializing in providing photographic equipment, web-based software, and related services for construction projects, with a record of providing satisfactory services similar to those required for Project.

1.07 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

1.08 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 or _____ megapixels, and at an image resolution of not less than 3200 by 2400 or _____ pixels, and with vibration-reduction technology. Use flash in low light levels or backlit conditions.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 or _____ megapixels and capable of recording in full high-definition mode, and with vibration-reduction technology. Provide supplemental lighting in low light levels or backlit conditions.
- C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- D. Metadata: Record accurate date and time and GPS location data from camera.
- E. File Names: Name media files with date, Project area, _____, and sequential numbering suffix.

1.09 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs with maximum depth of field and in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
 2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those

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submitted to Architect.

- C. **Preconstruction Photographs:** Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect, Construction Manager, or ____.
1. Flag excavation areas, construction limits, or _____ before taking construction photographs.
 2. Take 20 or _____ photographs to show existing conditions adjacent to property before starting the Work.
 3. Take 20 or _____ photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. **Concealed Work Photographs:** Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:
1. Underground utilities.
 2. Underslab services.
 3. Piping.
 4. Electrical conduit.
 5. Waterproofing and weather-resistant barriers.
- E. **Periodic Construction Photographs:** Take 20 photographs weekly coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- F. **Architect-Directed Construction Photographs:** From time to time, Architect will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.
- G. **Time-Lapse Sequence Construction Photographs:** Take 20 photographs as indicated, to show status of construction and progress since last photographs were taken.
1. **Frequency:** Take photographs monthly, on the same date each month or weekly, on the same day each week.
 2. **Vantage Points:** Following suggestions by Architect or Construction Manager and Contractor, photographer shall select vantage points. During each of the following construction phases, take not less than two or _____ of the required shots from same vantage point each time, to create a time-lapse sequence as follows:
 - a. Commencement of the Work, through completion of subgrade construction.
 - b. Above-grade structural framing.
 - c. Exterior building enclosure.
 - d. Interior Work, through date of Substantial Completion.
 3. **Final Completion Construction Photographs:** Take 20 photographs after date of Substantial Completion for submission as Project Record Documents. Architect and Construction Manager will inform photographer of desired vantage points.
- H. **Additional Photographs:** Architect or Construction Manager may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum or in the allowance for construction photographs.

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1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.
3. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Special events planned at Project site.
 - b. Immediate follow-up when on-site events result in construction damage or losses.
 - c. Photographs shall be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
 - d. Substantial Completion of a major phase or component of the Work.
 - e. Extra record photographs at time of final acceptance.
 - f. Owner's request for special publicity photographs.

1.10 CONSTRUCTION VIDEO RECORDINGS

- A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings.
- B. Narration: Describe scenes on video recording by audio narration by microphone while and or dubbing audio narration off-site after video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
 1. Confirm date and time at beginning and end of recording.
 2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.
- C. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from video recording opposite the corresponding narration segment.
- D. Preconstruction Video Recording: Before starting excavation, demolition, or construction, record video recording of Project site and surrounding properties from different vantage points, as directed by Architect or Construction Manager.
 1. Flag excavation areas and construction limits before recording construction video recordings.
 2. Show existing conditions adjacent to Project site before starting the Work.
 3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of excavation, demolition, and construction.
 4. Show protection efforts by Contractor.
- E. Periodic Construction Video Recordings: Record video recording monthly or weekly coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last video recordings were recorded. Minimum recording time shall be 30 or _____ minutes(s).
- F. Time-Lapse Sequence Construction Video Recordings: Record video recording to show status of construction and progress.
 1. Frequency: During each of the following construction phases, set up video recorder to automatically record one frame of video recording every five or _____ minutes, from same vantage point each time, to create a time-lapse sequence of 30 minutes or _____ in length as follows:
 - a. Commencement of the Work, through completion of subgrade construction.
 - b. Above-grade structural framing.
 - c. Exterior building enclosure.

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2. Timer: Provide timer to automatically start and stop video recorder, so recording occurs only during daylight or construction work hours.
3. Vantage Points: Following suggestions by Architect or Construction ManagerArchitect or Construction ManagerArchitect or Construction ManagerArchitect or Construction ManagerArchitect or Construction ManagerArchitect or Construction ManagerArchitect or Construction ManagerArchitect or Construction ManagerArchitect or Construction ManagerArchitect or Construction ManagerArchitect or Construction ManagerArchitect or Construction ManagerArchitect or Construction Manager and Contractor, photographer shall select vantage points.

1.11 CONSTRUCTION WEBCAM

- A. Webcam: Provide one or two fixed-location camera(s) with weatherproof housing, mounted to provide unobstructed view of construction site from location approved by Architect, with the following characteristics:
 1. Static view, Remotely controllable view with mouse-click user navigation for horizontal pan, vertical tile, and optical zoom of 500 percent minimum, and _____.
 2. Capable of producing minimum eight or 12 megapixel images.
 3. Provide pole mount, parapet mount, power supply, solar power station, active high-speed data connection to service provider's network, and static public IP address for each camera.
- B. Live Streaming Images: Provide web-accessible image of current site image, updated at five or _____ 15 or _____-minute intervals during daytime operation or when construction is underway.
- C. Web-Based Interface: Provide online interface to allow viewing of each high-definition digital still image captured and stored during construction, from the Internet.
 1. Access Control: Provide password-protected access for Project team administered by Contractor, providing current image access and archival image access by date and time, with images downloadable to viewer's device.
 2. Software: Provide responsive software interface for use on computer, tablet, and mobile screens with accompanying iPhone/iPad app and Android apps.
 3. Storage: Maintain images on the website for reference during entire construction period, and for not less than 30 days after Final Completion. Provide sufficient memory on remote server to store all Project images.
 4. Online Interface: Provide website interface with Project and client information and logos, calendar-based navigation interface for selecting images, and pan and zoom capability within high-definition images.
 5. Forward and Reverse: Provide capability to browse through images, moving forward and backward in time by individual image and by day.
 6. Slideshow: Provide capability to automatically display current images from sites when there are three or more cameras used.
 7. Time-Lapse: Provide capability for online display of project time-lapse.
 8. Dashboard: Provide capability to view thumbnails of all cameras on one screen.
 9. Weather: Provide corresponding weather data for each image captured.
 10. Provide public viewer open access to most recent Project camera image.
- D. Maintain cameras and web-based access in good working order, according to web-based construction photographic documentation service provider's written instructions until Final Completion. Provide for service of cameras and related networking devices and software.

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PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 013233

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SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Submittal schedule requirements.
 - 2. Administrative and procedural requirements for submittals.

1.02 RELATED SECTIONS

- A. Section 012900 - Payment Procedures for submitting Applications for Payment and the schedule of values.
- B. Section 013100 - Project Management And Coordination for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
- C. Section 013200 - Construction Progress Documentation for submitting schedules and reports, including Contractor's construction schedule.
- D. Section 013233 - Photographic Documentation for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
- E. Section 014000 - Quality Requirements for submitting test and inspection reports, and schedule of tests and inspections.
- F. Section 017700 - Closeout Procedures for submitting closeout submittals and maintenance material submittals.
- G. Section 017823 - Operation And Maintenance Data for submitting operation and maintenance manuals.
- H. Section 017839 - Project Record Documents for submitting record Drawings, record Specifications, and record Product Data.
- I. Section 017900 - Demonstration and Training for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.03 DEFINITIONS

- A. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.
- B. Mockups are full-size assemblies for review of construction, coordination, testing, or operation; they are not Samples.
- C. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

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- D. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- E. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- F. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.04 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
 - 1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in Revit for Microsoft Windows.
 - c. Contractor shall execute a data licensing agreement form "Digital Data Release Form" included in Project Manual.
 - d. The following digital data files will be furnished for each appropriate discipline:
 - 1) Floor plans.
 - 2) Reflected ceiling plans.

1.05 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
 - 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.

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- c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's and Construction Manager's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled date of fabrication.
 - i. Scheduled dates for installation.
 - j. Activity or event number.
- B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect. Maintain copies in the Project meeting room and field office.
- 1. When revisions are made, resubmit to the Architect.

1.06 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
- 1. Project name.
 - 2. Date.
 - 3. Name of Architect.
 - 4. Name of Construction Manager.
 - 5. Name of Contractor.
 - 6. Name of firm or entity that prepared submittal.
 - 7. Names of subcontractor, manufacturer, and supplier.
 - 8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 - 9. Category and type of submittal.
 - 10. Submittal purpose and description.
 - 11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 - 12. Drawing number and detail references, as appropriate.
 - 13. Indication of full or partial submittal.
 - 14. Location(s) where product is to be installed, as appropriate.
 - 15. Other necessary identification.
 - 16. Remarks.
 - 17. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect and Construction Manager on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Submittal Label: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
- 1. Provide space on the label or beside the title block on Shop Drawings to record the following:
 - a. General Contractor's review and approval markings, and the action taken.
 - b. Sub-Contractor's review and approval markings, and the action taken.
 - c. Engineer's review comments and the action to be taken.

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- d. Architect's review comments and the action to be taken.
 2. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of the Architect.
 - d. Name and address of the Contractor.
 - e. Name and address of the subcontractor.
 - f. Name and address of the supplier.
 - g. Name of the manufacturer.
 - h. Number and title of appropriate Specification Section with revision number.
 - i. Drawing number and detail references, as appropriate, with revision number.
 3. Highlight, encircle, or "cloud" deviations, comments and/or questions which conflict with the Contract Documents to facilitate review.
 4. Collate multiple sheets or copies into sets.
- E. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- F. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.07 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
 - a. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
 2. Post electronic submittals as PDF electronic files directly to Architect's FTP site specifically established for Project.
 - a. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
 3. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
 4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated or required.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay. Transmit submittals independently from other Project correspondence.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

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2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received. The Contractor will be notified if the Architect has determined to withhold action.
- C. Processing Time: Allow sufficient time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect or Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 5. Submittals received by Architect after 1:00 p.m. will be considered as received the following working day.
 6. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Construction Manager, through Architect before being returned to Contractor.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect and Construction Manager.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Architect's and Construction Manager's action stamp.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, Authorities Having Jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.
- G. Submittal Transmittal: Transmit each submittal attached to a completed transmittal/submittal coversheet. The Architect will review submittals only if accompanied by a transmittal/submittal coversheet. Use sample form attached at the end of this Section.

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1. Name file with submittal number or other unique identifier, including revision identifier.
 - a. Example: #054000-001-001 is Section 054000 (Cold-Formed Metal Framing)- Document number - Submittal sequence number.
2. On the transmittal/submittal coversheet, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
3. For submittals requiring review by the Architect's consultants or engineers, forward submittals directly to the respective consultants or engineers. Send a corresponding copy of the transmittal/submittal coversheet to the Architect for tracking purposes.
4. On each coversheet, each reviewer shall stamp "Received" and indicate the date received, in the box provided on the Transmittal/Submittal Cover Sheet. Reviewers include Contractor, Consultants, and Architect.
5. The Architect will not accept submittals received from sources other than the Contractor.
6. Reviewers shall stamp submittals with a "Received stamp" indicating the date received as follows:
 - a. Shop Drawings: Stamp each individual drawing or sheet.
 - b. Product Data: Stamp front cover of bound literature.
 - c. Samples: Attach a self-adhering blank label and stamp the label.

1.08 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.
 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts
 - b. Manufacturer's written installation instructions.
 - c. Manufacturer's product specifications.
 - d. Standard color charts.
 - e. Statement of compliance with specified referenced standards.
 - f. Testing by recognized testing agency.
 - g. Application of testing agency labels and seals.
 - h. Notation of coordination requirements.
 - i. Availability and delivery time information.
 - j. Notation of dimensions verified by field measurement.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.
 6. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
 7. Quantity: For paper submissions, submit four originals of each required submittal. The Architect will return one original marked with action taken.

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- a. Changes to quantities of required submittals will be determined by the Architect at the Pre-Construction meeting.
 8. Distribution: Furnish copies of the Architect's reviewed final submittal to others required for performance of construction activities.
- B. Shop Drawings: Submit newly prepared information drawn accurately to scale. Do not reproduce Contract Documents or standard printed data as the basis of Shop Drawings.
1. Preparation: Fully illustrate requirements in the Contract Documents. Shop Drawings include: fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following Project specific information, as applicable:
 - a. Dimensions.
 - b. Identification of products and materials included by sheet and detail number.
 - c. Schedules.
 - d. Compliance with specified standards.
 - e. Notation of coordination requirements.
 - f. Notation of dimensions established by field measurement.
 - g. Relationship and attachment to adjoining construction clearly indicated.
 - h. Seal and signature of professional engineer if specified.
 - i. Distribution: Furnish copies of the Architect's reviewed final submittal to others required for performance of constructions activities.
 2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
 3. BIM Incorporation: Develop and incorporate Shop Drawing files into BIM established for Project.
- C. Samples: Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
 2. Identification: Permanently attach label on unexposed side of Samples.
 3. Mount or display Samples in a manner to facilitate review of qualities indicated. Prepare Samples to match the Architect's sample. Include the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 - g. Compliance with recognized standards.
 - h. Availability and delivery time.
 4. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least 3 multiple units that show approximate limits of the variations.

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- b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
 - c. Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.
 - d. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.
5. Preliminary Submittals (for initial selection of finishes): Submit a full set of choices where Samples are submitted for selection of color, pattern, texture, or similar characteristics from a range of standard choices.
 - a. The Architect will review and return preliminary submittals with the Architect's notation, indicating selection and other action.
6. Quantity: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit 1 set. The Architect will return that set marked with the action taken.
7. Contractor shall maintain sets of Samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.
 - a. Sample sets may be used to obtain final acceptance of the construction associated with each set.
8. Distribution of Samples: Prepare and distribute additional sets to others as required for performance of the Work.
9. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
10. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will return submittal with options selected.
11. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect and Construction Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

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- 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
 4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
 5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
 6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:
1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
 2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
 3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

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4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.
7. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
 - a. Name, address, and telephone number of factory-authorized service representative making report.
 - b. Statement on condition of substrates and their acceptability for installation of product.
 - c. Statement that products at Project site comply with requirements.
 - d. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - e. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - f. Statement whether conditions, products, and installation will affect warranty.
 - g. Other required items indicated in individual Specification Sections.
- I. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 01 Section "Operation and Maintenance Data."
- J. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- K. Material Safety Data Sheets: Submit information directly to the General Contractor or Construction Manager. Do not submit this information to the Architect. If submitted to Architect, Architect will not review the entire submittal and will return it as ***"Rejected."***
- L. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.

4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

1.09 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and, if requested, three paper copies of certificate, signed, and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C. BIM Incorporation: Incorporate or Construction Manager will incorporate delegated-design drawing and data files into BIM established for Project.
 1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as original Drawings.

1.10 COORDINATION DRAWINGS

- A. Coordination Drawings: Prepare Coordination Drawings in accordance with General Conditions.

1.11 MATERIAL AND EQUIPMENT SUPPLIERS

- A. Along with the Construction Schedule and Submittal Schedule, submit documents from material and equipment producers proposed for use on this project, acceptance of conditions and warranty requirements as set forth in the Specifications. Failure to provide documentation may result in delay or rejection of payment for the labor and materials associated with the missing material and equipment certifications.
 1. Documentation from material, or equipment suppliers, sales representatives or distributors is not acceptable.

1.12 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with indication in web-based Project management software. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

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1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
- D. Proceed with execution of the Work, documented by applicable submittals, using only shop drawings, product data and samples indicating Architect's action.

1.13 ARCHITECT'S AND CONSTRUCTION MANAGER'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.
 1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action.
 2. Submittals by Web-Based Project Management Software: Architect will indicate, on Project management software website, the appropriate action.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Contractor will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect will return without review submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.
- G. Action Stamp: The Architect will stamp each submittal with a uniform action stamp. The Architect will mark the stamp appropriately to indicate the action taken, as follows:
 1. NO EXCEPTIONS: When the Architect marks a submittal "No Exceptions," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
 2. AMEND AS NOTED: When the Architect marks a submittal "Amend As Noted," the Work covered by the submittal may proceed provided it complies with notations on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
 3. AMEND AS NOTED/RESUBMIT FOR RECORD: When the Architect marks a submittal "Amend as Noted/Resubmit for Record," the Work covered by the submittal may proceed provided it complies with notations on the submittal and requirements of the Contract Documents. Provide a corrected copy without the Architect's and Construction Manager's review comments. Final payment depends on that compliance.
 4. REVISE AND RESUBMIT: When the Architect marks a submittal "Resubmit," the Work covered by the submittal may proceed, except in those portions of the Work designated to be resubmitted. Revise or prepare a new submittal, responding to the notations. Resubmit

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- without delay.
5. INFORMATION ONLY: When the Architect marks a submittal "Information Only," the submittal has been reviewed and will be kept on record for informational purposes and is not approved or rejected.
 6. FOR RECORD: Provide a corrected copy without the Architect's and Construction Manager's review comments. Final payment depends on this compliance.
 7. REJECTED: When the Architect marks a submittal "Rejected," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.
 - a. Do not use, or allow others to use, submittals marked "Rejected" at the Project Site or elsewhere where Work is in progress.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 013300

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Contractor:

Project No.: B23036.01
 Project: East Providence Police Dept Renovations
 750 Waterman Avenue
 East Providence, Rhode Island

Spec. Division _____ Submittal Number _____ Spec. Section _____

Subcontractor/Supplier _____

QUANTITY	ITEM

Contractor: Rec'd from Sub/Supplier: Date: _____ Quantity Sent: _____

Sent to: JCJ Date: _____ Action: _____

Consultant: _____

cc: _____

Consultant: Rec'd from Contractor: Date: _____ Quantity Sent: _____

Sent to JCJ: Date: _____ Action: _____

JCJ: Rec'd from: Contractor Date: _____ Quantity Sent: _____

Consultant

Sent to Contractor: Date: _____ Action: _____

Architect's Distribution Main File: # (T. only)

Architect
 JCJ Architecture
 21 West 3rd Street
 Boston, MA 02127

Project Representative:

Action Key
 NET/No Exception
 AN/Amend as Noted
 RS/Resubmit
 R/Rejected

Date received By C.M.	Date Received By Consultant	Date Received By JCJ
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SUBMITTAL ROUTING REVIEW STAMP COVER SHEET

SUBMITTAL NO:

Project Name: East Providence Police Department Renovations
Project Number: B23016.01
Project Address: 750 Waterman Avenue, East Providence, Rhode Island

SUBMITTAL REVIEW STAMPS

CIVIL REVIEW STAMP	STRUCTURAL REVIEW STAMP

MEP REVIEW STAMP	ARCHITECTURAL STAMP

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SECTION 014000 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance, special testing, and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, Commissioning Authority, Construction Manager, or Authorities Having Jurisdiction are not limited by provisions of this Section.

1.03 RELATED REQUIREMENTS

- A. Section 012100 - Allowances: For testing and inspection allowances.
- B. Section 013100 - Project Management And Coordination for developing a schedule of required tests and inspections.
- C. Section 013300 - Submittal Procedures
- D. Section 017300 - Execution
- E. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.04 REFERENCE STANDARDS

- A. 29 CFR 1910 - Occupational Safety and Health Standards.
- B. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- C. NIST - NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY, U.S. DEPARTMENT OF COMMERCE.
- D. NVLAP - National Voluntary Laboratory Accreditation Program (NVLAP).

1.05 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five or _____ previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of Authorities Having Jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Full-size physical assemblies to illustrate finishes and materials that are constructed either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review construction coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Laboratory Mockups: Full-size physical assemblies constructed and tested at testing facility to verify performance characteristics.
 - 2. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements or as indicated in-place portions of permanent construction, consisting of multiple products, assemblies, and subassemblies, with cutaways enabling inspection of concealed portions of the Work.
 - a. Include each system, assembly, component, and part of the exterior wall and roof to be constructed for the Project. Colors of components shall be those selected by the Architect for use in the Project.
 - 3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting.
 - 4. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
 - 5. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910 (29 CFR 1910.7), by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to Authorities Having Jurisdiction, to establish product performance and compliance with specified requirements.

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- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" shall have the same meaning as the term "testing agency."
- I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect or Construction Manager.

1.06 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.07 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
- B. 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 Architect for a decision before proceeding.

1.08 ACTION SUBMITTALS

- A. Mockup Shop Drawings: For integrated exterior, laboratory, and _____ mockups.
 - 1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
 - 2. Indicate manufacturer and model number of individual components.

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3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.09 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by Authorities Having Jurisdiction, submit copy of written statement of responsibility submitted to Authorities Having Jurisdiction before starting work on the following systems:
 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 1. Specification Section number and title.
 2. Entity responsible for performing tests and inspections.
 3. Description of test and inspection.
 4. Identification of applicable standards.
 5. Identification of test and inspection methods.
 6. Number of tests and inspections required.
 7. Time schedule or time span for tests and inspections.
 8. Requirements for obtaining samples.
 9. Unique characteristics of each quality-control service.
- F. Reports: Prepare and submit certified written reports and documents as specified, and that include the following:
 1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Ambient conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for

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compliance with standards and regulations bearing on performance of the Work.

1.10 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within ten or ____ days of Notice of Award or Notice to Proceed, and not less than five or ____ days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager may also serve as Project superintendent, shall not have other responsibilities, and _____.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
 - 2. Special inspections required by Authorities Having Jurisdiction and indicated on the Statement of Special Inspections.
 - 3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by Commissioning Authority.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of Authorities Having Jurisdiction.

1.11 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.

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6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement of whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement of whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

1.12 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

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- D. **Installer Qualifications:** A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. **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 the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. **Specialists:** Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged in the activities indicated.
 - 1. Requirements of Authorities Having Jurisdiction shall supersede requirements for specialists.
- G. **Testing and Inspecting Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by Authorities Having Jurisdiction, that is acceptable to authorities.
- H. **Manufacturer's Technical Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. **Factory-Authorized Service Representative Qualifications:** An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. **Preconstruction Testing:** Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:
 - 1. Provide test specimens representative of proposed products and construction.
 - 2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - 3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - 4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
 - 5. Build laboratory mockups at testing facility, using personnel, products, and methods of construction indicated for the completed Work.
 - 6. When testing is complete, remove test specimens and test assemblies, remove test specimens, test assemblies, mockups, and laboratory mockups; do not reuse products on Project.
 - 7. **Testing Agency Responsibilities:** Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority or and Commissioning Authority, through Construction Manager, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work

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complies with or deviates from the Contract Documents.

- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups of size indicated.
 2. Build mockups in location indicated or, if not indicated, as directed by Architect and Construction Manager.
 3. Notify Architect and Construction Manager a minimum of seven or _____ days in advance of dates and times when mockups will be constructed.
 4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 6. Obtain Architect's and Construction Manager's approval of mockups before starting corresponding Work, fabrication, or construction.
 - a. Allow seven or _____ days for initial review and each re-review of each mockup.
 7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
 8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 10. Demolish and remove mockups when directed unless otherwise indicated.
- L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings or as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials. Comply with requirements in "Mockups" Paragraph.
1. Coordinate construction of the mockup to allow observation of air barrier installation, flashings, air barrier integration with fenestration systems, and other portions of the building air/moisture barrier and drainage assemblies, prior to installation of veneer, cladding elements, and other components that will obscure the work.
- M. Room Mockups: Construct room mockups according to approved Shop Drawings or as indicated on Drawings, incorporating required materials and assemblies, finished according to requirements. Provide required lighting and additional lighting where required to enable Architect to evaluate quality of the Work. Comply with requirements in "Mockups" Paragraph.
1. Provide room mockups of the following rooms:
 - a. .
- N. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

1.13 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.

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2. Payment for these services will be made from testing and inspection allowances specified in Section 012100 - Allowances as authorized by Change Orders.
 3. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
1. Unless otherwise indicated, provide quality-control services specified and those required by Authorities Having Jurisdiction. Perform quality-control services required of Contractor by Authorities Having Jurisdiction, whether specified or not.
 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 72 hours in advance of time when Work that requires testing or inspection will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to Authorities Having Jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect Commissioning Authority, or Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect Commissioning Authority, or Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 - Submittal Procedures.
- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and

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conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspection equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
 2. Distribution: Distribute schedule to Owner, Architect, Commissioning Authority, or Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.14 REFERENCES AND STANDARDS

1.15 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections required by Authorities Having Jurisdiction as the responsibility of Owner, as indicated in the Statement of Special Inspections attached to this Section, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect Commissioning Authority, or Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority or and Commissioning Authority, through Construction Manager with copy to Contractor and to Authorities Having Jurisdiction.

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4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 TESTING AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, Construction Manager's, and Authorities' Having Jurisdiction reference during normal working hours.
 1. Submit log at Project closeout as part of Project Record Documents.

3.02 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 - Execution and in a manner that eliminates evidence of patching.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

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SECTION 014339 - MOCKUPS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Integrated exterior mockups.
 - 2. Preconstruction laboratory mockups.
 - 3. Room mockups.

1.03 RELATED REQUIREMENTS:

- A. Section 013233 - Photographic Documentation
- B. Section 014000 - Quality Requirements for quality assurance requirements for aesthetic and workmanship mockups specified in other Sections.
- C. Section 019119.43 - Exterior Enclosure Commissioning for testing building enclosure systems and assemblies as part of the exterior enclosure commissioning process.
- D. Section 084413 - Glazed Aluminum Curtain Walls
- E. Section 085113 - Aluminum Windows

1.04 DEFINITIONS

- A. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as freestanding temporary built elements or part of permanent construction, consisting of multiple products, assemblies, and subassemblies.
- B. Preconstruction Laboratory Mockups: Integrated exterior mockups constructed at testing facility to verify performance characteristics.
- C. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting as indicated.

1.05 REFERENCE STANDARDS

- A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.
- B. AAMA 501.4 - Recommended Static Test Method for Evaluating Window Wall, Curtain Wall and Storefront Systems Subjected to Seismic and Wind-Induced Inter-Story Drift.
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

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- D. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- E. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- F. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components.
- G. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
- H. ASTM E1105 - 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.
- I. IAS - International Accreditation Service.
- J. ILAC Mutual Recognition Arrangement - International Laboratory Accreditation Cooperation For Mutual Recognition Arrangement.
- K. ISO/IEC 17025 - General Requirements for the Competence of Testing and Calibration Laboratories.

1.06 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Construction Manager, Architect, testing and inspecting agency representative, and installers of major systems whose Work is included in integrated exterior, preconstruction laboratory, and room mockups.
 - 2. Review coordination of equipment and furnishings provided by the Owner for room mockups.
 - 3. Review locations and extent of mockups.
 - 4. Review testing procedures to be performed on mockups.
 - 5. Review and finalize schedule for mockups, and verify availability of materials, personnel, equipment, and facilities needed to complete mockups and testing and maintain schedule for the Work.

1.07 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior, preconstruction laboratory, and room mockups.
 - 1. Include plans, elevations, sections, and mounting, attachment, and support details.
 - 2. Indicate manufacturer and model number of individual components, subassemblies, and assemblies.
 - 3. Include site location drawing indicating orientation of mockup.
 - 4. Revise and resubmit Shop Drawings to reflect approved modifications in details and component interfaces resulting from changes made during testing procedures.
- B. Delegated Design Submittal: For temporary structural supports for mockups not attached to building structure, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.08 INFORMATIONAL SUBMITTALS

- A. Room Mockup Coordination Drawings: and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
- B. Qualification Data: For testing agency.
- C. Preconstruction Test Reports: For integrated exterior and preconstruction laboratory mockups.

1.09 QUALITY ASSURANCE

- A. Preconstruction Laboratory Mockup Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.
- B. Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025 and acceptable to Owner and Architect.
- C. Build mockups to do the following:
 - 1. Verify selections made under Sample submittals.
 - 2. Demonstrate aesthetic effects.
 - 3. Demonstrate the qualities of products and workmanship.
 - 4. Demonstrate acceptable coordination between components and systems.
 - 5. Perform preconstruction testing, such as window air- and water-infiltration testing.
- D. Fabrication: Before fabricating or installing portions of the Work requiring mockups, build mockups for each form of construction and finish required. Use materials and installation methods as required for the Work.
 - 1. Build mockups of size indicated.
 - 2. Build mockups in location indicated or, if not indicated, as directed by Architect or Construction Manager.
 - 3. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
 - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Demolish and remove mockups when directed unless otherwise indicated.
- E. Notifications:
 - 1. Notify Architect and Construction Manager seven or _____ days in advance of the dates and times when mockups will be constructed.
 - 2. Notify Architect and Construction Manager 14 or _____ days in advance of the dates and times when mockups will be tested.
 - 3. Allow seven or _____ days for initial review and each re-review of each mockup.
- F. Approval: Obtain Architect's and Construction Manager's approval of mockups before starting fabrication or construction of corresponding Work.
 - 1. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

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2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 COORDINATION

- A. Coordinate schedule for construction of mockups, so construction, testing, and review of mockups do not impact Project schedule.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 - Quality Requirements, to design support structure for free-standing mockups.
- B. Structural Performance:
 1. Seismic Performance: Mockups and support structure to withstand the effects of earthquake motions determined in accordance with SEI ASCE 7 .
 2. Wind Loads: As indicated on Drawings.
- C. Mockup Testing Performance Requirements: Perform tests using design pressures and performance criteria indicated for assemblies and products that are specified in other Sections and incorporated into integrated exterior and preconstruction laboratory mockups.

2.02 INTEGRATED EXTERIOR MOCKUPS

- A. Construct integrated exterior mockups according to approved mockup Shop Drawings or as indicated on Drawings. Construct mockups to demonstrate constructability, coordination of trades, and sequencing of Work; and to ensure materials, components, subassemblies, assemblies, and interfaces integrate into a system complying with indicated performance and aesthetic requirements.
- B. Design and construct foundation and superstructure to support free-standing integrated exterior mockups.
- C. Build integrated exterior mockups using installers and construction methods that will be used in completed construction.
- D. Use specified products that have been approved by the Architect. Coordinate installation of materials and products specified in individual Specification Sections that include Work included in integrated exterior mockups.
- E. The Work of integrated exterior mockups includes, but is not limited to, the following:
 1. Precast architectural concrete.
 2. Masonry veneer.
 3. Stone cladding.
 4. Cold-formed metal framing and sheathing.
 5. Air and weather barriers.
 6. Thermal insulation.

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7. Through-wall flashing.
 8. Flashing and sheet metal trim.
 9. Joint sealants.
 10. Metal wall panels.
 11. Aluminum-framed entrances and storefront.
 12. Glazed curtain walls.
 13. Aluminum windows.
 14. Glazing.
- F. Photographic Documentation: Document construction of integrated exterior mockups with photographs in accordance with Section 013233 - Photographic Documentation. Provide photographs showing details of interface of different materials and assemblies.
1. Document testing procedures, including water leakage and other deficiencies. Photograph modifications to component interfaces intended to correct deficiencies.
- G. Provide and document modifications to construction details and interfaces between components and systems required to properly sequence the Work, or to pass performance testing requirements. Obtain Architect's or Construction Manager's approval for modifications.
- H. Retain approved mockups constructed in place. Incorporate fully into the Work.

2.03 PRECONSTRUCTION LABORATORY MOCKUPS

- A. Construct preconstruction laboratory mockups according to approved mockup Shop Drawings or as indicated on Drawings. Construct mockups to demonstrate constructability, coordination of trades, and sequencing of Work; ensure materials, components, subassemblies, assemblies, and interfaces integrate into a system complying with indicated performance and aesthetic requirements; and conduct performance testing indicated.
- B. Build preconstruction laboratory mockups at testing agency facility using installers and construction methods that will be used at Project site.
- C. Use specified products that have been approved by the Architect. Coordinate installation of materials and products specified in individual Specification Sections that include Work included in preconstruction laboratory mockups.
- D. The Work of preconstruction laboratory mockups includes, but is not limited to, the following:
1. Precast architectural concrete.
 2. Masonry veneer.
 3. Stone cladding.
 4. Cold-formed metal framing and sheathing.
 5. Air and weather barriers.
 6. Thermal insulation.
 7. Through-wall flashing.
 8. Flashing and sheet metal trim.
 9. Joint sealants.
 10. Metal wall panels.
 11. Aluminum-framed entrances and storefront.
 12. Glazed curtain walls.
 13. Aluminum windows.
 14. Glazing.

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- E. Photographic Documentation: Document construction of preconstruction laboratory mockups with photographs in accordance with Section 013233 - Photographic Documentation. Provide photographs showing details of interface of different materials and assemblies.
 - 1. Document testing procedures, including water leakage and other deficiencies. Photograph modifications to component interfaces intended to correct deficiencies.
- F. Provide and document modifications to construction details and interfaces between components and systems required to properly sequence the Work, or to pass performance testing requirements. Obtain Architect's or Construction Manager's approval for modifications.
- G. When testing is complete, remove test specimens and test assemblies, and preconstruction laboratory mockups; do not reuse products on Project.

2.04 ROOM MOCKUPS

- A. Build room mockups according to approved mockup Shop Drawings or as indicated on Drawings to evaluate constructability, demonstrate the coordination of trades and sequencing of Work, and to demonstrate aesthetic requirements. Include each visible finish, component, and equipment item within room mockups; include operable lighting.
- B. Provide room mockups of the following rooms:
 - 1. Classroom.
 - 2. Patient care room.
 - 3. Hotel guest room.
 - 4. Residential apartment unit.
- C. The Work of room mockups includes, but is not limited to, the following:
 - 1. Millwork and casework.
 - 2. Doors and frames.
 - 3. Access doors and frames.
 - 4. Glazing.
 - 5. Metal framing.
 - 6. Gypsum board.
 - 7. Ceramic tiling.
 - 8. Acoustical ceilings.
 - 9. Resilient flooring.
 - 10. Painting.
 - 11. Registers and grilles.
 - 12. Wiring devices.
 - 13. Lighting.

PART 3 EXECUTION

3.01 TESTING OF INTEGRATED EXTERIOR MOCKUPS

- A. Integrated Exterior Mockup Testing Agency: Owner will engage or Engage a qualified testing agency to perform tests and inspections.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested Work complies with or deviates from requirements.

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- B. Integrated Exterior Mockup Testing Services: Perform the following tests in the following order:
1. Water-Spray Test: Before installation of interior finishes has begun, test areas designated by Architect in accordance with AAMA 501.2 for evidence of water penetration.
 - a. Perform a minimum of two, three, or _____ tests in areas as directed by Architect.
 2. Air Leakage: Test in accordance with ASTM E783 at 1.5 times the rate specified in "Mockup Testing Performance Requirements" Paragraph in "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
 - a. Perform a minimum of two, three, or _____ tests in areas as directed by Architect.
 3. Water Penetration: Test in accordance with ASTM E1105 at a minimum uniform or cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Mockup Testing Performance Requirements" Paragraph in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. (300 Pa), and verify no evidence of water penetration.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and installations, including connections, and also to observe testing for the following systems and assemblies.
1. Curtain wall specified in Section 084413 - Glazed Aluminum Curtain Walls.
- D. Integrated exterior mockup will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.02 TESTING OF PRECONSTRUCTION LABORATORY MOCKUPS

- A. Testing Agency: Owner will engage or Engage a qualified testing agency to perform tests and inspections.
1. Testing and inspecting agency will interpret tests and state in each report whether tested Work complies with or deviates from requirements.
- B. Testing Criteria: Where the following tests are indicated, use criteria indicated.
1. Air Infiltration in Accordance with ASTM E283/E283M: Static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa) or 6.24 lbf/sq. ft. (300 Pa).
 2. Water Penetration in Accordance with ASTM E331: Minimum static-air-pressure differential of 20 percent or _____ of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa), 10 lbf/sq. ft. (480 Pa), or 15 lbf/sq. ft.(720 Pa).
- C. Unlock, open, and relock operable windows and doors five times. Perform necessary hardware adjustments, if any, and repeat cycling.
- D. Preconstruction Laboratory Mockup Testing Services: Perform the following tests in the following order.
1. Structural: ASTM E330/E330M at 50 percent of positive test load for not less than ten or _____ seconds.
 2. Air Infiltration: ASTM E283.
 3. Water Penetration under Static Pressure: ASTM E331.
 4. Water Penetration under Dynamic Pressure: AAMA 501.1 at minimum air-pressure differential of 20 percent or _____ of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa), 10 lbf/sq. ft. (480 Pa), or 15 lbf/sq. ft.(720 Pa).

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5. Structural: ASTM E330/E330M at 100 percent of positive and negative test loads. Repeat the following:
 - a. Air Leakage: ASTM E283/E283M.
 - b. Water Penetration under Static Pressure: ASTM E331.
 6. Interstory Drift: AAMA 501.4 at 100 percent of design displacement. Repeat the following:
 - a. Air Leakage: ASTM E283/E283M.
 - b. Water Penetration under Static Pressure: ASTM E331.
 7. Thermal Cycling: In accordance with AAMA 501.5. Repeat the following:
 - a. Air Leakage: ASTM E283/E283M.
 - b. Water Penetration under Static Pressure: ASTM E331.
 8. Structural: ASTM E330/E330M at 100 percent of positive and negative test loads for not less than ten or _____ seconds.
 - a. Water Penetration under Static Pressure: ASTM E331.
 9. Structural: ASTM E330/E330M at 150 percent of positive and negative test loads for not less than ten or _____ seconds.
 - a. Water Penetration under Static Pressure: ASTM E331.
 10. Interstory Drift: AAMA 501.4 at 150 percent of design displacement. Repeat the following:
 - a. Water Penetration under Static Pressure: ASTM E331.
- E. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and installations, including connections, and also to observe testing for the following systems and assemblies.
1. Curtain wall specified in Section 084413 - Glazed Aluminum Curtain Walls.
 2. Aluminum windows specified in Section 085113 - Aluminum Windows.
- F. Preconstruction laboratory mockup will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

END OF SECTION 014339

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.03 RELATED REQUIREMENTS

- A. Section 011000 - Summary for work restrictions and limitations on utility interruptions.
- B. Section 011200 - Multiple Contract Summary for responsibilities for temporary facilities and controls for projects utilizing multiple contracts.
- C. Section 012100 - Allowances for allowance for metered use of temporary utilities.
- D. Section 015639 - Temporary Tree And Plant Protection
- E. Section 017419 - Construction Waste Management and Disposal
- F. Section 017700 - Closeout Procedures
- G. Section 311000 - Site Clearing
- H. Section 312000 - Earth Moving
- I. Section 321216 - Asphalt Paving

1.04 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design.
- B. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C.
- C. EPA - Environmental Protection Agency.
- D. NECA - National Electrical Contractors Association (NECA).
- E. NEMA - National Electrical Manufacturers Association.
- F. NFPA 70 - National Electrical Code.
- G. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

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- H. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- I. UL - Underwriters' Laboratories.

1.05 USE CHARGES

- A. General: Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and Authorities Having Jurisdiction.
- B. Sewer Service: Pay or Owner will pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay or Owner will pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay or Owner will pay electric-power-service use charges for electricity used by all entities for construction operations.
- E. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use with metering or without metering and without payment of use charges. Provide connections and extensions of services and metering as required for construction operations.
- F. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use with metering or without metering and without payment of use charges. Provide connections and extensions of services and metering as required for construction operations.
- G. Sewer, Water, and Electric Power Service: Use charges are specified in Section 011200 - Multiple Contract Summary.

1.06 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 or _____ days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and Authorities Having Jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

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- E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
 - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
 - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 - 3. Indicate methods to be used to avoid trapping water in finished work.

- F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. HVAC system isolation schematic drawing.
 - 3. Location of proposed air-filtration system discharge.
 - 4. Waste-handling procedures.
 - 5. Other dust-control measures.

- G. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
 - 1. Methods used to meet the goals and requirements of the Owner.
 - 2. Concrete cutting method(s) to be used.
 - 3. Location of construction devices on the site.
 - 4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
 - 5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
 - 6. Indicate locations of sensitive research, patient, and equipment areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

1.07 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

- C. Accessible Temporary Egress: Comply with applicable provisions in 2010 ADA Standards for Accessible Design [**and**] [ICC/ANSI A117.1].

1.08 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its

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use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8 inch (42-mm) OD top rails or , with galvanized barbed-wire top strand.
- B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide concrete, galvanized-steel, or _____ bases for supporting posts.
- C. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
- D. Wood Enclosure Fence: Plywood, 6 feet (1.8 m) or 8 feet (2.4 m) high, framed with four 2-by-4-inch (50-by-100-mm) rails, with preservative-treated wood posts spaced not more than 8 feet (2.4 m) apart.
- E. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
- F. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches (914 by 1524 mm).
- G. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.02 TEMPORARY FACILITIES

- A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Field Offices: Owner will provide conditioned interior space for field offices for duration of Project or upon completion of demolition and enclosure.
- C. Field Offices: Not permitted.
- D. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, Construction Manager, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.

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2. Conference room of sufficient size to accommodate meetings of ten or _____ individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
 3. Drinking water and private toilet.
 4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
 5. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- E. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations
1. Store combustible materials apart from building.
- F. Storage and Fabrication Sheds: Not permitted.

2.03 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to Authorities Having Jurisdiction, and marked for intended location and application.
 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 or _____ at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 - Closeout Procedures.
- C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 EXECUTION

3.01 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.02 INSTALLATION, GENERAL

- A. 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.

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1. Locate facilities to limit site disturbance as specified in Section 011000 - Summary.
- B. 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.
- C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.03 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 1. Connect temporary sewers to municipal system or private system indicated as directed by Authorities Having Jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- E. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of Authorities Having Jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted or will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- F. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes

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and their proper curing or drying.

- G. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service overhead or underground unless otherwise indicated.
 - 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- J. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment, one land-based telephone line, or WiFi cell phone access equipment and one land-based telephone line for each field office.
- K. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

3.04 SUPPORT FACILITIES INTALLATION

- A. Comply with the following:
 - 1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
 - 2. Utilize designated area within existing building for temporary field offices.
 - 3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated or within construction limits indicated on Drawings.
 - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
 - 1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 - 2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Section 312000 - Earth Moving.
 - 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
 - 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement

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before installation of final course in accordance with Section 321216 - Asphalt Paving.

- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Parking: Provide temporary offsite or Use designated areas of Owner's existing parking areas for construction personnel.
- F. Parking: No provision will be provided for personnel or construction vehicles within the construction zone.
- G. Storage and Staging: Provide temporary offsite or Use designated areas of Owner's existing for storage and staging needs.
- H. Dewatering Facilities and Drains: Comply with requirements of Authorities Having Jurisdiction. Maintain Project site, excavations, and construction free of water.
 - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 - 2. Remove snow and ice as required to minimize accumulations.
- I. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touch up signs, so they are legible at all times.
- J. Project Signs: Not permitted.
- K. Waste Disposal Facilities: Comply with requirements specified in Section 017419 - Construction Waste Management and Disposal.
- L. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- M. Temporary Elevator Use: Use of elevators is not permitted or See Division 14 elevator Section for temporary use of new elevators.
- N. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
 - 1. Do not load elevators beyond their rated weight capacity.
 - 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work, so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
 - 3. Usage shall be established at the Preconstruction Meeting.

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- O. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- P. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
 - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.
 - 2. Usage shall be established at the Preconstruction Meeting.
- Q. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.05 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of EPA Construction General Permit or Authorities Having Jurisdiction, whichever is more stringent and requirements specified in Section 311000 - Site Clearing.
- D. 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, according to erosion and sedimentation control Drawings, requirements of EPA Construction General Permit, or Authorities Having Jurisdiction, whichever is more stringent.
 - 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.
- E. Stormwater Control: Comply with requirements of Authorities Having Jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

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- F. Tree and Plant Protection: Comply with requirements specified in Section 015639 - Temporary Tree And Plant Protection.
- G. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- H. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by Authorities Having Jurisdiction.
- I. Site Enclosure Fence: Before construction operations begin or Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations or As indicated on Drawings.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- J. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- K. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- L. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by Authorities Having Jurisdiction. Provide signage directing occupants to temporary egress.
- M. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of Authorities Having Jurisdiction and requirements indicated on Drawings.
 - 1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
 - 2. Paint and maintain appearance of walkway for duration of the Work.
- N. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- O. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner, tenants, and General Public from fumes and noise.

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1. Construct dustproof partitions with gypsum wallboard, with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 2. Construct dustproof partitions with two layers of 6-mil (0.14-mm) polyethylene sheet on each side. Cover floor with two layers of 6-mil (0.14-mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches (1219 mm) between doors. Maintain water-dampened foot mats in vestibule.
 3. Where fire-resistance-rated temporary partitions are indicated or are required by Authorities Having Jurisdiction, construct partitions according to the rated assemblies.
 4. Insulate partitions to control noise transmission to occupied areas.
 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 6. Protect air-handling equipment.
 7. Provide walk-off mats at each entrance through temporary partition.
- P. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of Authorities Having Jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.06 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.

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4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard and replace stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 or _____ hours are considered defective and require replacing.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 or _____ hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect .
 - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 or _____ hours.

3.07 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by Authorities Having Jurisdiction.

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3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 - Closeout Procedures.

END OF SECTION 015000

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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.03 RELATED REQUIREMENTS

- A. Section 011000 - Summary for Contractor requirements related to Owner-furnished products.
- B. Section 012100 - Allowances for products selected under an allowance.
- C. Section 012300 - Alternates for products selected under an alternate.
- D. Section 012500 - Substitution Procedures for requests for substitutions.
- E. Section 013300 - Submittal Procedures
- F. Section 014200 - References for applicable industry standards for products specified.
- G. Section 017700 - Closeout Procedures for submitting warranties.
- H. Division 02 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.04 REFERENCE STANDARDS

1.05 DEFINITIONS

- A. Definitions below are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties", "systems", "structure", "finishes", "accessories", and similar terms. Such terms such are self-explanatory and have well recognized meanings in the construction industry.
- B. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials

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- are considered new products, unless indicated otherwise.
3. **Comparable Product:** Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- C. **"Materials"** are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
 - D. **"Equipment"** is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.
 - E. **Basis-of-Design Product Specification:** A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 1. **Evaluation of Comparable Products:** In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products. or _____
 - F. **Subject to Compliance with Requirements:** Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
 - G. **Comparable Product Request Submittal:** An action submittal requesting consideration of a comparable product, including the following information:
 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
 - H. **Basis-of-Design Product Specification Submittal:** An action submittal complying with requirements in Section 013300 - Submittal Procedures.
 - I. **Substitution:** Refer to Section 012500 - Substitution Procedures for definition and limitations on substitutions.

1.06 SUBMITTALS

- A. **Product List Schedule:**

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1. Prepare a schedule showing products specified in a tabular form acceptable to the Architect. Include generic names of products required. Include the manufacturer's name and proprietary product names for each item listed.
2. Coordinate the product list schedule with the Contractor's Construction Schedule and the Schedule of Submittals.
3. Architect's Action: The Architect will respond in writing to the Contractor within two weeks of receipt of the completed product list schedule. No response within this time period constitutes no objection to listed manufacturers or products, but does not constitute a waiver of the requirement that products comply with Contract Documents.

1.07 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.
- B. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 1. Resolution of Compatibility Disputes between Multiple Contractors:
 - a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- C. Identification of Products:
 1. Except for required labels and operating data, do not attach or imprint manufacturer's or producer's names, nameplates, or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
 2. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
 3. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
 4. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.08 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.09 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written

instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.10 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. **Manufacturer's Warranty:** Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
2. **Special Warranty:** Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. **Manufacturer's Standard Form:** Modified to include Project-specific information and properly executed.
2. **Specified Form:** When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 - Closeout Procedures.

PART 2 PRODUCTS

2.01 PRODUCT SELECTION

A. General Product Requirements:

1. Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, are new at time of installation.
2. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and for the intended use and effect.
3. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
4. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
5. Where products are accompanied by the term "as selected," Architect will make selection.
6. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
7. Or Approved: For products specified by name and accompanied by the term "or as approved by the Architect," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Architect through Construction Manager or _____ in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or approved" product status is by the Architect, whose determination is final.

B. Product Selection Procedures:

1. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
2. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
3. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
4. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.

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- a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 - Substitution Procedures for substitutions for convenience.
6. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
7. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements which are recommended by the manufacturer for the application indicated.
- a. General overall performance of a product is implied where the product is specified for a specific application.
 - b. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
8. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 - Substitution Procedures for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.
1. Select products for which sustainable design documentation submittals are available from manufacturer.
- F. Allowances: Refer to individual Specification Sections and provisions in Division 1 for allowances that control product selection, and for procedures required for processing such selections.

2.02 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
 - 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 - 3. Evidence that proposed product provides specified warranty.
 - 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
 - 5. Samples, if requested.

- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 013300 - Submittal Procedures.
 - 1. Form of Approval of Submittal: As specified in Section 013300 - Submittal Procedures.
 - 2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

- D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 EXECUTION

3.01 INSTALLATION OF PRODUCT

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated.

- B. Anchor each product securely in place, accurately located and aligned with other work.

- C. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 016000

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SECTION 016116 - VOLATILE ORGANIC COMPOUND (VOC) LIMITS FOR ADHESIVES,
SEALANTS, PAINTS, AND COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Requirements for volatile organic compound (VOC) content in adhesives and sealants used for the project.

1.02 RELATED REQUIREMENTS

- A. All sections in the Specifications with adhesives, sealants, paints, and coatings.

1.03 DEFINITIONS

- A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
 - 3. Flooring.
 - 4. Composite wood.
 - 5. Products making up wall and ceiling assemblies.
 - 6. Thermal and acoustical insulation.
 - 7. Free-standing furniture.
 - 8. Other products when specifically stated in the specifications.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Exterior and interior paints and coatings applied on site.
 - 2. Exterior and interior adhesives and sealants applied on site, including flooring adhesives.
 - 3. Other products when specifically stated in the specifications.
- C. Interior of Building: Anywhere inside the exterior weather barrier.
- D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following: Stone, concrete, clay brick, metals that are plated, anodized, or powder-coated, glass, ceramics, solid wood flooring that is unfinished and untreated.

1.04 REFERENCE STANDARDS

- A. GreenSeal GS-3 - Environmental Criteria for Anti-Corrosive Paints.
- B. GreenSeal GS-11 - Standard for Paints, Coatings, Stains, and Sealers.

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- C. GreenSeal GS-36 - Standard for Adhesives for Commercial Use.
- D. SCAQMD 1113 - Architectural Coatings.
- E. SCAQMD 1168 - Adhesive and Sealant Applications.

1.05 VOC REQUIREMENTS FOR INTERIOR ADHESIVES, SEALANTS, PAINTS, AND COATINGS

- A. The volatile organic compound (VOC) content of interior adhesives and sealants used in this project shall not exceed the limits defined in SCAQMD 1168, Rule 1168 – “Adhesive and Sealant Applications” of the South Coast Air Quality Management District (SCAQMD), of the State of California.
- B. The VOC limits defined by SCAQMD are as follows. All VOC limits are defined in grams per litre, less water and less exempt compounds.
- C. General: Unless otherwise specified below, the VOC content of all adhesives and sealants shall not be in excess of 250 grams per liter. Adhesives for commercial use, comply with GreenSeal GS-36.
- D. For specified building construction related applications, the allowable VOC content is as follows: Adhesive and Sealant VOC Limits for Architectural applications:
 - 1. Adhesives:
 - a. Indoor carpet adhesive 50 g/L.
 - b. Carpet pad adhesive 50 g/L.
 - c. Contact Adhesive 80 g/L.
 - d. Wood flooring adhesive 20 g/L.
 - e. Rubber floor adhesive 60 g/L.
 - f. Subfloor adhesive 50 g/L.
 - g. Ceramic, glass, porcelain, and stone tile adhesive 65 g/L.
 - h. Computer Diskette manufacturing adhesive 350 g/L.
 - i. VCT and asphalt tile adhesive 50 g/L.
 - j. Drywall and panel adhesive 50 g/L.
 - k. Cove base adhesive 50 g/L
 - l. Multipurpose construction adhesive 70 g/L.
 - m. Roofing adhesives:
 - 1) Single ply roof membrane adhesive 200 g/L.
 - 2) All other Roof Adhesives 200 g/L.
 - n. All other indoor floor covering adhesives 50 g/L.
 - o. All other outdoor floor covering adhesives 50 g/L.
 - p. Thin metal laminating adhesive 780 g/L.
 - q. Specialty Applications:
 - 1) Plastic Welding Cement:
 - (a) PVC welding cement 425 g/L.
 - (b) CPVC welding cement 400 g/L.
 - (c) ABS Welding Cement 325 g/L.
 - (d) ABS to PVC transition cement 425 g/L.
 - 2) Rubber vulcanization Adhesive 250 g/L.
 - 3) Contact Adhesive 80 g/L.

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- 4) Edge Glue Adhesive 250 g/L.
 - 5) Top and Trim Adhesive 250 g/L.
 - 6) All other Adhesives 250 g/L.
 - r. Substrate Specific Adhesives:
 - 1) Metal 30 g/L.
 - 2) Plastic foams 50 g/L.
 - 3) Porous material (except wood) 50 g/L.
 - 4) Wood 30 g/L.
 - 5) Fiberglass 80 g/L.
 - 6) Reinforced plastic composite 200 g/L.
 - 2. Adhesive Primers:
 - a. Plastic 500 g/L.
 - b. Pressure Sensitive 785 g/L.
 - c. Traffic Marking Tape 150 g/L.
 - d. Roof Adhesive primers 250 g/L.
 - e. All other adhesive primers 250 g/L.
 - 3. Sealants:
 - a. Foam insulation 50 g/L.
 - b. Foam sealant 50 g/L.
 - c. Grout 65 g/L.
 - d. Roadway sealant 250 g/L.
 - e. Marine Deck 760 g/L.
 - f. Non-staining plumbing putty 50 g/L.
 - g. Potable water sealant 100 g/L.
 - h. Roofing:
 - 1) Single Ply Roof membrane sealant Installation /Repair 250 g/L.
 - 2) All other roof sealants Installation/Repair 200 g/L.
 - i. All other Architectural Sealants 50 g/L.
 - j. All other sealants 250 g/L.
 - 4. Sealant Primers:
 - a. Architectural applications:
 - 1) Porous 775 g/L.
 - 2) Non-porous 250 g/L.
 - b. Marine Deck 760 g/L.
 - c. Modified Bituminous 500 g/L.
 - d. Roof Sealant primers 750 g/L.
 - e. All other sealant primers 750 g/L.
- E. VOC Limits For Paints And Coatings:
- 1. The volatile organic compound (VOC) content of interior paints, primers, and coatings used in this project shall not exceed the limits below as defined in GreenSeal GS-11.
 - 2. Paints, Primers, and Coatings:
 - a. Flat Finishes 50 g/L.
 - b. Non-Flat Finishes (i.e., satin, gloss) 50 g/L.
 - c. Non-Flat High Gloss 50 g/L.
 - 3. The volatile organic compound (VOC) content of interior anti-corrosive and anti-rust paints used in this project shall not exceed the limits defined in GreenSeal GS-3, Standard 03 (GS03), Anti-Corrosive Paints.
 - a. Anti-Corrosive Paint Finishes 250 g/L.

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- F. The volatile organic compound (VOC) content of interior Clear wood finishes, floor coatings, stains, sealers, and shellacs used in this project shall not exceed the limits defined in SCAQMD 1113, Rule 1113 – “Architectural Coatings”. South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov.
1. Architectural Coatings, Wood:
 - a. Clear Wood Finish: Varnish 275 g/L.
 - b. Clear Wood Finish: Lacquer 275 g/L.
 - c. Stains 100 g/L.
 - d. Stains interior 250 g/L.
 - e. Floor Coatings 50 g/L.
 - f. Water Proofing Sealers 100 g/L.
 - g. Sanding Sealers 275 g/L.
 - h. All Other Sealers 200 g/L.
 - i. Shellac: Clear 730 g/L.
 - j. Shellac: Pigmented 550 g/L.
 - k. Wood conditioners 100 g/L.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 016116

SECTION 017300 - EXECUTION

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner's portion of the Work.
 - 6. Coordination of Owner-installed products.
 - 7. Progress cleaning.
 - 8. Starting and adjusting.
- B. Protection of installed construction.

1.03 RELATED REQUIREMENTS:

- A. Section 011000 - Summary for coordination of Owner-furnished products, Owner-performed work, Owner's separate contracts, limits on use of Project site, and _____.
- B. Section 013100 - Project Management And Coordination
- C. Section 013300 - Submittal Procedures for submitting surveys.
- D. Section 014000 - Quality Requirements
- E. Section 015000 - Temporary Facilities and Controls
- F. Section 017419 - Construction Waste Management and Disposal
- G. Section 017700 - Closeout Procedures for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
- H. Section 019113 - General Commissioning Requirements
- I. Section 024119 - Selective Demolition for demolition and removal of selected portions of the building.
- J. Section 078413 - Penetration Firestopping for patching penetrations in fire-rated construction.

1.04 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.05 REFERENCE STANDARDS

- A. CAL (VOC) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers.
- B. EPA - Environmental Protection Agency.
- C. Green Seal's GS-37 - Green Seal GS-37 - STANDARD FOR CLEANING PRODUCTS FOR INDUSTRIAL AND INSTITUTIONAL USE.
- D. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.06 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site or _____.
 - 1. Prior to submitting cutting and patching plan, commencing work requiring cutting and patching, or _____, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect and Construction Manager or _____ of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
 - a. Contractor's superintendent.
 - b. Trade supervisor responsible for cutting operations.
 - c. Trade supervisor(s) responsible for patching of each type of substrate.
 - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
 - 2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- B. Layout Conference: Conduct conference at Project site or _____.
 - 1. Prior to establishing layout of new, new and existing, or _____ perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Architect and Construction Manager or _____ of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:
 - a. Contractor's superintendent.
 - b. Professional surveyor, Professional engineer, Contractor's personnel, or _____ responsible for performing Project surveying and layout.
 - c. Professional surveyor, Professional engineer, or _____ responsible for performing site survey serving as basis for Project design.
 - 2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
 - 3. Review requirements for including layouts on Shop Drawings and other submittals.

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4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.07 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor or Professional engineer.
- B. Certified Surveys: Submit two or _____ copies signed by land surveyor, Professional engineer, or _____.
- C. Certificates: Submit certificate signed by land surveyor, Professional engineer, or _____, certifying that location and elevation of improvements comply with requirements.
- D. Cutting and Patching Plan: Submit plan describing procedures at least 10 or _____ days prior to the time cutting and patching will be performed. Include the following information:
 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 4. Dates: Indicate when cutting and patching will be performed.
 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- E. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.08 CLOSEOUT SUBMITTALS

- A. Final Property Survey: Submit 10 or _____ copies showing the Work performed and record survey data.

1.09 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Professional Engineer Qualifications: Refer to Section 014000 - Quality Requirements.
- C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their

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- load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Plumbing piping systems.
 - f. Mechanical systems piping and ducts.
 - g. Control systems.
 - h. Communication systems.
 - i. Fire-detection and -alarm systems.
 - j. Conveying systems.
 - k. Electrical wiring systems.
 - l. Operating systems of special construction.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following: or _____
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Comply with requirements specified in other Sections.
 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

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- C. 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.
 - 1. Use cleaning products that comply with Green Seal's GS-37 , or if Green Seal's GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels [CAL (VOC)].

PART 3 EXECUTION

3.01 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

- A. Existing Utility Information: Furnish information to local utility, Owner, or _____ that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

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- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect through Construction Manager or _____ in accordance with requirements in Section 013100 - Project Management And Coordination."
 - 1. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.03 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect and Construction Manager or _____ promptly.
- B. Engage a land surveyor, Professional Engineer, or _____ experienced in laying out the Work, using the following accepted surveying practices:
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Architect and Construction Manager or _____ when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by Authorities Having Jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager or _____.

3.04 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Construction Manager or _____. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager or _____ before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two or _____ permanent benchmarks on Project site, referenced to data established by survey control points. Comply with Authorities Having Jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage a land surveyor, Professional Engineer, or _____ to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, Professional Engineer, or _____, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with Authorities Having Jurisdiction as the official "property survey."

3.05 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb, and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches (2440 mm) or _____ in occupied spaces and 90 inches (2300 mm) or _____ in unoccupied spaces, unless otherwise indicated on Drawings.

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- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. 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.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Do not use products, cleaners, and installation materials that are considered hazardous by EPA.
- K. Repair or remove and replace damaged, defective, or nonconforming Work.
 - 1. Comply with Section 017700 - Closeout Procedures for repairing or removing and replacing defective Work.

3.06 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

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- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 - Summary.
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize, prevent, or _____ interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size 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, Masonry, and _____: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical 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.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and

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appearance.

- a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.07 COORDINATION OF OWNER'S PORTION OF THE WORK

- A. Site Access: Provide access to Project site for Owner's construction personnel and Owner's separate contractors or _____.
1. Provide temporary facilities required for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed or _____ products.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel and Owner's separate contractors or _____.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction personnel and Owner's separate contractors or _____ at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.08 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.

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2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 - Temporary Facilities and Controls, 017419 - Construction Waste Management and Disposal, or ____.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.09 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 - General Commissioning Requirements.
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 - Quality Requirements.

3.10 PROTECTION AND REPAIR OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

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- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- D. Comply with manufacturer's written instructions for temperature and relative humidity.

3.11 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition, construction, and _____ waste.
 - 2. Recycling nonhazardous demolition, construction, and _____ waste.
 - 3. Disposing of nonhazardous demolition, construction, and _____ waste.

1.03 RELATED REQUIREMENTS

- A. Section 013100 - Project Management And Coordination
- B. Section 015000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- C. Section 024116 - Structure Demolition
- D. Section 024119 - Selective Demolition
- E. Section 042000 - Unit Masonry for disposal requirements for masonry waste.
- F. Section 044313.13 - Anchored Stone Masonry Veneer for disposal requirements for excess stone and stone waste.
- G. Section 044313.16 - Adhered Stone Masonry Veneer for disposal requirements for excess stone and stone waste.
- H. Section 311000 - Site Clearing for disposition of waste resulting from site clearing and removal of above-and below-grade improvements.
- I. Section -312000 - Earth Moving
- J. Section 329300 - Plants

1.04 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition and selective demolition operations.

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- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to Authorities Having Jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.05 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.06 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within seven, 30, or _____ days of date established for commencement of the Work, the Notice to Proceed, the Notice of Award, or _____.

1.07 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste, Form CWM-8 for demolition waste, and _____. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons (tonnes).
 - 4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
 - 5. Quantity of waste recycled, both estimated and actual in tons (tonnes).
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
 - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

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- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Qualification Data: For waste management coordinator, refrigerant recovery technician, and _____.
- H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- I. Refrigerant Recovery: Comply with requirements in Section 024116 - Structure Demolition, Section 024119 - Selective Demolition, and _____ for refrigerant recovery submittals.
- J. Waste Management Plan: Check the requirements from the governing agency.
- K. Waste Management Report: Check the requirements from the governing agency.

1.08 REFERENCE STANDARDS

- A. 40 CFR 273 - Standards For Universal Waste Management.
- B. EPA - Environmental Protection Agency.

1.09 QUALITY ASSURANCE

- A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent may or may not serve as Waste Management Coordinator.
- B. Refrigerant Recovery Technician Qualifications: Type I, Type II, Type III, or Universal certified by EPA-approved certification program.
- C. Refrigerant Recovery Technician Qualifications: Comply with requirements in Section 024116 - Structure Demolition, Section 024119 - Selective Demolition, and _____.
- D. Regulatory Requirements: Comply with transportation and disposal regulations of Authorities Having Jurisdiction.
- E. Waste Management Conference(s): Conduct conference(s) at Project site to comply with requirements in Section 013100 - Project Management And Coordination. Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.

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3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.10 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements in this Section and Authorities Having Jurisdiction. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. or _____ Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, construction, and _____ waste generated by the Work. Use Form CWM-1 for construction waste, Form CWM-2 for demolition waste, and _____. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste, Form CWM-4 for demolition waste, and _____. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work in compliance with Section 024116 - Structure Demolition, Section 024119 - Selective Demolition, and _____.
 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there were no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:
 1. Total quantity of waste.
 2. Estimated cost of disposal (cost per unit). Include transportation and tipping fees and cost of collection containers and handling for each type of waste.
 3. Total cost of disposal (with no waste management).
 4. Revenue from salvaged materials.
 5. Revenue from recycled materials.
 6. Savings in transportation and tipping fees by donating materials.
 7. Savings in transportation and tipping fees that are avoided.

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8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

PART 2 PRODUCTS

2.01 RECYCLING RECEIVERS AND PROCESSORS

- A. Subject to compliance with requirements, available recycling receivers and processors include, but are not limited to, the following:
 - 1.

2.02 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 50, 75, or _____ percent by weight of total nonhazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials., , including the following:, or _____
 1. Demolition Waste:
 - a. Asphalt paving.
 - b. Concrete.
 - c. Concrete reinforcing steel.
 - d. Brick.
 - e. Concrete masonry units.
 - f. Wood studs.
 - g. Wood joists.
 - h. Plywood and oriented strand board.
 - i. Wood paneling.
 - j. Wood trim.
 - k. Structural and miscellaneous steel.
 - l. Rough hardware.
 - m. Roofing.
 - n. Insulation.
 - o. Doors and frames.
 - p. Door hardware.
 - q. Windows.
 - r. Glazing.
 - s. Metal studs.
 - t. Gypsum board.
 - u. Acoustical tile and panels.
 - v. Carpet.
 - w. Carpet pad.
 - x. Demountable partitions.
 - y. Equipment.
 - z. Cabinets.
 - aa. Plumbing fixtures.
 - bb. Piping.
 - cc. Supports and hangers.
 - dd. Valves.

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- ee. Sprinklers.
- ff. Mechanical equipment.
- gg. Refrigerants.
- hh. Electrical conduit.
- ii. Copper wiring.
- jj. Lighting fixtures.
- kk. Lamps.
- ll. Ballasts.
- mm. Electrical devices.
- nn. Switchgear and panelboards.
- oo. Transformers.
- pp. .
- 2. Construction Waste:
 - a. Masonry and CMU.
 - b. Lumber.
 - c. Wood sheet materials.
 - d. Wood trim.
 - e. Metals.
 - f. Roofing.
 - g. Insulation.
 - h. Carpet and pad.
 - i. Gypsum board.
 - j. Piping.
 - k. Electrical conduit.
 - l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Wood pallets.
 - 8) Plastic pails.
 - m. Construction Office Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials:
 - 1) Paper.
 - 2) Aluminum cans.
 - 3) Glass containers.

PART 3 EXECUTION

3.01 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

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1. Comply with operation, termination, and removal requirements in Section 015000 - Temporary Facilities and Controls.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project. or _____
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 1. Distribute waste management plan to everyone concerned within three or _____ days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
 2. Comply with Section 015000 - Temporary Facilities and Controls for controlling dust and dirt, environmental protection, and noise control.
- E. Waste Management in Historic Zones or Areas: Transportation equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, by 12 inches (300 mm) or more.

3.02 SALVAGING DEMOLITION WASTE

- A. Comply with requirements in Section 024116 - Structure Demolition, Section 024119 - Selective Demolition, and Section 024296 - Historic Removal and Dismantling for salvaging demolition waste.
- B. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- C. Salvaged Items for Sale and Donation: Permitted or Not permitted on Project site.
- D. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
 1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area on-site, off-site, or designated by Owner.
 5. Protect items from damage during transport and storage.

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- E. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.
- F. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- G. Plumbing Fixtures: Separate by type and size.
- H. Lighting Fixtures: Separate lamps by type and protect from breakage.
- I. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.03 RECYCLING DEMOLITION, CONSTRUCTION, AND _____ WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner, accrue to Contractor, be shared equally by Owner and Contractor, or _____.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.04 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Grind asphalt to maximum 1-1/2 inch (38 mm), 4 inch (100 mm), or _____ size.
 - 1. Crush asphaltic concrete paving and screen to comply with requirements in Section 312000 - Earth Moving for use as general fill.
- B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

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1. Pulverize concrete to maximum 1-1/2 inch (38 mm), 4 inch (100 mm), or _____ size.
 2. Crush concrete and screen to comply with requirements in Section 312000 - Earth Moving for use as satisfactory soil for fill or subbase.
- D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
1. Pulverize masonry to maximum 3/4 inch (19 mm), 1 inch (25 mm), 1-1/2 inch (38 mm), 4 inch (100 mm), or _____ size.
 - a. Crush masonry and screen to comply with requirements in Section 312000 - Earth Moving for use as general fill, satisfactory soil for fill or subbase, or _____.
 - b. Crush masonry and screen to comply with requirements in Section 329300 - Plants for use as mineral mulch.
 2. Clean and stack undamaged, whole masonry units on wood pallets.
- E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- F. Metals: Separate metals by type.
1. Structural Steel: Stack members according to size, type of member, and length.
 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- H. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- J. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.
- K. Carpet and pad or _____: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
1. Store clean, dry carpet and pad or _____ in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- L. Carpet Tile: Remove debris, trash, and adhesive.
1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- M. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.
- N. Conduit: Reduce conduit to straight lengths and store by material and size.
- O. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.05 RECYCLING CONSTRUCTION WASTE

- A. Packaging:

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1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 2. Polystyrene Packaging: Separate and bag materials.
 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
 - a. Comply with requirements in Section 329300 - Plants for use of clean sawdust as organic mulch.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
 - a. Comply with requirements in Section 329300 - Plants for use of clean ground gypsum board as inorganic soil amendment.
- D. Paint: Seal containers and store by type.

3.06 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged or recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to Authorities Having Jurisdiction.
1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner's property.
- C. Burning: Do not burn waste materials.

3.07 ATTACHMENTS

- A. Form CWM-1 for construction waste identification.
- B. Form CWM-2 for demolition waste identification.
- C. Form CWM-3 for construction waste reduction work plan.
- D. Form CWM-4 for demolition waste reduction work plan.
- E. Form CWM-5 for cost/revenue analysis of construction waste reduction work plan.
- F. Form CWM-6 for cost/revenue analysis of demolition waste reduction work plan.

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G. Form CWM-7 for construction waste reduction progress report.

H. Form CWM-8 for demolition waste reduction progress report.

END OF SECTION 017419

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CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
FORM CWM-1

FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION							
MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED* (A)	EST. WASTE - % (B)	TOTAL EST. QUANTITY OF WASTE* (C = A x B)	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Packaging: Cardboard							
Packaging: Boxes							
Packaging: Plastic Sheet or Film							
Packaging: Polystyrene							
Packaging: Pallets or Skids							
Packaging: Crates							
Packaging: Paint Cans							
Packaging: Plastic Pails							
Site-Clearing Waste							
Masonry or CMU							
Lumber: Cut-Offs							
Lumber: Warped Pieces							
Plywood or OSB (scraps)							
Wood Forms							
Wood Waste Chutes							
Wood Trim (cut-offs)							
Metals							
Insulation							
Roofing							
Joint Sealant Tubes							
Gypsum Board (scraps)							
Carpet and Pad (scraps)							
Piping							
Electrical Conduit							
Other:							

* Insert units of measure.

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FORM CWM-2: DEMOLITION WASTE IDENTIFICATION

MATERIAL DESCRIPTION	EST. QUANTITY	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
Asphaltic Concrete Paving				
Concrete				
Brick				
CMU				
Lumber				
Plywood and OSB				
Wood Paneling				
Wood Trim				
Miscellaneous Metals				
Structural Steel				
Rough Hardware				
Insulation				
Roofing				
Doors and Frames				
Door Hardware				
Windows				
Glazing				
Acoustical Tile				
Carpet				
Carpet Pad				
Demountable Partitions				
Equipment				
Cabinets				
Plumbing Fixtures				
Piping				
Piping Supports and Hangers				
Valves				
Sprinklers				
Mechanical Equipment				
Electrical Conduit				
Copper Wiring				
Light Fixtures				
Lamps				
Lighting Ballasts				
Electrical Devices				
Switchgear and Panelboards				
Transformers				
Other:				

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FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN

MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Packaging: Cardboard						
Packaging: Boxes						
Packaging: Plastic Sheet or Film						
Packaging: Polystyrene						
Packaging: Pallets or Skids						
Packaging: Crates						
Packaging: Paint Cans						
Packaging: Plastic Pails						
Site-Clearing Waste						
Masonry or CMU						
Lumber: Cut-Offs						
Lumber: Warped Pieces						
Plywood or OSB (scraps)						
Wood Forms						
Wood Waste Chutes						
Wood Trim (cut-offs)						
Metals						
Insulation						
Roofing						
Joint Sealant Tubes						
Gypsum Board (scraps)						
Carpet and Pad (scraps)						
Piping						
Electrical Conduit						
Other:						

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FORM CWM-4: DEMOLITION WASTE REDUCTION WORK PLAN

MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (TONNES)	DISPOSAL METHOD AND QUANTITY			HANDLING AND TRANSPORTION PROCEDURES
			EST. AMOUNT SALVAGED TONS (TONNES)	EST. AMOUNT RECYCLED TONS (TONNES)	EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES)	
Asphaltic Concrete Paving						
Concrete						
Brick						
CMU						
Lumber						
Plywood and OSB						
Wood Paneling						
Wood Trim						
Miscellaneous Metals						
Structural Steel						
Rough Hardware						
Insulation						
Roofing						
Doors and Frames						
Door Hardware						
Windows						
Glazing						
Acoustical Tile						
Carpet						
Carpet Pad						
Demountable Partitions						
Equipment						
Cabinets						
Plumbing Fixtures						
Piping						
Supports and Hangers						
Valves						
Sprinklers						
Mechanical Equipment						
Electrical Conduit						
Copper Wiring						
Light Fixtures						
Lamps						
Lighting Ballasts						
Electrical Devices						
Switchgear and Panelboards						
Transformers						
Other:						

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FORM CWM-8: DEMOLITION WASTE REDUCTION PROGRESS REPORT

MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE TONS (TONNES) (A)	QUANTITY OF WASTE SALVAGED		QUANTITY OF WASTE RECYCLED		TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C)	TOTAL QUANTITY OF WASTE RECOVERED % (D / A x 100)
			ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (B)	ESTIMATED TONS (TONNES)	ACTUAL TONS (TONNES) (C)		
Asphaltic Concrete Paving								
Concrete								
Brick								
CMU								
Lumber								
Plywood and OSB								
Wood Paneling								
Wood Trim								
Miscellaneous Metals								
Structural Steel								
Rough Hardware								
Insulation								
Roofing								
Doors and Frames								
Door Hardware								
Windows								
Glazing								
Acoustical Tile								
Carpet								
Carpet Pad								
Demountable Partitions								
Equipment								
Cabinets								
Plumbing Fixtures								
Piping								
Supports and Hangers								
Valves								
Sprinklers								
Mechanical Equipment								
Electrical Conduit								
Copper Wiring								
Light Fixtures								
Lamps								
Lighting Ballasts								
Electrical Devices								
Switchgear and Panelboards								
Transformers								
Other:								

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SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Sections:
 - 1. Section 012900 - Payment Procedures for requirements for Applications for Payment for Substantial Completion and Final Completion.
 - 2. Section 013233 - Photographic Documentation for submitting Final Completion construction photographic documentation.
 - 3. Section 015000 - Temporary Facilities and Controls
 - 4. Section 017300 - Execution
 - 5. Section 017419 - Construction Waste Management and Disposal
 - 6. Section 017823 - Operation And Maintenance Data for additional operation and maintenance manual requirements.
 - 7. Section 017839 - Project Record Documents 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 8. Section 017900 - Demonstration and Training for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.
 - 9. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.03 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.04 REFERENCE STANDARDS

- A. Green Seal's GS-37 - Green Seal GS-37 - STANDARD FOR CLEANING PRODUCTS FOR INDUSTRIAL AND INSTITUTIONAL USE.
- B. NADCA ACR - The NADCA Standard for Assessment, Cleaning, and Restoration of HVAC System.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.

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- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.06 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From Authorities Having Jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

1.07 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.08 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 or _____ days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from Authorities Having Jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect, Construction Manager, or _____. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's, Construction Manager's, Owner's, or _____ signature for receipt of submittals.
 - 5. Submit testing, adjusting, and balancing records.
 - 6. Submit sustainable design submittals not previously submitted.
 - 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 or _____ days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

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1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 2. Advise Owner of pending insurance changeover requirements.
 3. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 4. Complete startup and testing of systems and equipment.
 5. Perform preventive maintenance on equipment used prior to Substantial Completion.
 6. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 - Demonstration and Training.
 7. Advise Owner of changeover in utility services.
 8. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 10. Complete final cleaning requirements.
 11. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
 12. Consent of surety to final payment.
 13. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 or _____ days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager and _____ will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.09 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment in accordance with Section 012900 - Payment Procedures.
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
 5. Submit Final Completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for

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Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.10 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first, proceeding from lowest floor to highest floor, and _____, listed by room or space number.
 2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect and Construction Manager and _____.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:
 - a. MS Excel Electronic File: Architect, through Construction Manager, and _____ will return annotated file.
 - b. PDF Electronic File: Architect, through Construction Manager, and _____ will return annotated file.
 - c. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).
 - d. Three or _____ Paper Copies: Architect, through Construction Manager, and _____ will return two or _____ copies.

1.11 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 or _____ days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
1. Submit on digital media acceptable to Architect, by uploading to web-based project software site, by email to Architect, or _____.
- E. Warranties in Paper Form:

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1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.01 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.
1. Use cleaning products that comply with Green Seal's GS-37, or if Green Seal's GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 EXECUTION

3.01 FINAL CLEANING

- A. General: Perform 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 before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site 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 not planted, mulched, or paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. 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.
 - g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
 - i. Vacuum and mop concrete.

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- j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - l. Remove labels that are not permanent.
 - m. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. 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.
 - n. Wipe surfaces of mechanical and electrical equipment elevator equipment, and _____ and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - o. Replace parts subject to unusual operating conditions.
 - p. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - q. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - r. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection or _____.
 - 1) Clean HVAC system in compliance with NADCA ACR, Section 230130.52 Existing HVAC Air-Distribution System Cleaning. Provide written report on completion of cleaning.
 - s. Clean luminaires, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - t. Clean strainers.
 - u. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 - Temporary Facilities and Controls. Prepare written report.
- D. 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.
- E. Construction Waste Disposal: Comply with waste-disposal requirements in Section 015000 - Temporary Facilities and Controls, Section 017419 - Construction Waste Management and Disposal, and _____.

3.02 REPAIR OF THE WORK

- A. Complete repair and restoration operations required by Section 017300 - Execution before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.
- B. Related Sections:
 - 1. Section 013300 - Submittal Procedures for submitting copies of submittals for operation and maintenance manuals.
 - 2. Section 019113 - General Commissioning Requirements for verification and compilation of data into operation and maintenance manuals.
 - 3. Section 017700 - Closeout Procedures for submitting operation and maintenance manuals.
 - 4. Section 017839 - Project Record Documents for preparing Record Drawings for operation and maintenance manuals.
 - 5. Divisions 2 through 49 Sections for specific operation and maintenance manual requirements for products in those Sections.

1.03 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.04 REFERENCE STANDARDS

- A. ASHRAE Guideline 4 - Preparation of Operations and Maintenance Documentation for HVAC&R Systems.

1.05 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect and Commissioning Authority and _____ will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

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- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit on digital media acceptable to Architect, by uploading to web-based project software site, by email to Architect, or _____. Enable reviewer comments on draft submittals.
 - 2. Submit three or _____ paper copies. Architect, through Construction Manager, will return two or _____ copies.
- C. Initial Manual Submittal: Submit one draft hardcopy, electronic draft copy, or _____ of each manual at least 30 or _____ days prior to requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect and Commissioning Authority and _____ will return one hardcopy, electronic copy, or _____ of draft and comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit one draft hardcopy, electronic draft copy, or _____ of each manual in final form prior to requesting inspection for Substantial Completion and at least 15 or _____ days before commencing demonstration and training. Architect and Commissioning Authority and _____ will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit three hardcopies, electronic copy, or _____ of each corrected manual within 15 or _____ days of receipt of Architect's and Commissioning Authority's and _____ comments and prior to commencing demonstration and training.
- E. Comply with Section 017700 - Closeout Procedures for schedule for submitting operation and maintenance documentation.

1.06 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

1.07 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf, post-type, or _____ binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

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- a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and or _____ subject matter of contents, and indicate Specification Section number on bottom of spine or _____. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
 4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.08 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 1. Title page.
 2. Table of contents.
 3. Manual contents.
- B. Title Page: Include the following information:
 1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Construction Manager.
 7. Name and contact information for Architect.
 8. Name and contact information for Commissioning Authority.
 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

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- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.09 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
 - 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
 - 2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
 - 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.10 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.
 - 3. Gas leak.
 - 4. Water leak.
 - 5. Power failure.
 - 6. Water outage.
 - 7. System, subsystem, or equipment failure.
 - 8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.

4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.11 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.
 9. Complete nomenclature and number of replacement parts.
- D. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures, including economy and efficiency adjustments.
 10. Effective energy utilization.

- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

1.12 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.
- C. Source Information: List each system, subsystem, and piece of equipment included in the manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide, including noise and vibration adjustments.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.

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- F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.
- J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of maintenance manuals.

1.13 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.

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4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.

1.03 RELATED REQUIREMENTS:

- A. Section 011200 - Multiple Contract Summary for coordinating Project Record Documents covering the Work of multiple contracts.
- B. Section 013300 - Submittal Procedures for requirements of data files.
- C. Section 017300 - Execution for final property survey.
- D. Section 017700 - Closeout Procedures for general closeout procedures.
- E. Section 017823 - Operation And Maintenance Data for operation and maintenance manual requirements.
- F. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of products in those Sections.

1.04 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one or _____ set(s) of marked-up record prints.
 - 2. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints and one or _____ set(s) of file prints.
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Print each drawing, whether or not changes and additional information were recorded.
 - c. Final Submittal:
 - 1) Submit one or _____ paper-copy set(s) of marked-up record prints.

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- 2) Submit Record Digital Data Files and three or _____ set(s) of Record Digital Data File plots.
 - 3) Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files, two paper copies, and _____ of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories, two paper copies, and _____ of each submittal.
1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories, two paper copies, and _____ of each submittal.
- E. Reports: Submit written report weekly or _____ indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.05 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
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 provide information for preparation of corresponding 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 acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
 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. Depths of foundations.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.

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3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 4. Mark record prints 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. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Same digital data software program, version, and operating system as for the original Contract Drawings.
 2. Format: DWG, DXF, RVT, and _____, Current Version, Microsoft Windows operating system.
 3. Format: Annotated PDF electronic file with comment function enabled.
 4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 5. Refer instances of uncertainty to Architect through Construction Manager for resolution.
 6. Architect will furnish C one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 013300 - Submittal Procedures for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- C. 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. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect and Construction Manager.
 - e. Name of Contractor.

1.06 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.

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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, Record Product Data, and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file, paper copy, and scanned PDF electronic file(s) of marked-up copy of Specifications.

1.07 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes.
- B. 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 Drawings, Record Specifications, and Product Data.
- C. Format: Submit Record Product Data as annotated PDF electronic file, paper copy, and scanned PDF electronic file(s) of marked-up copy of Product Data.
1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.08 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.
- B. Format: Submit miscellaneous record submittals as PDF electronic file, paper copy, and scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.09 MAINTENANCE OF RECORD DOCUMENTS

- 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 Construction Manager's reference during normal working hours.

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PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

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SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 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.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.
 - 2. Demonstration and training video recordings.
- B. Allowances: Furnish demonstration and training instruction time under the demonstration and training allowance as specified in Section 012100 - Allowances.
- C. Unit Price for Instruction Time: Length of instruction time will be measured by actual time spent performing demonstration and training in required location. No payment will be made for time spent assembling educational materials, setting up, or cleaning up. See requirements in Section 012200 - Unit Prices.

1.03 RELATED REQUIREMENTS

- A. Section 014000 - Quality Requirements
- B. Section 012100 - Allowances
- C. Section 012200 - Unit Prices
- D. Division 01 Section 013100 - Project Management And Coordination for requirements for pre-installation conferences.
- E. Section 017823 - Operation And Maintenance Data

1.04 REFERENCE STANDARDS

1.05 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit two copies of or _____ outline of instructional program for demonstration and training, including a list of training modules and 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. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module
 - 2. At completion of training, submit one complete training manual for Owner's use.
- B. Qualification Data: For facilitator, instructor, and videographer.

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1. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
1. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.06 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two or _____ copies within seven or _____ days of end of each training module.
1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of videographer.
 - c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Date of video recording.
 2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
 3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
 4. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper, PDF file, and _____ format required for operation and maintenance manuals specified in Section 017823 - Operation And Maintenance Data.

1.07 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. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 - Quality Requirements, experienced in operation and maintenance procedures and training.
- C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
- D. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 - Project Management And Coordination. 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.

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4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.08 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- 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 have been reviewed and approved by Architect.

1.09 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- 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 as applicable to the system, equipment, or component:
 1. System, subsystem, and equipment descriptions.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Regulatory requirements.
 5. Equipment function.
 6. Operating characteristics.
 7. Limiting conditions.
 8. Performance curves.
- C. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 1. System, subsystem, and equipment descriptions.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Regulatory requirements.
 5. Equipment function.
 6. Operating characteristics.
 7. Limiting conditions.
 8. Performance curves.
- D. Documentation: Review the following items in detail:
 1. Emergency manuals.
 2. Systems and equipment operation manuals.
 3. Systems and equipment maintenance manuals.
 4. Product maintenance manuals.
 5. Project Record Documents.
 6. Identification systems.
 7. Warranties and bonds.
 8. Maintenance service agreements and similar continuing commitments.
- E. Emergencies: Include the following, as applicable:
 1. Instructions on meaning of warnings, trouble indications, and error messages.
 2. Instructions on stopping.
 3. Shutdown instructions for each type of emergency.
 4. Operating instructions for conditions outside of normal operating limits.
 5. Sequences for electric or electronic systems.

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6. Special operating instructions and procedures.
- F. Operations: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Control sequences.
 6. Safety procedures.
 7. Instructions on stopping.
 8. Normal shutdown instructions.
 9. Operating procedures for emergencies.
 10. Operating procedures for system, subsystem, or equipment failure.
 11. Seasonal and weekend operating instructions.
 12. Required sequences for electric or electronic systems.
 13. Special operating instructions and procedures.
- G. Adjustments: Include the following:
1. Alignments.
 2. Checking adjustments.
 3. Noise and vibration adjustments.
 4. Economy and efficiency adjustments.
- H. Troubleshooting: Include the following:
1. Diagnostic instructions.
 2. Test and inspection procedures.
- I. Maintenance: Include the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Procedures for routine cleaning.
 5. Procedures for preventive maintenance.
 6. Procedures for routine maintenance.
 7. Instruction on use of special tools.
- J. Repairs: Include the following:
1. Diagnosis instructions.
 2. Repair instructions.
 3. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 4. Instructions for identifying parts and components.
 5. Review of spare parts needed for operation and maintenance.

1.10 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 - Operation And Maintenance Data.
- B. Set up instructional equipment at instruction location.

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1.11 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and OwnerO 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. Architect 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 Owner, through Architect or Construction Manager with at least seven or _____ days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-pla

- ce. Conduct training using final operation and maintenance data submittals.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, a written, or a demonstration performance-based test.
- F. Cleanup: Collect used and leftover educational materials and remove from Project site or give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.12 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 or _____ megapixels and capable of recording in full HD mode with vibration reduction technology.
 - 1. Submit video recordings on CD-ROM or thumb drive or by uploading to web-based Project software site.
 - 2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.
 - 3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.
 - 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:
 - a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. Email address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
 - 1. Film training session(s) in segments not to exceed 15 minutes.
 - a. Produce segments to present a single significant piece of equipment per segment.
 - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
 - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

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- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
 - 1. Furnish additional portable lighting as required.
- E. Narration: Describe scenes on video recording by audio narration by microphone while or dubbing audio narration off-site after video recording is recorded. Include description of items being viewed.
- F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
- G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 017900

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SECTION 018119 - CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT-TEST

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 CONSTRUCTION IAQ MANAGEMENT GOALS FOR THE PROJECT

- A. The Owner has established that this Project shall minimize the detrimental impacts on Indoor Air Quality (IAQ) resulting from construction activities. Factors that contaminate indoor air, such as dust entering HVAC systems and ductwork, improper storage of materials on-site, poor housekeeping, shall be minimized.

1.03 SUMMARY

- A. Section includes requirements for the development of a Construction Indoor Air Quality Management Plan (alternately referred to as "the Plan").
 - 1. Develop the Plan for approval by the Owner and Architect.
 - 2. The Plan shall be implemented throughout the duration of the project construction.
 - 3. The Plan shall be documented as outlined in the Submittal Requirements of Paragraph 1.7 below.
 - 4. The Plan is included as part of the SUSTAINABLE BUILDING REQUIREMENTS for the project.

1.04 RELATED REQUIREMENTS

- A. All sections of the Specifications related to interior construction, MEP systems, and items affecting indoor air quality.
- B. Division 01 Section 016116 - Volatile Organic (VOC) Limits For Adhesives, Sealants, Paints And Coatings.
- C. Division 09 Section 099123 - Interior Painting.

1.05 DEFINITIONS

- A. Volatile Organic Compounds (VOC's):
 - 1. Chemical compounds common in and emitted by many building products, including solvents in paints, coatings, adhesives and sealants, wood preservatives; composite wood binder, and foam insulations.
 - 2. Not all VOC's are harmful, but many of those contained within building products contribute to the formation of smog and irritate (at best) building occupants by their smell and/or health impact.
 - 3. Materials that act as "sinks" for VOC contamination: Absorptive materials, typically dry and soft (such as textiles, carpeting, acoustical ceiling tiles and gypsum board) that readily absorb VOC's emitted by "source" materials and release them over a prolonged period of time.
 - 4. Materials that act as "sources" for VOC contamination: Products with high VOC contents that emit VOC's either rapidly during application and curing (typically "wet" products,

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such as paints, sealants, adhesives, caulks and sealers) or over a prolonged period (typically “dry” products such flooring coverings with plasticizers and engineered wood with formaldehyde).

1.06 REFERENCE STANDARDS

- A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- B. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction.

1.07 SUSTAINABLE BUILDING PERFORMANCE GENERAL REQUIREMENTS

- A. Implement practices and procedures to meet the project’s environmental performance goals. Specific project goals that may impact this area of work include:
 - 1. Use of recycled-content materials.
 - 2. Use of locally-manufactured materials.
 - 3. Use of low-emitting materials.
 - 4. Use of certified wood products.
 - 5. Construction waste recycling.
 - 6. The implementation of a construction indoor air quality management plan.
- B. Ensure that the requirements related to these goals, as defined in the sections below, are implemented to the fullest extent. Substitutions, or other changes to the work shall not be allowed if such changes substantially compromise the stated SUSTAINABLE BUILDING PERFORMANCE Criteria.

1.08 CONSTRUCTION IAQ MANAGEMENT PLAN

- A. Prepare and submit a Construction IAQ Management Plan to the Owner for approval. The Construction IAQ Management Plan shall meet the following criteria:
 - 1. Construction activities shall be planned to meet or exceed the minimum requirements of the SMACNA (OCC).
 - 2. Absorptive materials shall be protected from moisture damage when stored on-site and after installation.
 - 3. If air handlers are to be used during construction, filtration with a Minimum Efficiency Reporting Value (MERV) of 8 must be at each return air grill, as determined byASHRAE Std 52.2.
 - 4. Filtration media shall be replaced immediately prior to occupancy. Filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 13 as determined by ASHRAE Std 52.2.
 - 5. A “Sequence of Finish Installation Plan” shall be developed, highlighting measures to reduce the absorption of VOCs by materials that act as “sinks”.
 - 6. Upon approval of the Plan by the Owner and Architect, it shall be implemented through the duration of the construction process, and documented in accordance with the Submittal Requirements of Article1.09, 1.9, or _____ below.
- B. Further description of the Construction IAQ Management Plan requirements is as follows:
 - 1. SMACNA (OCC) Guidelines: Chapter 3 of the referenced “IAQ Guidelines for Occupied Buildings Under Construction”, outline IAQ measures in five categories as listed below. The Construction IAQ Management Plan shall be organized in accordance with the SMACNA (OCC) format, and shall address measures to be implemented in each of the

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five categories (including subsections). All subsections shall be listed in the Plan; items that are not applicable for this project should be listed as such.

- a. HVAC Protection:
 - 1) Return Side.
 - 2) Central Filtration.
 - 3) Supply Side.
 - 4) Duct Cleaning.
 - b. Source Control:
 - 1) Product Substitution.
 - 2) Modifying Equipment Operation.
 - 3) Changing Work Practices.
 - 4) Local Exhaust.
 - 5) Air Cleaning.
 - 6) Cover or Seal.
 - c. Pathway Interruption:
 - 1) Depressurize Work Area.
 - 2) Pressurize Occupied Space.
 - 3) Erect Barriers to Contain Construction Areas.
 - 4) Relocate Pollutant Sources.
 - 5) Temporarily Seal the Building.
 - d. Housekeeping.
 - e. Scheduling.
2. Protection of Materials from Moisture Damage: As part of the “Housekeeping” section of the Construction IAQ Management Plan, measures to prevent installed materials or material stored on-site from moisture damage shall be described. This section should also describe measures to be taken if moisture damage does occur to absorptive materials during the course of construction.
 3. Replacement of Filtration Media: Under the “HVAC Protection” section of the Construction IAQ Management Plan, a description of the filtration media in all ventilation equipment shall be provided. The description shall include replacement criteria for filtration media during construction, and confirmation of filtration media replacement for all equipment immediately prior to occupancy.
 4. Sequence of Finish Installation for Materials: Where feasible, absorptive materials shall be installed after the installation of materials or finishes which have high short-term emissions of VOC’s, formaldehyde, particulates, or other air-borne compounds.
 - a. Absorptive materials include, but are not limited to:
 - 1) Carpets.
 - 2) Acoustical Ceiling panels.
 - 3) Fabric wall coverings.
 - 4) Insulations (exposed to the airstream).
 - 5) Upholstered furnishings.
 - 6) Other woven, fibrous or porous materials.
 - b. Materials with high short-term emissions include, but are not limited to:
 - 1) Adhesives.
 - 2) Sealants and glazing compounds (specifically those with petrochemical vehicles or carriers).
 - 3) Paints.
 - 4) Wood preservatives and finishes.
 - 5) Control and/or expansion joint fillers.
 - 6) Hard finishes requiring adhesive installation.

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- 7) Gypsum board (with associated finish processes and products)
- 8) Composite or engineered wood products with formaldehyde binders.
5. Develop a separate sequencing plan that identifies feasible opportunities to meet the above-stated goals for the project. The plan shall be submitted to the Architect and Owner in accordance with the Submittal Requirements of this specification.
6. Implementation and Coordination: Implement the Construction IAQ Management Plan, and coordinate the Plan with all affected trades. Designate one individual as the Construction IAQ Representative, who will be responsible for communicating the progress of the Plan with the Owner and Architect on a regular basis, and for assembling the required documentation. Include provisions in the Construction IAQ Management Plan for addressing conditions in the field that do not adhere to the Plan, including provisions to implement a stop work order, or to rectify non-compliant conditions.

1.09 SUBMITTALS

- A. Submit the following Sustainable Building Performance required records and documents:
 1. A copy of the Construction IAQ Management Plan as defined in this specification.
 2. Product cut-sheets for all filtration media used during construction and installed immediately prior to occupancy, with MERV values highlighted. Cut sheets shall be submitted with the Contractor's or Subcontractor's 'approved' stamp as confirmation that the products are the products installed on the project.
 3. Provide the Architect or Owner's Representative with a minimum of 18 photographs comprising of at least six photographs taken on three different occasions during construction. The photographs shall document the implementation of the Construction IAQ Management Plan throughout the course of the project construction. Examples include photographs of ductwork sealing and protection, temporary ventilation measures, and conditions of on-site materials storage (to prevent moisture damage). Photographs shall be submitted with brief descriptions of the Construction IAQ Management Plan measure documented, or be referenced to project meeting minutes or similar project documents which reference to the Construction IAQ Management Plan measure documented.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 018119

SECTION 024100 - DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of building elements for alteration purposes.
- B. Removal and salvage of existing items for delivery to Owner and removal of existing items for reinstallation.

1.02 RELATED REQUIREMENTS

- A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 016000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- D. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- E. Section 017419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- F. Division 31 Sections: Vegetation and existing debris removal; earth stripping and stockpiling, rough and fine grading, and filling holes and excavations.
- G. Section 312200 - Grading: Rough and fine grading.

1.03 DEFINITIONS

- A. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.
- C. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.
- D. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

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- F. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- G. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- H. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- I. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- J. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- K. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- L. Retain: To keep an element or detail secure and intact.
- M. Strip: To remove existing finish down to base material unless otherwise indicated.

1.04 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.05 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.06 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Site Plan: Indicate:
 - 1. Vegetation to be protected.
 - 2. Areas for temporary construction and field offices.
 - 3. Areas for temporary and permanent placement of removed materials.
- C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
 - 1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
 - 2. Demolition firm qualifications.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.07 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.
 - 1. Minimum of 5 years of documented experience.

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- B. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.
 - 6. Review and finalize protection requirements.
 - 7. Review procedures for noise control.
 - 8. Review storage, protection, and accounting for items to be removed for salvage or reinstallation.

- C. Refrigerant Recovery Technician Qualifications: Type I certified by an EPA-approved certification program.

1.08 FIELD CONDITIONS

- A. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with demolition work.

- B. Size Limitations in Existing Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within existing spaces, areas, rooms, and openings, including temporary protection, by 12 inches (300 mm) or more.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

- C. Perform an engineering survey of 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 building demolition operations.

3.02 PREPARATION

- A. Temporary Shoring: Design, 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.

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- B. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- C. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment in accordance with 40 CFR 82 and regulations of authorities having jurisdiction.

3.03 DEMOLITION

- A. Remove portions of existing building as indicated on Drawings.
- B. Remove paving and curbs required to accomplish new work.
- C. Break up paving as indicated on drawings to permit natural moisture drainage; leave pieces not larger than 1 square yard (1 square meter).
- D. Within area of new construction, remove foundation walls and footings to minimum 2 feet (600 mm) below finished grade.
- E. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
 - 1. Remove concrete slabs on grade as indicated on drawings.
- F. Remove fences and gates as indicated on drawings.
- G. Remove other items indicated, for salvage, relocation, and recycling.
- H. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.04 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 4. Provide, erect, and maintain temporary barriers and security devices.
 - 5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 7. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 - 8. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
 - 9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

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10. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
 - a. Do not proceed with the work in question until directed by Architect.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Do not begin removal until built elements to be salvaged or relocated have been removed.
- D. Do not begin removal until vegetation to be relocated has been removed and vegetation to remain has been protected from damage.
- E. Protect existing structures and other elements to remain in place and not removed.
 1. Provide bracing and shoring.
 2. Prevent movement or settlement of adjacent structures.
 3. Stop work immediately if adjacent structures appear to be in danger.
- F. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. Perform demolition in a manner that maximizes salvage and recycling of materials.
 1. Comply with requirements of Section 017419 - Construction Waste Management and Disposal.
 2. Dismantle existing construction and separate materials.
 3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.
- H. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.05 EXISTING UTILITIES

- A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Unused underground piping may be abandoned in place, provided it is completely drained and capped; remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

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- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

3.06 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
 - 1. Verify construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
 - 4. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.

- B. Separate areas in which demolition is being conducted from areas that remain occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 in locations indicated on drawings.
 - 2. Provide sound retardant partitions of construction and in locations indicated on drawings.

- C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.

- D. Remove existing work as indicated and required to accomplish new work.
 - 1. Remove items indicated on drawings.
 - 2. Resilient Floor Coverings: Remove floor coverings and adhesive in accordance with recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

- E. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
 - 1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
 - 2. 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.
 - 3. See Section 011000 - Summary for limitations on outages and required notifications.
 - 4. Verify that abandoned services serve only abandoned facilities before removal.
 - 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.

- F. Salvaged Materials:
 - 1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
 - 2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area on-site.
 - 5. Protect items from damage during transport and storage.
 - 6. If required by Owner, reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide

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connections, supports, and miscellaneous materials to make items functional for use indicated.

- G. Storage: Catalog items being stored within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
- H. Protect existing work to remain.
 - 1. Prevent movement of structure. Provide shoring and bracing as required.
 - 2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch to match new work.

3.07 DEBRIS AND WASTE REMOVAL

- A. Remove materials not to be reused on site; comply with requirements of Section 017419 - Waste Management and Disposal.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 024100

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SECTION 030100 - MAINTENANCE OF CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cleaning of existing concrete surfaces.
- B. Sealing interior concrete slabs where no floor finish is scheduled.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints, And Coatings for additional requirements.
- B. Section 017419 - Construction Waste Management and Disposal; Requirements for recycling packaging and material waste.
- C. Section 018113.71 for additional requirements.
- D. Section 033000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.03 REFERENCE STANDARDS

- A. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.04 SUBMITTALS

- A. Refer to Section 013300 - Submittal Procedures for submittal procedures.
- B. Refer to Section 017419 - Construction Waste Management and Disposal for additional submittal requirements.
- C. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.
- D. Manufacturer's instructions.
- E. Installer's qualification statement.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Cleaner Qualifications: Company specializing in, and with minimum of five of experience in, the type of cleaning specified.

- C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum of five of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturers' instructions for storage, shelf life limitations, and handling of products.

PART 2 PRODUCTS

2.01 CLEANING MATERIALS

- A. Detergent: Non-ionic detergent.

2.02 ACCESSORIES

- A. Water: Clean and potable.
- B. Sealer (**CONC-S1**): A penetrating sealer, densifier, and hardener for exposed concrete; VOC content 100 g/L or less.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. PROSOCO; Consolideck LS/CS.
 - b. Substitutions: See Section 016000-Product Requirements.
- C. MIXES
 - 1. General: Mix products, in clean containers, according to manufacturer's written instructions.
 - a. Do not add water, thinners, or additives unless recommended by manufacturer.
 - b. When practical, use manufacturer's premeasured packages to ensure that materials are mixed in proper proportions. When premeasured packages are not used, measure ingredients using graduated measuring containers; do not estimate quantities or use shovel or trowel as unit of measure.
 - c. Do not mix more materials than can be used within time limits recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

- A. Prepare concrete surfaces to be repaired according to ICRI 310.2R, CSP 3.

3.03 CLEANING EXISTING CONCRETE

- A. Provide enclosures, barricades, and other temporary construction as required to protect adjacent work from damage.

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- B. Clean concrete surfaces of dirt or other contamination using the gentlest method that is effective.
 - 1. Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.
 - 2. Clean out cracks and voids using same methods.

- C. The following are acceptable cleaning methods, in order from gentlest to less gentle:
 - 1. Water washing using low-pressure, maximum of 100 psi, and, if necessary, brushes with natural or synthetic bristles.
 - 2. Increasing the water washing pressure to maximum of 400 psi.
 - 3. Adding detergent to washing water; with final water rinse to remove residual detergent.
 - 4. Steam-generated low-pressure hot-water washing.

- D. Do not use any of the following cleaning methods, unless otherwise indicated:
 - 1. Brushes with wire bristles, grinding with abrasives, solvents, hydrochloric or muriatic acid, sodium hydroxide, caustic soda, or lye.
 - 2. Soap or detergent that is not non-ionic.

3.04 APPLICATION

- A. General: Comply with manufacturer's written instructions and recommendations for application of products, including surface preparation.

- B. Sealer: Apply by brush, roller, or airless spray at manufacturer's recommended application.

- C. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; re-wet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry.

END OF SECTION 030100

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SECTION 032000

CONCRETE REINFORCING

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. Steel reinforcement bars.
2. Welded-wire reinforcement.

B. Related Requirements:

1. Section 033000 "Cast-In-Place Concrete" for reinforcing used in cast in placed concrete.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction contraction and isolation joints.
 - c. Steel-reinforcement installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Epoxy repair coating.
3. Bar supports.
4. Mechanical splice couplers.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.

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2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
- C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
1. Location of construction joints is subject to approval of the Architect and EoR.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For testing and inspection agency.
- B. Material Certificates: For each of the following, signed by manufacturers:
1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."
- C. Material Test Reports: For the following, from a qualified testing agency:
1. Steel Reinforcement
 2. Mechanical splice couplers.
- D. Field quality-control reports.
- E. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. and to avoid damaging coatings on steel reinforcement.
1. Store reinforcement to avoid contact with earth.
 2. Do not allow epoxy-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60 minimum, deformed.
- B. Headed-Steel Reinforcing Bars: ASTM A970/A970M.
- C. Epoxy-Coated Reinforcing Bars:
 - 1. Steel Bars: ASTM A615/A615M, Grade 60 minimum, deformed bars.
 - 2. Epoxy Coating: ASTM A775/A775M or ASTM A934/A934M with less than 2 percent damaged coating in each 12-inch bar length.
- D. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60 minimum, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Epoxy-Coated Joint Dowel Bars: ASTM A615/A615M, Grade 60 minimum, plain-steel bars, ASTM A775/A775M epoxy coated.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
 - b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - c. For dual-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - d. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.
 - e. For stainless steel reinforcement, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
- D. Mechanical Splice Couplers: ACI 318 Type 2, same material of reinforcing bar being spliced; tension-compression type, dowel-bar type, or mechanical-lap type as indicated on Drawings.

- E. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
 - 1. Finish: Galvanized.
- F. Stainless Steel Tie Wire: ASTM A1022/A1022M, not less than 0.0508 inch in diameter.
- G. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A775/A775M.

2.4 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. 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 reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
 - 1. Bars indicated to be continuous, and all vertical bars shall be lapped per structural drawings or as per ACI 318 Class B Tension Lap Splice
 - 2. Stagger splices in accordance with ACI 318.
 - 3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.

- G. Install welded-wire reinforcement in longest practicable lengths.
1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing shall not exceed 12 inches.
 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 4. Lace overlaps with wire.
- H. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating in accordance with ASTM D3963/D3963M.

3.3 JOINTS

- A. 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.
 2. Continue reinforcement across construction joints unless otherwise indicated.
 3. Do not continue reinforcement through sides of strip placements of floors and slabs.
- B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: 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. Steel-reinforcement mechanical splice couplers.

END OF SECTION 032000

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SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
2. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.
3. Section 321313 "Concrete Paving" for concrete pavement and walks.

DEFINITIONS

- C. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- D. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. 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 concrete finish Subcontractor.
2. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.

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- b. Construction joints, control joints, isolation joints, and joint-filler strips.
- c. Semirigid joint fillers.
- d. Vapor-retarder installation.
- e. Anchor rod and anchorage device installation tolerances.
- f. Horizontal Tolerances at slab edges sensitive to ACI 117 requirements (E.G. bearing walls at perimeter of building, sensitive façades, columns/walls at perimeter of building)
- g. Cold and hot weather concreting procedures.
- h. Mass concreting procedures
- i. Concrete finishes and finishing.
- j. Curing procedures.
- k. Forms and form-removal limitations.
- l. Shoring and reshoring procedures.
- m. Methods for achieving specified floor and slab flatness and levelness.
- n. Floor and slab flatness and levelness measurements.
- o. Concrete repair procedures.
- p. Concrete protection.
- q. Initial curing and field curing of field test cylinders (ASTM C31)
- r. Protection of field cured field test cylinders.
- s. Supplementary cementitious materials: Review how they may alter the concrete properties associated with the contractors means and methods. Such properties that may be affected includes but are not limited to: workability, set time, air entrainment.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

- 1. Portland cement.
- 2. Fly ash.
- 3. Slag cement.
- 4. Silica fume.
- 5. Aggregates.
- 6. Admixtures:
 - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
- 7. Vapor retarders.
- 8. Liquid floor treatments.
- 9. Curing materials.
 - a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.
- 10. Joint fillers.
- 11. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

- 1. Mixture identification.

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2. Type and source information on concrete materials proposed for use including:
 - a. Cementitious Materials
 - b. Aggregates
 - c. Admixtures
 - d. Water
3. Minimum 28-day compressive strength. (f'_c)
4. Required average compressive strength, f'_{cr} , for each class of concrete.
5. Documentation of strength test records of similar class of concrete used to establish standard deviation in accordance with ACI 301, when test records exist.
6. Documentation of compliance with f'_{cr} of proposed mixture(s) and test age
7. Strength of concrete at other specified ages, or as required for means and methods.
8. Durability exposure class.
9. Maximum w/cm.
10. Calculated equilibrium unit weight, for lightweight concrete.
11. Slump limit.
12. Air content.
13. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
14. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
15. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
16. Intended placement method.
17. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings: Comply with ACI SP-066

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.
2. Include placing drawings that detail fabrication, bending, and placement.
3. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For testing and inspection agency.
- B. Material Certificates: For each of the following, signed by manufacturers:
 1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."
 2. Dual-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."
- C. Material Test Reports: For the following, from a qualified testing agency:
 1. Steel Reinforcement:

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- a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.
 2. Mechanical splice couplers.
- D. Field quality-control reports.
- E. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.
1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.
- B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94 requirements for production facilities and equipment.
1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- D. Field Quality-Control Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
1. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

1.8 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

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1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. 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.
3. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
4. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 90 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Regional Materials: Verify concrete is manufactured within 100 miles of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

B. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

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C. Cementitious Materials:

1. Portland Cement: ASTM C150, Type I/II , gray. Only Type II, Type IV and Type V permitted for mass concrete.
2. Supplemental Cementitious Materials (SCM's):
 - a. Fly Ash: ASTM C618, Class C or F.
 - b. Slag Cement: ASTM C989, Grade 120.
 - c. Blended Hydraulic Cement: ASTM C595, Type IS, portland blast-furnace slag Type IP, portland-pozzolan Type IL, portland-limestone Type IT, ternary blended cement.
 - d. Silica Fume: ASTM C1240 amorphous silica.
 - e. Performance-Based Hydraulic Cement: ASTM C1157: Type GU, general use Type HE, high early strength Type MS, moderate sulfate resistance Type HS, high sulfate resistance Type MH, moderate heat of hydration Type LH, low heat of hydration.

For ASTM C595 exceeding 25% cement replacement, and all ASTM C1157 cements it is required that an engineered mix design be submitted with past performance data for the same mix and for it to be stamped by a qualified Professional Engineer.

D. Normal-Weight Aggregates: ASTM C33, Class 3S 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. Alkali-Silica Reaction: Comply with one of the following:
 - a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
 - b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
 - c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
2. Maximum Coarse-Aggregate Size: See Concrete Mixtures section for size
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Lightweight Aggregate: ASTM C330: See Concrete Mixtures section for size.

F. Air-Entraining Admixture: ASTM C260.

G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do 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 C494, Type A.
2. Retarding Admixture: ASTM C494, Type B.
3. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
4. Plasticizing and Retarding Admixture: ASTM C1017, Type II.

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5. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C494, Type C.

H. Water and Water Used to Make Ice: ASTM C94, potable.

2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.4 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch, or equal product approved by the architect and engineer.

1. Available Products
 - a. Colloid Environmental Technologies Company (CETCO). WATERSTOP-RX

2.5 CURING MATERIALS

- A. Water: Potable or complying with ASTM C1602
- B. Curing Compound
 1. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.
- C. Curing and Sealing Compounds:
 1. Clear, Solvent-Borne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.
 2. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 in accordance with ASTM D2240.
- C. Bonding Agent: ASTM C1059, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

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- D. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:
1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.0217-inch- thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.7 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 C150 portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 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 in accordance with ASTM C109.
- 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 C150 portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 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 in accordance with ASTM C109.

2.8 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type of concrete noted in the general notes, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301. Proportioning of concrete mix shall be performed according to ACI 211.1
1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

- B. Supplemental Cementitious Materials (SCM):
1. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - a. Fly Ash or Other Pozzolans: 25 percent by mass.
 - b. Slag Cement: 50 percent by mass.
 - c. Silica Fume: 10 percent by mass.
 - d. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
 - e. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
 2. If mix designs exceed 25% Portland cement replacement it is required that an engineered mix design be submitted with past performance data for the same mix and for it to be stamped by a qualified Professional Engineer.
 3. SCM's may change workability, cause delayed strength gain, and other properties pertaining to Means and Methods. The contractor shall be responsible for coordinating with the mix designer to limit SCM's within a mix such that the mix can achieve or exceed the required structural properties and the Contractor's Means and Methods.
- C. Admixtures: Use admixtures in accordance with 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 admixture, as required, in pumped concrete, concrete for heavy-use industrial slabs concrete for parking structure slabs, and concrete with a w/cm below 0.50.
 3. Use corrosion-inhibiting admixture in concrete mixtures where indicated on structural drawings.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
1. Daily access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
 4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF 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.
1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
 3. 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.

3.4 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 2. Face laps away from exposed direction of concrete pour.
 3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
 4. Lap joints 6 inches and seal with manufacturer's recommended tape.
 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.5 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

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1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 6. Space vertical joints in walls as indicated on Structural Drawings . Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
 7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: 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 on Drawings.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

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- B. Notify testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Structural Engineer of Record and Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
 - 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 is placed on concrete that has hardened enough to cause seams or planes of weakness.
 - 1. If a section cannot be placed continuously, provide construction joints as indicated.
 - 2. Deposit concrete to avoid segregation.
 - 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. 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. Do not place concrete floors and slabs in a checkerboard sequence.
 - 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 3. Maintain reinforcement in position on chairs during concrete placement.
 - 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 5. Level concrete, cut high areas, and fill low areas.
 - 6. Slope surfaces uniformly to drains where required.
 - 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 - 8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING FORMED SURFACES

- A. As-Cast Surface Finishes: Unless otherwise noted on the Structural or Architectural Drawings, per ACI 301, provide a SF-1.0 for surfaces not exposed to public view and a SF-2.0 for surfaces exposed to public view.
 - 1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.

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- a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
 - b. Remove projections larger than 1 inch.
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 Class D.
 - e. Apply to concrete surfaces not exposed to public view .
2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
 - a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
 - b. Remove projections larger than 1/4 inch.
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 Class B.
 - e. Locations: 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 .
 3. ACI 301 Surface Finish SF-3.0:
 - a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
 - b. Remove projections larger than 1/8 inch.
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 Class A.
 - e. Locations: As noted on Structural or Architectural drawings.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. Comply with finish requirements on Architectural Drawings and Specifications, ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces as indicated on the Architectural drawings.

C. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.

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2. Continue troweling passes and restraighthen until surface is free of trowel marks and uniform in texture and appearance.
 3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 4. Do not add water to concrete surface.
 5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
 6. Apply a trowel finish to surfaces as indicated on the Architectural drawings. .
 7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, see general notes for flatness and levelness requirements.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces as indicated on the Architectural Drawings. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.
1. Coordinate required final finish with Architect before application.
 2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
 2. Coordinate required final finish with Architect before application.

3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

- A. Filling In:
1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
 2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
 3. 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:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases as indicated on Drawings, in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
 3. Minimum Compressive Strength: 4000 psi at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor as indicated on Drawings .
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchorage devices.

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- a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.
 - c. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
1. Cast-in inserts and accessories, as shown on Drawings.
 2. Screed, tamp, and trowel finish concrete surfaces.

3.10 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h before and during finishing operations.
- B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 3. If forms remain during curing period, moist cure after loosening forms.
 4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.
- C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
1. Begin curing immediately after finishing concrete.
 2. Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

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- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 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.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 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.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- c. Floors to Receive Polished Finish: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.

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- d. Floors to Receive Chemical Stain:
 - 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.
 - 2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
 - 3) Butt sides of curing paper tight; do not overlap sides of curing paper.
 - 4) Leave curing paper in place for duration of curing period, but not less than 28 days.
- e. Floors to Receive Urethane Flooring:
 - 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - 2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches and sealed in place.
 - 3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
 - 4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.
- f. Floors to Receive Curing Compound:
 - 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Maintain continuity of coating, and repair damage during curing period.
 - 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
- g. Floors to Receive Curing and Sealing Compound:
 - 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.11 TOLERANCES

- A. Conform to ACI 117, Unless Noted Otherwise
- B. Horizontal tolerances at slab edges shall be decreased to ½” in lieu of 1” at slab edges with wood/light guage bearing walls, brick façade, or where concrete walls/columns are flush with the slab edge.

3.12 APPLICATION OF LIQUID FLOOR TREATMENTS

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

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1. Defer joint filling until concrete has aged at least one month(s).
 2. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.
- D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete:
1. Repair and patch defective areas when approved by Architect.
 2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 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.
 - a. Limit cut depth to 3/4 inch.
 - b. Make edges of cuts perpendicular to concrete surface.
 - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
 - d. Fill and compact with patching mortar before bonding agent has dried.
 - e. 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 matches surrounding color.
 - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces:
1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
 - a. Correct low and high areas.
 - b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that

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- penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
 4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
 - a. Finish repaired areas to blend into adjacent concrete.
 5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
 - a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - b. Feather edges to match adjacent floor elevations.
 6. Correct other low areas scheduled to remain exposed with repair topping.
 - a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
 - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
 - a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
 - b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
 - c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
 - d. Place, compact, and finish to blend with adjacent finished concrete.
 - e. Cure in same manner as adjacent concrete.
 8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
 - a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
 - b. Dampen cleaned concrete surfaces and apply bonding agent.
 - c. Place patching mortar before bonding agent has dried.
 - d. Compact patching mortar and finish to match adjacent concrete.
 - e. 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.

3.15 FIELD QUALITY CONTROL

- A. Special Inspections: Owner shall engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Owner shall engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

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1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
 2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Ambient air temperature.
 - 7) Date and time of concrete placement.
 - 8) Location in Work of concrete represented by samples.
 - 9) Date and time sample was obtained.
 - 10) Truck and batch ticket numbers.
 - 11) Design compressive strength at 28 days.
 - 12) Concrete mixture designation, proportions, and materials.
 - 13) Field test results.
 - 14) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
 - 15) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
1. Headed bolts and studs.
 2. Steel reinforcement
 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.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

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- a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M:
 - a. 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.
 - b. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for structural lightweight concrete.
 - a. 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 C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and laboratory cure six 4-inch by 8-inch cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test the samples at the following intervals:
 - 1) 2 cylinders at 7 days
 - 2) 3 cylinders at 28 days
 - a) If any of the first two tested cylinders are below the specified 28 day f'c, hold the remaining cylinders for 56 day testing
 - 3) 1 additional cylinder to be tested at contractors discretion based on desired construction sequencing (i.e. 3 or 14 day breaks)
 - b. A compressive-strength test to be the average compressive strength from a set of three specimens obtained from same composite sample and tested at age indicated.
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 if specified compressive strength is 5000 psi or less, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
9. 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.
10. Additional Tests:
 - a. Testing and inspecting agency to 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 or EoR.
 - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect or EoR.
 - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

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12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 72 hours of completion of floor finishing and promptly report test results to Architect.

3.16 PROTECTION

- A. Protect concrete surfaces as follows:
1. Protect from petroleum stains.
 2. Diaper hydraulic equipment used over concrete surfaces.
 3. Prohibit vehicles from interior concrete slabs.
 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
 5. Prohibit placement of steel items on concrete surfaces.
 6. Prohibit use of acids or acidic detergents over concrete surfaces.
 7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
 8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 03300

SECTION 042000 - UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block.
- B. Mortar and grout.
- C. Reinforcement and anchorage.

1.02 REFERENCE STANDARDS

- A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- B. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- C. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
- D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- E. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
- F. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- G. ASTM C150/C150M - Standard Specification for Portland Cement.
- H. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
- I. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- J. ASTM C476 - Standard Specification for Grout for Masonry.
- K. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry.
- L. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

1.03 ADMINISTRATIVE REQUIREMENTS

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

D. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
 - 1. Maintain one copy of each document on project site.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 MOCK-UPS

- A. Construct a masonry wall as a mock-up panel sized 8 feet (2.4 m) long by 6 feet (1.8 m) high; include mortar, accessories, and reinforcement in mock-up.
- B. Locate where directed.
- C. Mock-up may remain as part of work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depths as indicated on drawings for specific locations.
 - 2. Special Shapes: Provide nonstandard blocks configured for corners.
 - a. Provide bullnose units for outside corners.
 - 3. Nonloadbearing Units: ASTM C129.
 - a. Hollow block, as indicated.
 - b. Lightweight.

2.02 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
 - 1. Not more than 0.60 percent alkali.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Mortar Aggregate: ASTM C144.
- D. Water: Clean and potable.

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- E. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1. Type: Type N.
 - 2. Color: Standard gray.
- F. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
 - 1. Blok-Lok Limited; BL-10 Ladder Reinforcement: www.blok-lok.com/#sle.
 - 2. Hohmann & Barnard, Inc; 220 Ladder Mesh Reforcement: www.h-b.com/#sle.
 - 3. WIRE-BOND; Ladder2Wire: www.wirebond.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi) (280 MPa), deformed billet bars; galvanized.
- C. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Ladder.
 - 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
 - 3. Size: 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not less than 5/8 inch (16 mm) of mortar coverage on each exposure.

2.04 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 - 1. Interior, loadbearing masonry: Type N.
- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).
- C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
- D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.

3.02 PREPARATION

- A. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
 - 3. Mortar Joints: Match existing adjacent masonry work.

3.05 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Cut mortar joints flush where resilient base is scheduled.

3.06 GROUTED COMPONENTS

- A. Lap splices minimum 24 bar diameters.
- B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.
- C. Place and consolidate grout fill without displacing reinforcing.

3.07 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).
- C. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).
- E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).

3.08 CUTTING AND FITTING

- A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.09 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.10 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

3.11 SCHEDULES

- A. Interior Partitions: Single wythe concrete block units.

END OF SECTION 042000

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SECTION 044313 - STONE MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Adhered cut stone veneer at interior walls.

1.02 REFERENCE STANDARDS

- A. ASTM C616/C616M - Standard Specification for Quartz-Based Dimension Stone.
- B. ASTM C1242 - Standard Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems.
- C. ASTM C1528/C1528M - Standard Guide for Selection of Dimension Stone.
- D. ICC (IBC) - International Building Code.
- E. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on stone panels, mortar, and reinforcement.
- C. Samples: Submit two stone samples illustrating color range, texture, and markings.
- D. Samples: Submit mortar color samples.
- E. Stone Fabricator's Qualification Statement.
- F. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type required by this section, with minimum five years of documented experience.

1.06 MOCK-UP

- A. Construct stone wall mock-up, 10 feet (3 m) long by 10 feet (3 m) wide; include corner condition and typical control joint in mock-up.
- B. See Section 014000 - Quality Requirements for additional requirements.
- C. Locate where directed.

D. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect stone from discoloration during storage on site.
- B. Provide ventilation to prevent condensation from forming on stone.

1.08 FIELD CONDITIONS

- A. Cold Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.
- B. Maintain materials and ambient air at minimum of 40 degrees F (5 degrees C) prior to, during, and for 48 hours after completion of work.

PART 2 PRODUCTS

2.01 STONE

- A. Stone, General: See recommendations in ASTM C1528/C1528M.
- B. Quartz-Based Stone; complying with ASTM C616/C616M Classification III - Quartzite.
- C. Products: MSI Surfaces
 - 1. Color: Black.
 - 2. Surface Finish: Split face.
 - 3. Substitutions: See Section 016000 - Product Requirements.

2.02 MORTAR APPLICATIONS

- A. Mortar: Refer to Specification Section 093000 "Tiling."
- B. Grout: Refer to Specification Section 093000 "Tiling."

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that support work and site conditions are ready to receive work of this section.

3.02 PREPARATION - ADHERED VENEER

- A. Clean surfaces of foreign matter using solutions by mortar manufacturer and then rinse surfaces thoroughly with clean water.

3.03 INSTALLATION - ADHERED VENEER

- A. Install thin stone veneer with a cementitious mortar setting bed to a backing surface, in accordance with fabricator's instructions and applicable sections of the ICC (IBC), TMS 402/602 and ASTM C1242 that apply to adhered masonry veneer.

B. Mortar Joints: Concave.

3.04 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet (6 mm in 3 m) and 1/2 inch in 20 feet (13 mm in 6 m) or more.
- D. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 feet (3 mm in 1 m) and 1/4 inch in 10 feet (6 mm in 3 m); 1/2 inch in 30 feet (13 mm in 9 m).
- F. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet (3 mm in 1 m).

3.05 CLEANING

- A. Remove excess mortar as work progresses, and upon completion of work.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.06 PROTECTION

- A. During temporary storage on site, at the end of working day, and during rainy weather, cover stone work exposed to weather with non-staining waterproof coverings, securely anchored.

END OF SECTION 044313

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SECTION 051200

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other steel items not defined as structural steel.
2. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for painting requirements.

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written 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.

1.4 PREINSTALLATION MEETINGS

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

1.5 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.

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3. Anchor rods.
 4. Threaded rods.
 5. Shop primer.
 6. Galvanized-steel primer.
 7. Etching cleaner.
 8. Galvanized repair paint.
 9. Shrinkage-resistant grout.
- B. 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 members and connections of the seismic-load-resisting system.
 6. Indicate locations and dimensions of protected zones.
 7. Identify demand-critical welds.
 8. Identify members not to be shop primed.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M 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.
- D. Delegated Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer fabricator.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural-steel materials, including chemical and physical properties.
- E. 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.

- F. Survey of existing conditions.
- G. Source quality-control reports.
- H. Field quality-control reports.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).
- B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.
 - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds are to pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G are to be considered separate processes for welding personnel qualification.

1.8 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 F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:

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1. ANSI/AISC 303.
2. ANSI/AISC 341.
3. ANSI/AISC 360.
4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Connection Design Information:

1. Fabricator's experienced steel detailer selects or completes standard shear connections in accordance with ANSI/AISC 303.
 - a. Select and complete connections using schematic details indicated and ANSI/AISC 360.
 - b. Use Load and Resistance Factor Design; data are given at factored-load level.
2. Design connections and final configuration of member reinforcement at non-standard connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.
 - a. Use Load and Resistance Factor Design; data are given at factored-load level.

2.2 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 90 percent.
- B. All steel products available shall be produced by an electric arc furnace (EAF).
- C. W-Shapes: ASTM A992/A992M.
- D. Channels, Angles: ASTM A36/A36M.
- E. Plate and Bar: ASTM A36/A36M ASTM A572/A572M, Grade 50, as indicated on Drawings.
- F. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C structural tubing.
- G. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
 1. Weight Class: Standard Extra strong Double-extra strong., as indicated on Drawings.
 2. Finish: Black except where indicated to be galvanized.
- H. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
 1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with plain finish.

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- B. High-Strength A490 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490, Type 1, heavy-hex steel structural bolts or Grade F2280 tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
1. Direct-Tension Indicators: ASTM F959/F959M, Type 490-1, compressible-washer type with plain finish.
- C. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
1. Finish: Hot-dip or mechanically deposited zinc coating.
 2. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with mechanically deposited zinc coating finish.
- D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, heavy-hex or round head assemblies, consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
1. Finish: Plain or Mechanically deposited zinc coating.
- E. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.4 RODS

- A. Unheaded Anchor Rods: ASTM F1554, Grade 36.
1. Configuration: Hooked.
 2. Nuts: ASTM A563 heavy-hex carbon steel.
 3. Plate Washers: ASTM A36/A36M carbon steel.
 4. Washers: ASTM F436, Type 1, hardened carbon steel.
 5. Finish: Plain and Hot-dip zinc coating, ASTM A153/A153M, Class C, as indicated on Drawings.
- B. Headed Anchor Rods: ASTM F1554, Grade 36 and ASTM F1554, Grade 55, weldable, as indicated on Drawings, straight.
1. Nuts: ASTM A563 heavy-hex carbon steel.
 2. Plate Washers: ASTM A36/A36M carbon steel.
 3. Washers: ASTM F436, Type 1, hardened carbon steel.
 4. Finish: Plain and Hot-dip zinc coating, ASTM A153/A153M, Class C, as indicated on Drawings.
- C. Threaded Rods: ASTM A36/A36M and ASTM A572/A572M, Grade 50, as indicated on Drawings.
1. Nuts: ASTM A563 heavy-hex carbon steel.

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2. Washers: ASTM F436, Type 1, hardened carbon steel.
3. Finish: Plain and Hot-dip zinc coating, ASTM A153/A153M, Class C, as indicated on Drawings.

2.5 PRIMER

A. Steel Primer:

1. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.6 SHRINKAGE-RESISTANT GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- B. Minimum Compressive Strength: 8000 psi
 1. Minimum strength at fluid consistency required for installation.
- C. Grout installation procedure shall be in accordance with the manufacturer's recommendations to ensure that no air voids are present beneath the baseplate.

2.7 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.
 1. Camber structural-steel members where indicated.
 2. Fabricate beams with rolling camber up.
 3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
 4. Mark and match-mark materials for field assembly.
 5. 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.

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- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 2.
- F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel 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.

2.8 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened
 - a. Snug tightened bolts are acceptable for all bolted connections where other joint type is not specifically indicated on the contract drawings or on the steel shop drawings.
 - 2. Joint Type: Pretensioned
 - a. Pretensioned bolts are required at all braced frame connections, and at all other locations specifically indicated on the contract drawings or on the steel shop drawings.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M 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 maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.10 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:

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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 of high-strength bolted, slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 5. Galvanized surfaces unless indicated to be painted.
 6. Corrosion-resisting (weathering) steel surfaces.
 7. Surfaces enclosed in interior construction.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
1. SSPC-SP 2.
 2. SSPC-SP 3.
- C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.
- D. Priming: Immediately after surface preparation, apply primer in accordance with 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.

2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
 2. Bolted Connections: Inspect and test shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
 3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E165/E165M.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E164.
 - d. Radiographic Inspection: ASTM E94/E94M.
 4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.

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- b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.
- 5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of existing conditions. Include 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 on Drawings.
 - 1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing 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 in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-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 place shrinkage-resistant 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 grouting.

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- C. 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 are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- D. Splice members only where indicated.
- E. Do not use thermal cutting during erection unless approved by the Engineer of Record. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- F. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
 - 1. Joint Type: Snug tightened and slip critical, as specified on Drawings.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with ANSI/AISC 303 and ANSI/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, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.5 REPAIR

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting:
 - 1. 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.
 - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 - 2. Cleaning and touchup painting are specified in Section 099123 "Interior Painting."

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- C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:
1. Verify structural-steel materials and inspect steel frame joint details.
 2. Verify weld materials and inspect welds.
 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
 2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
 - a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1) Liquid Penetrant Inspection: ASTM E165/E165M.
 - 2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3) Ultrasonic Inspection: ASTM E164.
 - 4) Radiographic Inspection: ASTM E94/E94M.
 3. Shear Stud Connectors: 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:
 - a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - b. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

END OF SECTION 051200

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SECTION 055000 - METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel items, including:
 - 1. Handcuff rails.
 - 2. Mugshot steel wall panel.
 - 3. Spit guard frame.
 - 4. Door Frames for Overhead Door Openings.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 055213 - Pipe and Tube Railings.
- C. Section 099123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
- E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- G. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
- H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- I. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- J. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- K. AWS D1.2/D1.2M - Structural Welding Code - Aluminum.

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- L. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172.
- M. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
- N. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).
- O. SSPC-SP 2 - Hand Tool Cleaning.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
 - a. Include the following, as applicable:
 - 1) Design criteria.
 - 2) Engineering analysis depicting stresses and deflections.
 - 3) Member sizes and gauges.
 - 4) Details of connections.
 - 5) Support reactions.
 - 6) Bracing requirements.
- B. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
- C. Designer's Qualification Statement.
- D. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.05 QUALITY ASSURANCE

- A. Design vehicular barrier cable systems under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.
- C. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.

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- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Plates: ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M, Grade B Schedule 40, hot-dip galvanized finish.
- E. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.
- F. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.
- G. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 3, plain.
- H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- I. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 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. Continuously seal joined members by continuous welds.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. 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.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

- A. Door Frames for Overhead Door Openings: Channel sections; galvanized finish.

2.04 FINISHES - STEEL

- A. Prime paint steel items.
 - 1. Exceptions: Galvanize items.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements. If painting is indicated, do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

2.05 FABRICATION TOLERANCES

- A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).
- C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).
- D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).
- E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Furnish setting templates to the appropriate entities for steel items required to be cast into concrete.

3.03 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. Field weld components as indicated on shop drawings.
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.

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- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 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).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION 055000

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SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior handrails.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 042000 - Unit Masonry: Placement of anchors in masonry.
- C. Section 092116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.
- D. Section 099123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- E. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- F. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
- G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- H. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification.
- I. AWS D1.1/D1.1M - Structural Welding Code - Steel.
- J. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic).

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Manufacturer's product lines of mechanically connected railings.

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2. Fasteners.
 3. Post-installed anchors.
 4. Handrail brackets.
 5. Shop primer.
 6. Bituminous paint.
 7. Nonshrink, nonmetallic grout.
 8. Metal finishes.
- C. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 2. Include the design engineer's seal and signature on each sheet of shop drawings.
 3. Samples: Submit two, 12 inch (305 mm) long samples of handrail. Submit two samples of elbow, wall bracket, and end stop.
 4. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated within the previous 12 months.
 5. Designer's Qualification Statement.
 6. Fabricator's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
- B. Welder Qualifications: Welding processes and welding operators qualified within previous 12 months.
- C. Fabricator Qualifications:
1. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
- B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 50 pounds per linear foot (730 N/m) applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 500 pounds (2225 N) applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935
- D. Allow for expansion and contraction of members and building movement without damage to connections or members.
- E. Dimensions: See drawings for configurations and heights.

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1. Top Rails and Wall Rails: 1-1/2 inches (38 mm) diameter, round.
 2. Intermediate Rails: 1-1/2 inches (38 mm) diameter, round.
 3. Posts: 1-1/2 inches (38 mm) diameter, round.
- F. 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.
1. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
 2. For anchorage to stud walls, provide backing plates, for bolting anchors.
 3. Posts: Provide adjustable flanged brackets.
- G. 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.
- H. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
1. Ease exposed edges to a small uniform radius.
 2. Welded Joints:
 - a. Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.

2.02 STEEL RAILING SYSTEM

- A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.
- B. Steel Pipe: ASTM A53/A53M Grade B Schedule 40, galvanized finish.
- C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- D. Exposed Fasteners: No exposed bolts or screws.
- E. Straight Splice Connectors: Steel welding collars.
- F. Galvanizing: In accordance with requirements of ASTM A123/A123M.
1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type II - Organic.

2.03 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 intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.

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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.

- E. Weld connections that cannot be shop welded due to size limitations.
 1. Weld in accordance with AWS D1.1/D1.1M.
 2. Match shop welding and bolting.
 3. Clean welds, bolted connections, and abraded areas.
 4. Touch up shop primer and factory-applied finishes.
 5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 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. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.
- E. Field weld anchors as indicated on shop drawings. Touch-up welds with primer. Grind welds smooth.
- F. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 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).

END OF SECTION 055213

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof-mounted curbs.
- B. Roofing nailers.
- C. Preservative treated wood materials.
- D. Fire retardant treated wood materials.
- E. Communications and electrical room mounting boards.
- F. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

- A. Section 077200 - Roof Accessories: Prefabricated roof curbs.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. AWWA U1 - Use Category System: User Specification for Treated Wood.
- D. PS 1 - Structural Plywood.
- E. PS 20 - American Softwood Lumber Standard.

1.04 SUBMITTALS

- A. Product Data: Provide technical data on wood preservative materials and application instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No.2 or Standard Grade.
 - 2. Boards: Standard or No.3.

2.03 CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: PS 1, A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- B. Other Applications:
 - 1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 - 2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
 - 3. Other Locations: PS 1, C-D Plugged or better.

2.04 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.

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- B. Fire Retardant Treatment:
1. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature, low hygroscopic type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Interior concealed rough carpentry items are to be fire retardant treated.
 - c. Treat rough carpentry items as indicated.
 - d. Do not use treated wood in applications exposed to weather or where the wood may become wet.
- C. Preservative Treatment:
1. General: Lumber treated with Alkaline Copper Quaternaries (ACQ), Sodium Borates (SBX), Copper Azoles (CBA), or Copper Zinc Arsenate (ACZA) shall comply with the following:
 - a. Metals, including coated metals, must not have direct contact with treated lumber.
 - b. Membrane: Place a water resistant barrier membrane between treated lumber and metal. Membrane must not include paper, felt, or any other material that can absorb water. Acceptable materials include:
 - 1) Bituminous Coating.
 - 2) Peel and Stick.
 - c. Fasteners: Stainless steel fasteners, including stainless steel ring shank nails.
 2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber in contact with roofing, flashing, or waterproofing.
 - c. Treat lumber in contact with masonry or concrete.
 - d. Treat lumber in other locations as indicated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- E. Provide the following specific nonstructural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Wall paneling and trim.
 - 8. Joints of rigid wall coverings that occur between studs.

3.04 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.05 INSTALLATION OF CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.

3.06 SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.
- B. Allow preservative to dry prior to erecting members.

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3.07 CLEANING

- A. Waste Disposal: See Section 017419 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION 061053

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SECTION 064100 - ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Hardware.
- C. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints, And Coatings.
- B. Section 061000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- C. Section 123600 - Countertops.

1.03 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.
- D. BHMA A156.9 - Cabinet Hardware.
- E. NEMA LD 3 - High-Pressure Decorative Laminates.

1.04 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.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.
 - 2. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches (300 mm) square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.

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- E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and finish.

1.06 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. Single Source Responsibility: Provide and install this work from single fabricator.

1.07 MOCK-UPS

- A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, including hardware, finishes, and plumbing accessories.
- B. See Section 014000 - Quality Requirements for additional requirements.
- C. Locate where directed.
- D. Mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.09 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

2.01 CABINETS

- A. Quality Standard: Premium Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Cabinets:
 - 1. Casework Construction Type: Type B - Face-frame.
 - 2. Adjustable Shelf Loading: 40 psf (19.5 gm/sq cm).
 - a. Deflection: L/144.
 - 3. Cabinet Style: Flush overlay.
 - 4. Cabinet Doors and Drawer Fronts: Flush style.
 - 5. Drawer Side Construction: Multiple-dovetailed.

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.03 PANEL CORE MATERIALS

- A. Particleboard: Composite panel composed of cellulosic particles, additives, and bonding system; comply with ANSI A208.1.
 - 1. Grade: M-2; moisture resistance: MR30.
 - 2. Panel Thickness: 1/2 inch (12.7 mm).

2.04 THERMALLY FUSED LAMINATE PANELS

- A. Thermally Fused Laminate (TFL): Melamine- or polyester-resin-saturated decorative papers; for fusion to composite wood substrates under heat and pressure.
 - 1. Test in accordance with NEMA LD 3 Section 3.
 - 2. Panel Core Substrate: Particleboard.
 - 3. Color: As selected from manufacturer's standard range of colors.

2.05 LAMINATE MATERIALS

- A. Manufacturers:
 - 1. Arborite: www.arborite.com/#sle.
 - 2. Formica Corporation: www.formica.com/#sle.
 - 3. Panolam Industries International, Inc: www.panolam.com/#sle.
 - 4. Wilsonart LLC: www.wilsonart.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- C. Provide specific types as indicated.
 - 1. Horizontal Surfaces: HGS, 0.048 inch (1.22 mm) nominal thickness, finish as indicated.
 - 2. Vertical Surfaces: VGS, 0.028 inch (0.71 mm) nominal thickness, finish as indicated.
 - 3. Color and Pattern:
 - a. **PL-1**: #17012K-57, "*Mercer Oak*"; Wilsonart.
 - b. **PL-2**: #1595-60, "*Black*"; Wilsonart.
 - c. **PL-3**: #5013K-19, Leno Weave, "*Mushroom*"; Wilsonart.

2.06 COUNTERTOPS

- A. Countertops: See Section 123600.

2.07 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
 - 1. Color: As selected by Architect from manufacturer's standard range.
 - 2. Use at all exposed shelf edges.
- C. Fasteners: Size and type to suit application.

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- 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. Grommets (**DH-2**): Standard metal grommets for cut-outs, in color as scheduled.
 - 1. Basis of Design: #20694170, "Brushed Nickel 2."
 - a. Size: 15/16-inch.

2.08 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Metal Z-Shaped Wall Cabinet Support Clips: Paired, cleated, structural anchorage components applied to back of cabinets and walls for wall cabinet mounting.
 - 1. Material: Extruded Aluminum.
- C. Countertop Support Brackets (**DH-3**): Fixed, L-shaped, face-of-stud mounting.
 - 1. Materials: Steel; T-shape cross-section.
 - a. Finish: Manufacturer's standard, factory-applied, primer.
 - b. Color: Painted to match adjacent surface/.
 - c. Height: 18 inches (460 mm).
 - 2. Products:
 - a. Rakks/Rangine Corporation; EHR Series Brackets: www.rakks.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
- D. Drawer Pulls: Zamac, right angle drawer pull.
 - 1. Product (**DH-1**):
 - a. Richelieu; #873, "Modern Pull": <https://www.richelieu.com/>.
 - 1) Finish: Matte Black.
 - 2) Size: 5 7/16-inch, center to center.
 - b. Substitutions: See Section 016000 - Product Requirements.
- E. Drawer Pulls: "U" shaped wire pull, stainless steel with satin finish, 4-inch centers.
 - 1. Product (**DH-5**):
 - a. Richelieu; #33205170, "Functional Stainless Steel Pull": <https://www.richelieu.com/>.
 - 1) Finish: Satin.
 - 2) Size: 4-3/32-inch.
- F. Cabinet Catches and Latches:
 - 1. Type: Push latch.
 - 2. Manufacturers:
 - a. Knappe & Vogt Manufacturing Company: www.knappeandvogt.com/#sle.
 - b. Sugatsune America, Inc: www.sugatsune.com/#sle.
 - c. Titus Cabinet Hardware; Push Latch: www.titusplus.com/us/en/#sle.
 - 3. Substitutions: See Section 016000 - Product Requirements.
- G. Mechanical Fasteners:
 - 1. Manufacturers:
 - a. Titus Cabinet Hardware; Cabinet Connectors: www.titusplus.com/us/en/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.

- H. Drawer Slides (**DH-4**):
 - 1. Type: Extension types as indicated.
 - 2. Static Load Capacity: Commercial grade.
 - 3. Mounting: Side mounted.
 - 4. Features: Provide self closing/stay closed type.
 - 5. Manufacturers:
 - a. Accuride International, Inc; Heavy-Duty Drawer Slides: www accuride.com/#sle.
 - b. Blum, Inc; TANDEM: www blum.com/#sle.
 - c. Knappe & Vogt Manufacturing Company; Heavy-Duty Drawer Slides: www knapeandvogt.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.

- I. Hinges: European style concealed self-closing type, steel with nickel-plated finish.
 - 1. Manufacturers:
 - a. Blum, Inc; CLIP top BLUMOTION: www blum.com/#sle.
 - b. Grass America Inc; TEC Self-Close: www grassusa.com/#sle.
 - c. Sugatsune America, Inc; Stainless Steel Swing-Free Swing, 304B-46/14: www sugatsune.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.

2.09 FABRICATION

- A. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

- B. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

- C. 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. Locate counter butt joints minimum 2 feet from sink cut-outs. (Locate counter butt joints minimum 600 mm from sink cut-outs.)
 - 1. Cap exposed plastic laminate finish edges with material of same finish and pattern.

- D. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches (400 mm) on center.

- E. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.

- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.
- F. Secure cabinets to floor using appropriate angles and anchorages.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION 064100

SECTION 072100 - THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Acoustical batt insulation in interior wall construction.

1.02 DEFINITIONS

- A. Mineral Fiber Material Composition: Insulation referred to as mineral fiber block, board, and blanket insulation is composed of fibers from mineral based substances such as rock, slag, or glass and processed from the molten state into fibrous form.
 - 1. Based on type of insulation substance, the material will be referred to as a mineral fiber when having a rock or slag base, and glass fiber with a glass or silica sand base, also considered a mineral.
 - 2. Insulation blankets are flexible units consisting of felted, bonded, or unbonded fibers formed into rolls or flat cut pieces referred to as batts; rolls are simply longer versions of batts.
 - 3. For additional information about mineral fiber and the various classification types, refer to the following reference standards; ASTM C553, ASTM C612, ASTM C665, and ASTM C726.

1.03 REFERENCE STANDARDS

- A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- B. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- D. ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. NFPA 285 Compliance: Compliance with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285, shall be subject to the following.
 - 1. ICC-compliance through third-party NFPA 285 testing and engineering evaluation(s).

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2. Submit NFPA 285 data on project-specific system(s) for Architect's approval. Variation in wall type assembly shall be represented by IEC approvals.
- D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

2.02 MINERAL FIBER BLANKET INSULATION MATERIALS

- A. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
 2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
 3. Thermal Resistance: R-value (RSI-value) of 11.
 4. Thickness: 3 inch (165 mm).
 5. Products:
 - a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
 - b. ROCKWOOL; COMFORTBATT: www.rockwool.com/#sle.
 - c. Thermafiber, Inc; SAFB: www.thermafiber.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of irregularities.

3.02 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- C. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

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3.03 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 072100

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SECTION 072700 - AIR BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air barriers over exterior wall sheathing and CMU walls in existing window openings.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Air barrier under exterior cladding.

1.03 DEFINITIONS

- A. Air Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

1.04 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-- Tension.
- B. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
- C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.
- F. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials.
- G. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components.

1.05 DEFINITIONS

- A. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- B. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.
- C. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

1.06 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on material characteristics, performance criteria, and limitations.
- C. Shop Drawings: Provide drawings of special joint conditions, including the following.
 - 1. Location and extent of air barrier system.
 - 2. Metal and self-adhering flashing terminations and joinery to fluid-applied membrane.
 - 3. Air barrier closure at penetrations.
 - 4. Membrane termination at fenestration and door openings.
 - 5. Treatment of substrate joints, moving and non-moving, and cracks.
 - 6. Membrane joinery with roof membrane.
 - 7. Membrane joinery with below-grade and above-grade waterproofing, if applicable.
- D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.
- E. Evaluation Reports: Manufacturer's ICC evaluation report for air barrier indicating compliance with applicable Building Code.
- F. Close-Out Submittals: Record actual installation that varies from that shown in Contract Documents, with particular attention to concealed components that would be difficult to identify at a later date.
- G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification; keep copies of each contractor accreditation and installer certification on site during and after installation, and present on-site documentation upon request.
- H. Field quality control test reports.
- I. Warranty: Copy of specified warranty.
- J. Testing agency qualification statement.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum 10 years documented experience, and approved by manufacturer.
- B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.08 MOCK-UPS

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Construct air barrier mock-up, 10 feet (3 m) long by 10 feet (3 m) wide, indicating quality of materials and installation technique.
 - 1. Use same installer personnel, including supervisors, which will perform work on Project.

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2. Air barrier system to be identical to methodology to be used on Project installation.
 3. Mock up shall demonstrate aesthetic affects and set quality standards for fabrication and installaiton for air barrier system on Project.
 4. Approved mock up shall remain undisturbed as a standard for judging completed work.
- C. Locate where directed.
- D. Mock-up may remain as part of work.

1.09 WARRANTY

- A. Provide manufacturer's standard material and performance warranty, covering a period of not less than 15 years.
1. Failures include, but are not limited to, the following:
 - a. Bond integrity and weathertightness.
 - b. Deterioration of air barrier membrane and other air barrier materials beyond normal weathering.
 2. Warranty coverage includes the following components of air barrier wall assemblies:
 - a. Repair and replacemnt of components of air barrier system.
 - b. Exploratory work to determine cause of defective work during the warranty period, including trim components and flashing, at no additional cost.
- B. Provide separate warranty from installer covering labor for repairs or replacement for a period of not less than 10 years. Include , but not limited to, the following:
1. Thermal movement causing damage or deteriation to air barrier and components.
 2. Sealant failure.
 3. Air infiltration in excess of specified limits.
 4. Water penetration or condensation in excess of specified limits.
 5. Staining of exposed surfaces due to incompatibility of adjacent products.
 6. Failue in adhesion, cohesion, abrasion-resistance, migration-resistance, stain-resistance, general durability, or any other form of apparent deterioration.
 7. Failue to fulfill other specified performance requirements.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

1.11 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.
- B. Coordinate installation of work of this Section with adjacent and related work to ensure provision of continuous, unbroken, and avoid UV damage from overexposure.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General: Air-barrier assembly and seals with adjacent construction to be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies to be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
1. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested in accordance with ASTM E2357.
 2. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75 Pa) pressure difference; ASTM E2178.
 3. Ultimate Elongation: Minimum 600 percent; ASTM D412, Die C.
 4. Adhesion to Substrate: Minimum 16 lbf/sq. in. (110 kPa) when tested in accordance with ASTM D4541.
 5. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 6. UV Resistance: Can be exposed to sunlight for 90 days in accordance with manufacturer's written instructions.
 7. Volatile Organic Content (VOC): 19 g/L, maximum.

2.02 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

- A. Air Barrier Sheet, Self-Adhered:
1. Air Permeance: 0.004 cfm/sq ft (0.02 L/(s sq m)), maximum, when tested in accordance with ASTM E2178.
 2. Water Vapor Permeance: 10 perms (572 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F (23 degrees C).
 3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 90 days of weather exposure.
 4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
 5. Seam and Perimeter Tape: As recommended by sheet manufacturer.
 6. Products: Verify selected product is compatible with existing air barrier.
 - a. Henry Company; Blueskin VP160: www.henry.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.03 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.
- B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrate and air barrier materials.
1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch (0.76 to 1.02 mm), nominal thickness.
 2. Elongation: 1,300 percent, measured in accordance with ASTM D412.

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3. Peel Adhesion: 28 lb/inch (5.0 kg/cm), minimum, when tested in accordance with ASTM D903.
 4. Comply with NFPA 285 requirements for wall assembly.
 5. Products: As recommended by air barrier manufacturer.
- C. Primer: Liquid applied polymer.
1. Elongation: 1,300 percent, measured in accordance with ASTM D412.
 2. Products: As recommended by air barrier manufacturer.
- D. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement waived if not installed on roof.
1. Width: 4 inches (102 mm), minimum.
 2. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 180 days of weather exposure.
 3. Products: As recommended by air barrier manufacturer.
- E. Preformed Transition Membrane: Semirigid silicone or polyester composition, tapered edges, tear resistant.
1. Products: As recommended by air barrier manufacturer.
- F. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready for work of this section.
- B. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.
1. Ensure that exterior sheathing boards are sufficiently stabilized with corners and edges fastened with appropriate screws.
 2. Ensure all voids and holes in CMU, particularly in the mortar joints, are filled with mortar, non-shrinking grout or parge coat for a smooth flush finish.
- C. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.02 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 sealants and air barrier in accordance with manufacturer's installation instructions.
1. Remove contaminants such as grease, oil, form release agents and wax from exposed surfaces.
 2. Remove dust, dirt, loose stone and debris.
- C. Perform work only at ambient and surface temperature, and relative humidity ranges recommended by manufacturer. Do not apply to surfaces with surface moisture.

- D. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

3.03 INSTALLATION

- A. Install materials in accordance with manufacturer's installation instructions.
- B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
- D. Self-Adhered Sheets:
 - 1. Prepare substrate in accordance with sheet manufacturer's installation instructions; fill and tape joints in substrate and between dissimilar materials.
 - 2. Lap sheets shingle fashion to shed water and seal laps airtight.
 - 3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.
 - 4. Use same material, or other material approved by sheet manufacturer, to seal to adjacent substrates, and as flashing.
 - 5. At wide joints, provide extra flexible membrane allowing joint movement.
- E. Application of Transition/Detailing Accessory Materials:
 - 1. Follow Manufacturer's instructions for recommended accessory material for each type of job condition.
 - 2. Treat sheathing joint, expansion joints, rough openings, transitions, terminations, corners, penetrations and surface irregularities as recommended by membrane manufacturer. Transitions and detailing can be performed before or after air barrier membrane application.
 - 3. Connect and seal accessory materials to adjoining components of building, including but not limited to:
 - a. Roof membrane system.
 - b. Below-grade or above-grade waterproofing system.
 - c. Perimeter metal flashings at openings or metal flashings used to bridge between incompatible adjacent materials.
- F. Openings and Penetrations in Exterior Air Barriers:
 - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto air barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.
 - 2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.
 - 3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches (230 mm) wide, and covering entire depth of framing.
 - 4. At head of openings, install flashing under air barrier extending at least 2 inches (50 mm) beyond face of jambs; seal air barrier to flashing.
 - 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.

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6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Owner will provide testing services, and Contractor to provide temporary construction and materials for testing.
- C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspection shall include the following:
 1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 2. Air-barrier dry film thickness.
 3. Continuous structural support of air-barrier system has been provided.
 4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
 5. Site conditions for application temperature and dryness of substrates have been maintained.
 6. Maximum exposure time of materials to UV deterioration has not been exceeded.
 7. Surfaces have been primed, if applicable.
 8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
 9. Termination mastic has been applied on cut edges.
 10. Strips and transition strips have been firmly adhered to substrate.
 11. Compatible materials have been used.
 12. Transitions at changes in direction and structural support at gaps have been provided.
 13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 14. All penetrations have been sealed.
- D. Air barriers will be considered defective if they do not pass tests and inspections.
 1. Apply additional air-barrier material, in accordance with manufacturer's written instructions, where inspection results indicate insufficient thickness.
 2. Remove and replace deficient air-barrier components for retesting as specified above.
- E. Do not cover installed air barriers until required inspections have been completed.
- F. Obtain approval of installation procedures from air barrier manufacturer based on a mock-up, prior to proceeding with remainder of installation.
- G. Take digital photographs of each portion of installation prior to covering up air barriers.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.
 1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-

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- barrier application after repairing and preparing the overexposed materials in accordance with air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.
- C. Remove masking materials after installation.

END OF SECTION 072700

SECTION 078400 - FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 REFERENCE STANDARDS

- A. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- B. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems.
- C. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
- D. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- E. ITS (DIR) - Directory of Listed Products.
- F. FM 4991 - Approval Standard of Firestop Contractors.
- G. FM (AG) - FM Approval Guide.
- H. SCAQMD 1168 - Adhesive and Sealant Applications.
- I. UL 1479 - Standard for Fire Tests of Penetration Firestops.
- J. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems.
- K. UL (DIR) - Online Certifications Directory.
- L. UL (FRD) - Fire Resistance Directory.

1.03 SUBMITTALS

- A. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- B. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- C. Sustainable Design Submittal: Submit VOC content documentation for nonpreformed materials.
- D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- E. Installer's qualification statement.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
 - 2. Verification of minimum three years documented experience installing work of this type.
 - 3. Verification of at least five satisfactorily completed projects of comparable size and type.
 - 4. Evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.05 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
 - 2. A/D Fire Protection Systems Inc: www.adfire.com/#sle.
 - 3. Hilti, Inc: www.hilti.com/#sle.
 - 4. Nelson FireStop Products: www.nelsonfirestop.com/#sle.
 - 5. Specified Technologies Inc: www.stifirestop.com/#sle.
 - 6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.

2.02 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
- C. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
- D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.

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2. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.04 FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
 1. Fire Ratings: See drawings for required systems and ratings.
- B. Firestopping Between Top of Partition Wall and Roof Slab or Floor Slab: Fiber firestopping with smoke seal coating; UL Design No. 1479, F Rating 1 hour, provide at locations as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.

3.03 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 Owner's Independent Testing Agency.
- C. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.
- B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 078400

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SECTION 079200 - JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.
- D. Owner-provided field quality control.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints, And Coatings: Additional requirements for sealants and primers.
- B. Section 092116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.
- C. Section 093000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
- B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
- F. ASTM C1311 - Standard Specification for Solvent Release Sealants.
- G. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
- H. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

1.04 PREINSTALLATION MEETING

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

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Backing material recommended by sealant manufacturer.
 - 4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 5. Substrates the product should not be used on.
 - 6. Substrates for which use of primer is required.
 - 7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
 - 8. Sample product warranty.
- B. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- D. Sustainable Design Documentation: For sealants and primers, submit VOC content and emissions documentation; see Section 016116.
- E. Installation Plan: Submit at least four weeks prior to start of installation.
- F. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.
- G. Field Quality Control Plan: Submit at least two weeks prior to start of installation.
- H. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.
- I. Installation Log: Submit filled-out log for each length or instance of sealant installed.
- J. Field Quality Control Log: Submit filled-out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.
- K. Field Quality-Control Reports: For field-adhesion-test reports, for each sealant application tested.
- L. Installer's qualification statement.
- M. Executed warranty.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section and with at least 10 years of documented experience.

- B. Installation Plan: Include schedule of sealed joints, including the following:
 - 1. Joint width indicated in Contract Documents.
 - 2. Joint depth indicated in Contract Documents; to face of backing material at centerline of joint.
 - 3. Method to be used to protect adjacent surfaces from sealant droppings and smears, with acknowledgment that some surfaces cannot be cleaned to like-new condition and therefore prevention is imperative.
 - 4. Approximate date of installation, for evaluation of thermal movement influence.
 - 5. Field Quality Control Log Form: Include the following data fields, with known information filled out.
 - a. Unique identification of each length or instance of sealant installed.
 - b. Location on project.
 - c. Substrates.
 - d. Sealant used.
 - e. Stated movement capability of sealant.
 - f. Primer to be used, or indicate no primer is used.
 - g. Size and actual backing material used.
 - h. Date of installation.
 - i. Name of installer.
 - j. Actual joint width; provide space to indicate maximum and minimum width.
 - k. Actual joint depth to face of backing material at centerline of joint.
 - l. Air temperature.

- C. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
 - 1. Identification of testing agency.
 - 2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
 - a. Substrate; if more than one type of substrate is involved in a single joint, provide two entries on form, for testing each sealant substrate side separately.
 - b. Test date.
 - c. Location on project.
 - d. Sealant used.
 - e. Stated movement capability of sealant.
 - f. Test method used.
 - g. Date of installation of field sample to be tested.
 - h. Date of test.
 - i. Copy of test method documents.
 - j. Age of sealant upon date of testing.
 - k. Test results, modeled after the sample form in the test method document.
 - l. Indicate use of photographic record of test.

- D. Owner will employ an independent testing agency to perform the field quality control inspection and testing as referenced in PART 3 of this section and as follows, to prepare and

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submit the field quality control plan and log, and to provide recommendations of remedies in the case of failure.

1. Contractor shall cooperate with testing agency and repair failures discovered and destructive test location damage.

E. Field Quality Control Plan:

1. Visual inspection of entire length of sealant joints.
2. Nondestructive field adhesion testing of sealant joints, except interior acrylic latex sealants.
 - a. For each different sealant and substrate combination, allow for one test every 12 inches (305 mm) in the first 10 linear feet (3 linear m) of joint and one test every 24 inches (610 mm) thereafter.
 - b. If any failures occur in the first 10 linear feet (3 linear m), continue testing at 12 inches (305 mm) intervals at no extra cost to Owner.
3. Destructive field adhesion testing of sealant joints, except interior acrylic latex sealant.
 - a. For each different sealant and substrate combination, allow for one test every 100 feet (30 m) in the first 1,000 linear feet (305 linear m), and one test per 1,000 linear feet (305 linear m) thereafter, or once per floor on each elevation.
 - b. If any failures occur in the first 1,000 linear feet (305 linear m), continue testing at frequency of one test per 500 linear feet (152 linear m) at no extra cost to Owner.
4. Field Quality Control Log Form: Show data fields as indicated above, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.

F. Field Adhesion Test Procedures:

1. Allow sealants to fully cure as recommended by manufacturer before testing.
2. Have a copy of the test method document available during tests.
3. Take photographs or make video records of each test, with joint identification provided in the photos/videos; for example, provide small erasable whiteboard positioned next to joint.
4. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
5. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
6. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
7. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

G. Nondestructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Spot Method.

1. Record results on Field Quality Control Log.
2. Repair failed portions of joints.

H. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or another applicable method as recommended by manufacturer.

1.07 WARRANTY

- A. Manufacturer Warranty:** Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not

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cure. Complete forms in Owner's name and register with manufacturer.

- B. Special Installer's Warranty: Installer agrees to repair or replace defective work within 5-year period commencing on Date of Substantial Completion.
1. Defective work includes, but is not limited to, the following:
 - a. Adhesive or cohesive failure of sealant.
 - b. Abrasion-resistance failure.
 - c. Lack of resistance to migration.
 - d. Staining of substrates from sealant or primers.
 - e. Durability of specified performance.
 - f. Failure to maintain continuous airtight and watertight seal.
 - g. Cracking on surface of non-structural sealant.
 - h. Non-structural sealant hardening beyond Shore A durometer 50 or softening below 20.
 2. Exclusions: Includes, but not limited to, deterioration or failure of sealants from the following:
 - a. Movement of structure caused by structural settlement resulting in stresses on sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - b. Disintegration of joint substrates from natural causes exceeding design specifications.
 - c. Mechanical damage caused by individuals, tools, or other outside agents.
 - d. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 PRODUCTS

2.01 GENERAL

- A. Source Limitations: Obtain joint sealants from single manufacturer for each sealant type.
- B. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.02 MANUFACTURERS

- A. Nonsag Sealants:
1. Dow: www.dow.com/#sle.
 2. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/#sle.
 3. Pecora Corporation: www.pecora.com/#sle.
 4. Sika Corporation; _____: www.usa.sika.com/#sle.
 5. Tremco Commercial Sealants & Waterproofing; _____: www.tremcosealants.com/#sle.
 6. Substitutions: See Section 016000 - Product Requirements.

2.03 JOINT SEALANT APPLICATIONS

- A. Scope:
1. Interior Joints:

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- a. Do not seal interior joints indicated on drawings as not sealed.
 - b. Do not seal gaps and openings in gypsum board and suspended ceilings
 - c. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
 - d. Seal open joints except specific open joints indicated on drawings as not sealed.
2. Do Not Seal:
- a. Joints indicated to be covered with expansion joint cover assemblies.
 - b. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
 - c. Joints where sealant installation is specified in other sections.

B. Areas Where Tamper-Resistance is Required: As indicated on drawings.

2.04 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 016116.

2.05 NONSAG JOINT SEALANTS

A. Nonstaining Silicone Sealant (**JS-1**): ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 50 percent, minimum.
2. Nonstaining to Porous Stone: Nonstaining to light-colored concrete when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
5. Color: To be selected by Architect from manufacturer's standard range.
6. Cure Type: Single-component, neutral moisture curing.
7. Service Temperature Range: Minus 20 to 180 degrees F (Minus 29 to 82 degrees C).
8. Products: Better Suited For Exterior Use. Provide one of the following, or an approved equivalent.
 - a. Dow; DOWSIL 995 Silicone Structural Sealant: www.dow.com/#sle.
 - b. Momentive Performance Materials, Inc/GE Silicones; SCS 2000 SilPruf: www.siliconeforbuilding.com/#sle.
 - c. Pecora Corporation; Pecora 895 NST: www.pecora.com/#sle.
 - d. Tremco Commercial Sealants & Waterproofing; Proglaze SSG: www.tremcosealants.com/#sle.

B. Silicone Sealant (**JS-2**): ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 50 percent, minimum.
2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: Match adjacent finished surfaces.
4. Cure Type: Single component, neutral moisture curing.
5. Service Temperature Range: Minus 65 to 180 degrees F (Minus 54 to 82 degrees C).
6. Products:
 - a. Dow; DOWSIL 758 Silicone Weather Barrier Sealant: www.dow.com/#sle.
 - b. Momentive Performance Materials, Inc/GE Silicones; SCS2700 SilPruf LM (Low Modulus) - Silicone Weatherproofing Sealant: www.siliconeforbuilding.com/#sle.
 - c. Pecora Corporation; 898 NST: www.pecora.com/#sle.

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- d. Sika Corporation; Sikasil 728NS: www.usa.sika.com/#sle.
- C. Mildew-Resistant Silicone Sealant (**JS-3**): ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
 - 1. Color: Clear.
 - 2. Products: Provide one of the following, or an approved equivalent.
 - a. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
 - b. Sika Corporation; Sikasil GP: www.usa.sika.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
- D. Tamper-Resistant Sealant (**JS-4**): ASTM C920, Grade NS, Uses M and A; multi-component.
 - 1. Movement Capability: Plus and minus 12-1/2 percent, minimum
 - 2. Hardness Range: 70, Shore A, when tested in accordance with ASTM C661.
 - 3. Color: Match adjacent finished surfaces.
 - 4. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).
 - 5. Products:
 - a. Pecora Corporation; DynaFlex SC (Security Sealant): www.pecora.com/#sle.
 - b. Sika Corporation; Sikadur 31 H-Mod Gel: www.usa.sika.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.

2.06 ACCESSORIES

- A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.
- D. Reports: Maintain log indicating tests conducted, sealant lot numbers, dates, times, and results.
- E. Acceptance of Surfaces and Conditions:

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1. Examine substrates to which sealants will be applied for compliance with requirements and other conditions affecting performance.
 2. Joint widths, depths, and conditions detailed on shop drawings shall be considered as minimum allowable requirements except where they may conflict with sealant manufacturer's recommendations.
 3. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
 4. Starting work within a particular area will be construed as acceptance of surface conditions.
- F. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
 2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
 3. Record each test on Preinstallation Adhesion Test Log as indicated.
 4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
 5. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.

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- F. **Joint Priming:** Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- G. **Masking Tape:** Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION

- A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Provide joint sealant installations complying with ASTM C1193.
- C. Install acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
 - 1. Width/depth ratio of 2:1.
 - 2. Neck dimension no greater than 1/3 of the joint width.
 - 3. Surface bond area on each side not less than 75 percent of joint width.
- E. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. **Nonsag Sealants:** Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

- A. Qualified testing agency shall perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. **Non-Destructive Adhesion Testing:** If there are any failures in first 100 linear feet (30 linear m), notify Architect immediately.
- C. **Destructive Adhesion Testing:** If there are any failures in first 1,000 linear feet (300 linear m), notify Architect immediately.
- D. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

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- E. Re-testing and Re-inspections Due to Failures:
 - 1. Perform further testing to ascertain the extent of the failure. Failed sealants are to be replaced promptly and the resulting weather tightness shall be verified.
 - 2. Remove from site marginal or defective material.
 - 3. Expenses incurred shall be without additional cost to Owner.

- F. Repair destructive test location damage immediately after evaluation and recording of results.

3.05 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.06 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.07 POST-OCCUPANCY

- A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width, i.e., at low temperature in thermal cycle. Report failures immediately and repair them.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Commercial security hollow metal doors and frames.
- C. Detention security hollow metal doors and frames.
- D. Bullet-resistant hollow metal doors and frames.
- E. Accessories, including glazing.

1.02 RELATED REQUIREMENTS

- A. Section 087100 - Door Hardware.
- B. Section 099123 - Interior Painting: Field painting.

1.03 ABBREVIATIONS AND ACRONYMS

- A. ANSI: American National Standards Institute.
- B. HMMA: Hollow Metal Manufacturers Association.
- C. NAAMM: National Association of Architectural Metal Manufacturers.
- D. SDI: Steel Door Institute.

1.04 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors.
- C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
- D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100).
- E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability,

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Required Hardness, Solution Hardened, and Bake Hardenable.

- H. ASTM A1011/A1011M - 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.
- I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
- J. ASTM C476 - Standard Specification for Grout for Masonry.
- K. ASTM F1450 - Standard Test Methods for Hollow Metal Swinging Door Assemblies for Detention and Correctional Facilities.
- L. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
- M. ICC A117.1 - Accessible and Usable Buildings and Facilities.
- N. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames.
- O. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames.
- P. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames.
- Q. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.
- R. NAAMM HMMA 863 - Guide Specifications for Detention Security Hollow Metal Doors and Frames.
- S. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames.
- T. UL 752 - Standard for Bullet-Resisting Equipment.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements 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 standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Samples: Submit two samples of metal, 2 by 2 inches (51 by 51 mm) in size, showing factory finishes, colors, and surface texture.
- E. Design Submittals: Manufacturer to submit anchor design analysis calculations for blast-resistant doors signed and sealed by specialty design engineer experienced in this type of work and licensed in the State in which the Project is located.

- F. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- G. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
- H. Manufacturer's Qualification Statement.
- I. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- C. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
 - 2. Curries, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
 - 3. Republic Doors, an Allegion brand; _____: www.republicdoor.com/#sle.
 - 4. Steelcraft, an Allegion brand; _____: www.allegion.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Bullet-Resistant, Commercial Security, and Detention Security Hollow Metal Doors and Frames (**BRDR-1**):
 - 1. Fleming Door Products, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Habersham Metal Products: <https://habershammetal.com/#sle>.
 - 3. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
 - 4. Security Metal Products Corporation, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 5. Titan Metal Products, Inc; Ballistic Rated Doors and Frames: www.titanmetalproducts.com/#sle.
 - 6. Trussbilt: www.trussbilt.com/#sle.
 - 7. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 3. Door Edge Profile: Manufacturers standard for application indicated.
 4. Typical Door Face Sheets: Flush.
 5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
 6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 7. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvanized) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with 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.

2.03 HOLLOW METAL DOORS

- A. Door Finish: Factory primed and field finished.
- B. Interior Doors, Non-Fire-Rated:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 4 - Maximum-duty for Interview Room.
 - b. Level 3 - Extra Heavy-duty for all other doors unless otherwise indicated.
 - c. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
 - d. Model 1 - Full Flush.
 - e. Door Face Metal Thickness: 14 gauge, 0.067 inch (1.7 mm), minimum.
 - f. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
 3. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
- C. Type BRDF-1 , Detention Security and Bullet-Resistant Doors; Interior:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 2 - Heavy-duty.
 - b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 14 gauge, 0.067 inch (1.7 mm), minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.

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2. Detention Security Facility Swinging Door Assemblies: Comply with Grade 2 security characteristics, in accordance with NAAMM HMMA 863 and ASTM F1450 requirements.
3. Bullet Resistance: UL 752, Threat Level Rating - Level 4.
4. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
5. Door Thickness: 1-3/4 inch (44.5 mm).
6. Hinge Rail and Reinforcement: Non-beveled edge, reinforced with continuous steel channel, 12 gauge, 0.093 inch (2.3 mm) minimum metal thickness, welded at 5 inch (127 mm) on center maximum, and compatible with 4-1/2 inch (114 mm) full mortise template and continuous geared hinges.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Factory primed and field finished.
- C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 1. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
- D. Bullet-Resistant Door Frames (**BRDF-1**): Comply with UL 752, with same level of bullet resistance as door; face welded construction, ground smooth, fully prepared and reinforced for hardware installation.
 1. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
 2. Frame Finish: Factory primed and field finished.
 3.
 - a. Armortex; Bullet Resisting Hollow Metal Frame: <https://www.armortex.com/>.
 - b. Substitutions: See Section 016000 - Product Requirements.
- E. Commercial and/or Detention Security-Resistant Door Frames (**BRDF-1**): With same security resistance as door; face welded or full profile/continuously welded construction, ground smooth, fully prepared and reinforced for hardware installation.
 1. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
 2. Frame Finish: Factory primed and field finished.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch (0.4 mm) dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.06 ACCESSORIES

- A. Door Window Frames: Door window frames with glazing securely fastened within door opening.
 1. Frame Material: 18 gauge, 0.0478 inch (1.21 mm), galvanized steel.

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- B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- C. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches (102 mm) as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Coordinate frame anchor placement with wall construction.
- C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- D. Install door hardware as specified in Section 087100.
 - 1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.
- E. Coordinate installation of electrical connections to electrical hardware items.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

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3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION 081113

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SECTION 081416 - FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush wood doors; flush and flush glazed configuration; non-rated and bullet resistant.
- B. Attack-resistant door opening assemblies.

1.02 RELATED REQUIREMENTS

- A. Section 081113 - Hollow Metal Doors and Frames.
- B. Section 087100 - Door Hardware.
- C. Section 088000 - Glazing.
- D. Section 092116 - Gypsum Board Assemblies: Bullet-resistant sheathing and wallboard for bullet-resistant partitions and walls.
- E. Section 099123 - Interior Painting: Field finishing of doors.
- F. Section 099300 - Staining and Transparent Finishing: Field finishing of doors.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
- D. Samples: Submit two samples of door construction, 12 by 12 inches (305 by 305 mm) in size cut from top corner of door.
- E. Samples: Submit two samples of door veneer, 6 by 6 inches (152 by 152 mm) in size illustrating wood grain, stain color, and sheen.
- F. Test Reports: Show compliance with specified requirements for the following:
 - 1. Bullet resistant doors and frames.

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- G. Manufacturer's Installation Instructions: Indicate special installation instructions.
- H. Manufacturer's qualification statement.
- I. Installer's qualification statement.
- J. Specimen warranty.
- K. Warranty, executed in Owner's name.

1.05 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 not less than three years of documented experience.
 - 1. Company with at least one project within past five years with value of woodwork within at least 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.
- C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 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, and inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
 - 1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Labmton Doors; <https://www.lambtondoors.com/>.
 - 2. Masonite Architectural: www.architectural.masonite.com/#sle.

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3. Oregon Door: www.oregondoor.com/#sle.
4. Oshkosh Door Company; www.oshkoshdoor.com.
5. VT Industries, Inc: www.vtindustries.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

- B. Bullet Resistant Wood Doors (**BRDF-2**):
1. Overly Door Company: www.overly.com/#sle.
 2. Armortex .
 3. North American Bullet Proof, Inc..
 4. US Bullet Proofing, Inc.
 5. Substitutions: See Section 016000 - Product Requirements.

2.02 DOORS

- A. Doors: See drawings for locations and additional requirements.
1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.
1. Provide solid core doors at each location.
 2. Wood veneer facing for field transparent finish, white maple, plain sliced, book match, balanced match.
 3. Wood veneer facing for field opaque finish, poplar, plain sliced.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type structural composite lumber core (SCLC), plies and faces as indicated.
- B. Bullet Resistant Doors: Equivalent to type, with bonded structural composite lumber core (SCLC); rating; plies and faces as indicated above.

2.04 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: Match existing doors species and cut, veneer grade in accordance with quality standard indicated, with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
1. Vertical Edges: Any option allowed by quality standard for grade.
- B. Veneer Facing for Opaque Finish: Medium density overlay (MDO), in compliance with indicated quality standard.

2.05 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.

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- C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- 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.

2.06 FINISHES - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:
 - a. System - 12, Polyurethane, Water-based.
 - b. Stain: As selected by Architect.
 - c. Sheen: Flat.
 - 2. Opaque:
 - a. System - 12, Polyurethane, Water-based.
 - b. Color: As selected by Architect.
 - c. Sheen: Flat.
- B. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

- A. Hollow Metal Door Frames: See Section 081113.
- B. Glazed Openings:
 - 1. Laminated Safety Glass: Comply with 16 CFR 1201 test requirements for Category II.
- C. Door Window Frames: Door window frames with glazing securely fastened within door opening.
 - 1. Size: As indicated on drawings.
 - 2. Frame Material: 18 gauge, 0.0478 inch (1.21 mm), galvanized steel.
- D. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.
- E. Door Hardware: See Section 087100.

PART 3 EXECUTION

3.01 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.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. 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.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION 081416

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SECTION 083100 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall- and ceiling-mounted access units.

1.02 RELATED REQUIREMENTS

- A. Section 087100 - Door Hardware: Mortise cylinder and core hardware.
- B. Section 099123 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

- A. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- B. Shop Drawings: Indicate exact position of each access door and/or panel unit.
- C. Samples: Submit two access units, 12 by 12 inches (305 by 305 mm) in size indicating frame configuration.
- D. Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.
- E. Manufacturer's qualification statement.
- F. Installer's qualification statement.
- G. Project Record Documents: Record actual locations of each access unit.

1.05 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 work of the type specified and with at least three years documented experience.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Wall-Mounted Units:
 - 1. Location: As indicated on drawings.
 - 2. Panel Material: Aluminum extrusions with gypsum board inlay.
 - 3. Size: 12 by 12 inches (305 by 305 mm) unless otherwise indicated.
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

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5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
 6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
- B. Wall-Mounted Units in Wet Areas:
1. Location: As indicated on drawings.
 2. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
 3. Size: 12 by 12 inches (305 by 305 mm) unless otherwise indicated.
 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
 6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
- C. Wall-Mounted Security Units:
1. Location: As indicated on drawings.
 2. Panel Material: Steel.
 3. Size: 12 by 12 inches (305 by 305 mm) unless otherwise indicated.
 4. Door/Panel and Frame: Heavy duty.
 5. Security type lock as indicated.

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS

- 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. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
 - a. Multipurpose Access Panel: Activar/JL Industries TM.
 - b. Medium-Security (10 ga) Access Panel: Activar/JL Industries SP.
 2. ACUDOR Products Inc: www.acudor.com/#sle.
 - a. Wall- and Ceiling-Mounted Units: ACUDOR DW-5058.
 3. BAUCO Access Panel Solutions Inc: www.accesspanelsolutions.com/#sle.
 - a. Concealed Hardware and Gypsum Board Inlay - Regular Size: BAUCO Plus II - Access Panels.
 4. Karp Associates, Inc: www.karpinc.com/#sle.
 5. Larsen's Manufacturing Company; www.larsensmfg.com.
 6. MIFAB, Inc: www.mifab.com/#sle.
 7. Nystrom, Inc: www.nystrom.com/#sle.
 8. Substitutions: See Section 016000 - Product Requirements.
 9. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- B. Wall- and Ceiling-Mounted Units (**AD-1**): Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
1. Style: Exposed frame with door surface flush with frame surface.
 - a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
 2. Door Style: Single thickness with rolled or turned in edges.
 3. Frames: 16-gauge, 0.0598-inch (1.52 mm) minimum thickness.
 4. Single Steel Sheet Door Panels: 16-gauge, 0.0625-inch (1.6 mm) minimum thickness.
 5. Steel Finish: Primed.
 6. Door/Panel Size: As indicated on the drawings.

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7. Hardware:
 - a. Hinges: Concealed, constant force closure spring type.
 8. Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
 9. Style: Concealed frame with door surface flush with gypsum board surface.
 - a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
 10. Door Style: Single thickness with rolled or turned in edges.
 11. Frames: 16 gauge, 0.0598 inch (1.52 mm), minimum thickness.
 12. Single Steel Sheet Door Panels: 1/16 inch (1.6 mm), minimum thickness.
 13. Steel Finish: Primed.
 14. Hardware:
 - a. Hinges: Concealed, constant force closure spring type.
 - b. Latch/Lock: Tamperproof tool-operated cam latch.
 - c. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.
 - d. Gasketing: Extruded neoprene, around perimeter of door panel.
- C. Wall- and Ceiling-Mounted Units (**AD-2**): Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
1. Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
 2. Style: Concealed frame with door surface flush with gypsum board surface.
 - a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
 3. Door Style: Single thickness with rolled or turned in edges.
 4. Frames: 16 gauge, 0.0598 inch (1.52 mm), minimum thickness.
 5. Heavy Duty Frames: 14 gauge, 0.0747 inch (1.89 mm), minimum thickness.
 6. Single Steel Sheet Door Panels: 1/16 inch (1.6 mm), minimum thickness.
 7. Heavy Duty Single Steel Sheet Door Panels: 14 gauge, 0.0747 inch (1.89 mm), minimum thickness.
 8. Steel Finish: Primed.
 9. Stainless Steel Finish: No. 4 brushed finish.
 10. Aluminum Finish: Natural brushed.
 11. Hardware:
 - a. Hinges: Concealed, constant force closure spring type.
 - b. Latch/Lock: Screw driver slot for quarter turn cam latch.
 - c. Latch/Lock: Tamperproof tool-operated cam latch.
 - d. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.

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- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION 083100

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Exterior coiling doors.
- B. Electric operators and control stations.
- C. Wiring from electric circuit disconnect to operators and control stations.

1.02 RELATED REQUIREMENTS

- A. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. Section 260583 - Wiring Connections: Power to disconnect.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ITS (DIR) - Directory of Listed Products.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts.
- G. NEMA MG 1 - Motors and Generators.
- H. UL (DIR) - Online Certifications Directory.
- I. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide general construction, electrical equipment, and component connections and details.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

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- D. Samples: Two slats, 6 by 6 inches (150 by 150 mm) in size illustrating shape, color and finish texture.
- E. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.
- H. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.
- I. Specimen warranty.

1.05 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 work of type specified and with at least three years documented experience.
- C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified and indicated.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide five-year manufacturer warranty for three-ply multifilament polyester fabric curtain. Complete forms in Owner's name and register with manufacturer.
- C. Manufacturer Warranty: Provide 2-year manufacturer warranty for roller shaft counterbalance assembly. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Overhead Coiling Doors:
 - 1. Overhead Door Corporation; Model 625: <https://www.overheaddoors.com/>.
 - 2. Raynor Garage Doors; DuraCoil, Model IF: www.raynor.com/#sle.
 - 3. The Cookson Company; Model ESD30: www.cooksondoor.com/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.

2.02 COILING DOORS

- A. Exterior Coiling Doors Type OH-1: Steel slat curtain.

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1. Capable of withstanding positive and negative wind loads of 30 psf (1436 Pa) without undue deflection or damage to components.
2. Sandwich Slats: Manufacturer's standard, with core of foamed-in-place polyurethane insulation; minimum R-value of 8.1 (RSI-value of 1.43).
3. Nominal Slat Size: 2 inches (50 mm) wide by required length.
4. Finish: Factory painted, color as selected.
5. Guide, Angles: Galvanized steel.
6. Hood Enclosure: Manufacturer's standard; primed steel.
7. Electric operation.
8. Mounting: Within framed opening.
9. Locking Devices: Slide bolt on inside.

2.03 MATERIALS AND COMPONENTS

- A. Metal Curtain Construction: Interlocking 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 for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
 3. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
 4. Steel Slats: Minimum thickness, 24 gauge; ASTM A653/A653M galvanized steel sheet.
- B. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.
- C. Guides - Angle: ASTM A36/A36M metal angles, size as indicated.
1. Hot-dip galvanized in compliance with ASTM A123/A123M.
 2. Prime painted.
- D. Hood Enclosure and Trim: Internally reinforced to maintain rigidity and shape.
1. Minimum thickness; 24 gauge.
 2. Prime painted.
- E. Lock Hardware:
1. For motor operated units, additional lock or latching mechanisms are not required.
- F. 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.

2.04 ELECTRIC OPERATION

- A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
1. Provide interlock switches on motor operated units.
 2. Provide tamperproof operation cycle counter.
- B. Electric Operators:
1. Mounting: Side mounted.
 2. Motor Enclosure:

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- a. Exterior Coiling Doors: NEMA MG 1, Type 4; open drip proof.
 3. Motor Rating: 1/3 HP (250 W); continuous duty.
 4. Motor Voltage: 120 volts, single phase, 60 Hz.
 5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
 6. Controller Enclosure: NEMA 250, Type 4.
 7. Opening Speed: 12 inches per second (300 mm/sec).
 8. Brake: Manufacturer's standard type, activated by motor controller.
 9. Manual override in case of power failure.
 10. See Section 260583 for electrical connections.
- C. Control Station: Provide standard three button, 'Open-Close-Stop' momentary-contact control device for each operator complying with UL 325.
1. 24 volt circuit.
 2. Surface mounted, at at location indicated.
 3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
 - a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.
- D. Safety Edge: Located at bottom of coiling door, full width, electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that adjacent construction is suitable for door installation.
- B. Verify that electrical services have been installed and are accessible.
- C. Verify that door opening is plumb, header is level, and dimensions are correct.
- D. Notify Architect of any unacceptable conditions or varying dimensions.
- E. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.02 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 electrical service with Section 260583.
- F. Complete wiring from disconnect to unit components.

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G. Install enclosure and perimeter trim.

3.03 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch (1.6 mm).
- C. Maximum Variation From Level: 1/16 inch (1.6 mm).
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet (3.2 mm per 3 m) straight edge.

3.04 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

END OF SECTION 083323

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SECTION 085113 - ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Extruded aluminum windows with fixed sash and operating sash.
- B. Factory glazing.
- C. Operating hardware.
- D. Insect screens.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Rough opening framing.
- B. Section 079200 - Joint Sealants: Sealing joints between window frames and adjacent construction.
- C. Section 088000 - Glazing.

1.03 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights.
- B. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site.
- C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document).
- D. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- H. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- I. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

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- J. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Include component dimensions, information on glass and glazing, internal drainage details, and descriptions of hardware and accessories.
- C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, anchorage locations, and installation requirements.
- D. Samples:
 - 1. Framing: Two samples, 12 by 12 inch (300 by 300 mm) in size illustrating typical corner construction, accessories, and finishes.
 - 2. Sashes: Two samples, 12 by 12 inch (300 by 300 mm) in size illustrating typical corner construction, accessories, and finishes.
 - 3. Operating Hardware: Two samples of each type and finish.
- E. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
 - 1. Evidence of AAMA Certification.
 - 2. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.
- F. Test Reports: Prior to submitting shop drawings or starting fabrication, submit test report(s) by independent testing agency showing compliance with performance requirements in excess of those prescribed by specified grade.
- G. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.
- H. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- I. Manufacturer's qualification statement.
- J. Installer's qualification statement.
- K. Specimen warranty.

1.06 QUALITY ASSURANCE

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

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- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 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.

1.08 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.

1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Manufacturer Warranty: Provide 5-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units. Complete forms in Owner's name and register with manufacturer.
- D. Manufacturer Warranty: Provide 20-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: EFCO, LLC; XTherm 450X, fixed and project out: <https://efcocorp.com/>.
- B. Other Acceptable - Aluminum Windows Manufacturers:
 - 1. Kawneer North America: <https://www.kawneer.us/#sle>.
 - 2. Winco Window Company, Inc: www.wincowindow.com/#sle.
 - 3. Substitutions: See Section 016000 - Product Requirements.

2.02 BASIS OF DESIGN - AW PERFORMANCE CLASS WINDOWS

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 having Performance Class of AW, and Performance Grade at least as high as specified design pressure.

2.03 ALUMINUM WINDOWS

- A. Aluminum Windows: Extruded aluminum frame and sash, factory fabricated, factory finished, with operating hardware, related flashings, and anchorage and attachment devices.

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1. Operable Units: Double weatherstripped.
 2. Provide factory-glazed units.
 3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for operating hardware and imposed loads.
 4. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 5. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
 6. 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.
 7. Thermal Movement: Design to accommodate 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.
- B. Fixed, Non-Operable Type:
1. Construction: Thermally broken.
 2. Glazing: Double; clear; low-e.
 3. Exterior Finish: Class I color anodized.
- C. Outswinging Awning Type:
1. Construction: Thermally broken.
 2. Provide screens.
 3. Glazing: Double; clear; low-e.

2.04 PERFORMANCE REQUIREMENTS

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
1. Performance Class (PC): AW.
 2. Performance Grade (PG): Equivalent to or greater than specified design pressure.
- B. Design Pressure (DP): In accordance with applicable codes.
- C. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
- D. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, tested by independent agency in accordance with ASTM E1996 for Wind Zone 4 - Additional Protection for Large and Small Missile impact and pressure cycling at design wind pressure.
- E. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 12.11 psf (580 Pa).
- F. Air Leakage: 0.1 cfm/sq ft (0.5 L/sec sq m) maximum leakage per unit area of outside window frame dimension when tested at 1.57 psf (75 Pa) pressure difference in accordance with ASTM E283/E283M.
- G. Overall Thermal Transmittance (U-value): 0.35, maximum, including glazing, measured on window sizes required for this project.

2.05 COMPONENTS

- A. Glazing: See Section 088000.
 - 1. For Exterior Windows: Type IG-1.
- B. Sills: 0.080 inch (2 mm) thick, extruded aluminum; sloped for positive wash; fit under sash leg to 1/2 inch (12 mm) beyond wall face; one piece full width of opening; jamb angles to terminate sill end.
- C. Insect Screens: Extruded aluminum frame with mitered and reinforced corners; screen mesh taut and secure to frame; secured to window with adjustable hardware allowing screen removal without use of tools.
 - 1. Hardware: Spring loaded steel pins; four per screen unit.
 - 2. Screen Mesh: Vinyl-coated fiberglass, window manufacturer's standard mesh.
 - 3. Frame Finish: Same as frame and sash.
- D. Operable Sash Weatherstripping: Wool pile; permanently resilient, profiled to achieve effective weather seal.
- E. Fasteners: Stainless steel.
- F. Glazing Materials: See Section 088000.
- G. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.
 - 1. See Section 079200 for additional requirements.

2.06 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Concealed Steel Items: Profiled to suit mullion sections; galvanized in accordance with ASTM A123/A123M.

2.07 HARDWARE

- A. Sash lock: Lever handle with cam lock.
- B. Operator: Lever action handle fitted to projecting sash arms with limit stops.
- C. Projecting Sash Arms: Cadmium plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.
- D. Pulls: Manufacturer's standard type.
- E. Bottom Rollers: Stainless steel, adjustable.
- F. Limit Stops: Resilient rubber.

2.08 FINISHES

- A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A44, electrolytically deposited colored anodic coating not less than 0.7 mil (0.018 mm) thick.
- B. Finish Color: Black.
- C. Operator and Exposed Hardware: Enameled to color as selected from manufacturer's standard line.
- D. Apply one coat of bituminous coating to concealed aluminum and steel surfaces in contact with dissimilar materials.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 PRIME WINDOW INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Install window assembly in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
- C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- E. Install sill and sill end angles.
- F. Set sill members and sill flashing in continuous bead of sealant.
- G. 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.
- H. Install operating hardware not pre-installed by manufacturer.
- I. Install glass in accordance with requirements; see Section 088000.

3.03 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.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

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- B. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

- A. Adjust hardware for smooth operation and secure weathertight closure.

3.06 CLEANING

- A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.
- B. Remove protective material from factory finished aluminum surfaces.
- C. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.
- D. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.
- E. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION 085113

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SECTION 085653 - SECURITY WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Security view windows, with glazing.
- B. Detention windows, with glazing.

1.02 RELATED REQUIREMENTS

- A. Section 081113 - Hollow Metal Doors and Frames: Interior, non-ballistic- and non-forced-entry-rated steel windows.
- B. Section 092116 - Gypsum Board Assemblies: Bullet-resistant sheathing and wallboard for bullet-resistant partitions and walls.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- D. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.
- E. SSPC-Paint 33 - Coal Tar Mastic Coating, Cold-Applied.
- F. UL 752 - Standard for Bullet-Resisting Equipment.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Furnish anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, to be embedded into concrete or masonry, with setting diagrams and installation, to applicable installer in time for installation.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's published data showing materials, construction details, dimensions of components, and finishes.
- C. Shop Drawings: Drawings prepared specifically for this project, showing plans, elevations, sections, details of construction, anchorage to other work, hardware, and glazing.
 - 1. For new work show required opening dimensions and allowance for field deviation.

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- D. Test Reports: Test reports for specific window model and glazing to be furnished, showing compliance with specified requirements; window and glazing may be tested separately, provided window test sample adequately simulates the glazing to be used.
 - 1. Include testing agency qualifications.
 - 2. For structural, forced entry, and ballistic tests, provide details on method of anchorage to test frame.
- E. Samples:
 - 1. Actual sections of frame members, at least 12 inch (305 mm) long, showing finish, weatherstripping, and fasteners.
 - 2. Samples of each type of hardware and operator.
- F. Coordination Drawings: For each window opening, show locations and details of items necessary to anchor windows that must be installed by others, in sufficient detail that installer of those items can do so correctly without reference to the actual window itself.
- G. Manufacturer's Qualification Statement.
- H. Installer's Qualification Statement.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements for additional provisions.
 - 2. Extra Security Fasteners: At least one box for every 50 boxes, or fraction thereof, of each type and size installed; provide products matching those installed, packaged and labeled.
 - 3. Tool Kit: 6 sets of tools for security fasteners.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm with at least 5 years experience in the manufacture of windows of the type specified and able to provide test reports showing that their standard manufactured products meet the specified requirements; custom designed products not acceptable.
- B. Testing Agency Qualifications: Independent testing agency able to show experience in conducting tests of the type specified and:
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- D. Welder Qualifications: Qualified in accordance with AWS procedures for type of welding required.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Provide manufacturer's warranty agreeing to repair or replace windows and window components that fail within three years after Date of Substantial Completion due to, but not limited to, the following:
 - 1. Structural failure, failure of welds, and deterioration of metals and finishes beyond that expected under detention use and normal weathering.

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2. Failure of glazing due to excessive deflection of supporting members under wind load.
3. Faulty operation of hardware and operators.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Security Transaction Windows with Pass-Through Device:
1. Action Bullet Resistant.
 2. Armortex.
 3. North Americal Bullet Proof Inc.
 4. Substitutions: See Section 016000 - Product Requirements.
- B. Security Fasteners:
1. Acument Global Technologies: www.acument.com/#sle.
 2. Safety Socket Screw Corporation: www.safetysocket.com/#sle.
 3. Tamperproof Screw Co, Inc: www.tamperproof.com/#sle.
 4. Tamper-Pruf Screws, Inc: www.tamper-pruf-screws.com/#sle.
 5. Substitutions: See Section 016000 - Product Requirements.
- C. Provide windows from a single manufacturer.

2.02 ASSEMBLIES

- A. Security and Detention Windows:
1. Dimensions, profiles, features, and performance specified and indicated on drawings are required; do not deviate unless specifically approved by Architect under substitution procedures; see Section 016000.
 2. Design to fit openings indicated on drawings; design to accommodate deviation of actual construction from dimensions indicated on drawings.
 3. Fabricate frames and sash with corners mitered or coped full depth with concealed welded joints.
 4. Design anchorages to provide performance equivalent to that required for window unit; provide anchorages at least equivalent to those by which the tested units were anchored to the test frame.
 5. Design interface between frame and adjacent construction so that gap between them has at least the equivalent performance as specified for window; coordinate with anchorage requirements; custom testing is not required.
 6. Separate dissimilar metals to prevent corrosion by galvanic action by painting contact surfaces with primer or with sealant or tape recommended by manufacturer for the purpose.
 7. Weld components before finishing and in concealed locations, to greatest extent possible; minimize distortion and discoloration of finish; remove residue of welding; grind exposed welds smooth and finish to match.
 8. Label units to indicate which side is which, such as inside/outside or secure/non-secure; use labels that are removable after installation but durable enough not to be lost during delivery, storage, handling, and installation.

2.03 SECURITY TRANSACTION WINDOWS WITH PASS-THROUGH DEVICE

- A. Security Transaction Windows with Pass-Through Device:
1. Location: Built within exterior wall, as indicated on drawings.

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2. Type of Use: Walk-up.
3. Ballistic Resistance: Tested to meet UL 752, Level 4.
4. Window Type: Fixed.
 - a. Frame Material: Steel.
5. Glazing: Single (monolithic), clear, and ballistic resistant.
6. Pass-Through Device: Deal tray, non ricochet.
 - a. Material: Stainless steel, polished.
7. Products:
 - a. Action Bullet Resistant; Model STW-2: <https://www.actionbullet.com/> .
 - b. Armortex; Model W1-TW-HM-NV: www.Armortex.com/#sle.
 - c. North Americal Bullet Proof Inc; Shotgard Model EXTW:
 - d. Substitutions: See Section 016000 - Product Requirements.

2.04 ASSEMBLY COMPONENTS

- A. Formed Steel Framing: ASTM A1008/A1008M, Designation CS (commercial steel), cold-rolled steel sheet; 12 gauge, 0.1046 inch (2.66 mm) minimum thickness.
- B. Galvannealed Formed Steel Framing: ASTM A653/A653M galvannealed to A60/ZF180 coating; 12 gauge, 0.1046 inch (2.66 mm) minimum base metal thickness.
- C. Rolled Steel Framing: ASTM A36/A36M steel shapes, plates, and bars.
- D. Stainless Steel Framing: ASTM A666, Type 304; 14 gauge, 0.0781 inch (1.98 mm) minimum thickness.
- E. Frame Anchors: Mild steel plates, shapes, or bars, concealed in completed construction; provide anchorage devices as necessary to securely fasten windows to adjacent construction; use security fasteners for exposed anchors.
 1. Provide minimum of two anchors per side of window plus one additional anchor for each 18 inches (457 mm) or fraction thereof more than 36 inches (915 mm) in height or width.
- F. Glazing Seals: Factory installed; molded EPDM or neoprene compressible gaskets and compression strips.
- G. Security Fasteners: Operable only by tools produced by fastener manufacturer or manufacturer's licensee; head style appropriate to installation conditions, strength, and finish of materials being fastened; use countersunk heads wherever possible.
 1. Drive System: Use not more than one of the following:
 - a. 5-lobe Torx Plus socket head with security pin.
 - b. Standard Torx socket head with security pin.
 - c. Hex socket head with security pin.
 - d. Phillips head with security pin.
 - e. Two-hole drilled spanner head.
 - f. Notched spanner head.
 - g. One-way screw head.
 2. On Steel: Heat-treated alloy steel, with zinc chromate coating at exterior locations and interior wet locations.
 3. On Stainless Steel: Stainless steel, Type 304.

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- H. Deal Trays: Formed stainless steel, recessed into counter or sill for mounting under glazing frame.
 - 1. Style: Ricochet-resistant, with recessed bullet trap on secure side, with sliding cover.
 - 2. Clear Opening Height: 1-1/2 inches (38 mm).
 - 3. Tray Dimensions: 12 by 8 inches (305 by 203 mm), wide by deep.
 - 4. Listed and labeled by UL as bullet resisting to UL 752 same level as window.
- I. Bituminous Paint: Cold-applied asbestos-free asphalt mastic, complying with SSPC-Paint 33; 30 mils, 0.030 inch (0.76 mm) minimum thickness per coat.

2.05 FINISHES

- A. Primed Finish on Steel:
 - 1. Cleaned using white metal blast cleaning as specified in SSPC-SP 5.
 - 2. Zinc phosphate pretreatment; lead- and chromate-free corrosion resistant primer compatible with a wide range of field-applied top coats.
- B. Polished Stainless Steel Finish:
 - 1. Polished as specified, without tool or die marks, stretch lines, or scratches, with grain running in long dimension of each piece.
 - 2. Passivated, rinsed, and chemically clean.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that window openings are ready for installation of windows.
- B. Notify Architect if conditions are not suitable for installation of windows; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and drawing details.
- B. Install windows in correct orientation (inside/outside or secure/non-secure).
- C. Anchor windows securely in manner so as to achieve performance specified.
- D. Separate metal members from concrete and masonry using bituminous paint.
- E. Set sill members and sill flashing in continuous bead of sealant.

3.03 CLEANING

- A. Clean exposed surfaces promptly after installation without damaging finishes.
- B. Remove and replace defective work.

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3.04 CLOSEOUT ACTIVITIES

- A. Demonstrate operation and maintenance to designated Owner personnel.

END OF SECTION 085653

SECTION 087163 - DETENTION DOOR HARDWARE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes detention door hardware for the following:
 - 1. Card accessed, swinging detention doors.
- B. Related Requirements:
 - 1. Section 013513.16 "Special Project Procedures for Detention Facilities" for general requirements for detention work.

1.03 COORDINATION

- A. Templates: Obtain and distribute, to the parties involved, templates for detention doors, frames, and other work specified to be factory prepared for installing detention door hardware.
- B. Electrical System Roughing-In: Coordinate layout and installation of electrically powered detention door hardware with connections to power supplies and building control system.

1.04 PREINSTALLATION MEETINGS

- A. Detention Keying Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." In addition to Owner, Contractor, and Architect, conference participants shall also include Installer. Incorporate detention keying conference decisions into Project's final Detention Keying Schedule after reviewing detention door hardware keying system including, but not limited to, the following:
 - 1. Preliminary key system schematic diagram.
 - 2. Requirements for key-control system.
 - 3. Requirements for access control.
 - 4. Address for delivery of keys.
- B. Preinstallation Conference: Conduct conference at Project site .
 - 1. Inspect and discuss power and control system roughing-in and other preparatory work performed by other trades.
 - 2. Review sequence of operation for each type of detention door hardware.
 - 3. Review and finalize a construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Certifying procedures.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of detention door hardware.

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- B. Shop Drawings: For each type of detention door hardware.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include diagrams for power, signal, and control wiring; differentiate between manufacturer-installed and field-installed wiring for detention door hardware. Include the following:
 - a. System schematic.
 - b. Point-to-point wiring diagram, including location of connections.
 - c. Riser diagram.
 - d. Elevation of each door type.
 - 3. Detail interface between electrically powered detention door hardware and building control system.
- C. Detention Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware as well as installation procedures and wiring diagrams. Coordinate the Detention Door Hardware Schedule with detention doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of detention door hardware.
 - 1. Integrate detention door hardware indicated in "Detention Door Hardware Schedule" Article into Project's final Detention Door Hardware Schedule, and indicate complete designations of every item required for each detention door and opening.
 - 2. Keying Schedule: Coordinate detention keying with other door hardware in Project's final Keying Schedule.
 - 3. Indicate each detention lock and type of key cylinder using the following prefixes: "P" for paracentric, "M" for mogul, "HS" for high security, and "C" for commercial.
 - 4. Indicate security level of each item.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer, supplier, and Architectural Hardware Consultant.
- B. Product Certificates: For each type of detention door hardware.
 - 1. Certify that detention door hardware complies with listed fire door assemblies.
- C. Product Test Reports: For each type of detention lock and latch, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Examination reports documenting inspections of substrates, areas, and conditions.
- E. Anchor inspection reports documenting inspections of built-in and cast-in anchors.
- F. Field quality-control reports documenting inspections of installed products.
 - 1. Field quality-control certification signed by Contractor.
- G. Sample Warranties: For special warranties.

1.07 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For detention door hardware to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

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- a. Normal remote security operation.
- b. Normal local security operation.
- c. Emergency security operation.

1.08 MAINTENANCE MATERIAL SUBMITTALS

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of detention door hardware.
- B. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of detention door hardware Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper detention door hardware operation. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.
- C. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Detention Door Hardware: .
 - 2. Electrical Parts: .
 - 3. Security Fasteners: Furnish not less than one box for every 50 boxes or fraction thereof, of each type and size of security fastener installed.
 - 4. Tools: Provide two sets of tools for installing and removing security fasteners.

1.09 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer and an authorized representative of detention door hardware manufacturer for installation and maintenance of units required for this Project.
- B. Supplier Qualifications: Detention door hardware supplier with warehousing facilities in Project's vicinity who is, or employs, a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about detention door hardware and keying.
 - 1. Detention Door Hardware Supplier Qualifications: An experienced detention door hardware supplier who has completed projects with electrically powered detention door hardware similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable to manufacturer of primary materials.
 - a. Engineering Responsibility: Prepare data for electrically powered detention door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
 - b. Scheduling Responsibility: Preparation of Detention Door Hardware and Keying schedules.
- C. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for detention door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
 - 1. Architectural Hardware Consultant (AHC) who is also an Electrified Hardware Consultant (EHC).

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Inventory detention door hardware on receipt and provide secure lockup for detention door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the Detention Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver detention door keys to Owner.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of detention door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of operators and detention door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering or detention use.
 - 2. Warranty Period: Three years from date of Substantial Completion.

1.12 REFERENCE STANDARDS

- A. UL - Underwriters' Laboratories.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Swinging Detention Door Assemblies: Provide detention door hardware as part of a detention door assembly that complies with security grade indicated, when tested according to ASTM F 1450, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.
 - 1. Tool-Attack Resistance: Comply with small-tool-attack-resistance rating when tested according to UL 1034 and UL 437; where indicated [on Drawings] [in door schedule].

2.02 DETENTION DOOR HARDWARE, GENERAL

- A. Provide detention door hardware for each door as scheduled in "Detention Door Hardware Schedule" Article to comply with requirements in this Section.
 - 1. Detention Door Hardware Sets: Provide quantity, item, size, finish, or color indicated.
 - 2. Sequence of Operation: Provide electrically powered detention door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Electrically Powered Detention Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Detention Door Hardware Control and Monitoring: Provide detention door hardware with features, functions, and internal equipment required to perform control and monitoring functions indicated in Section 284619 "PLC Electronic Detention Monitoring and Control Systems."

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- D. Source Limitations: Obtain mechanical detention door hardware from same manufacturer as that of electrically powered or pneumatic detention door hardware.
- E. Regulatory Requirements:
 - 1. Fire-Rated Detention Door Assemblies: Provide detention door hardware for assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 2. Where indicated to comply with accessibility requirements, comply with 2010 ADA Standards for Accessible Design and ICC A117.1 .

2.03 DETENTION HINGES

- A. Full-Surface Detention Hinges: Extra heavy weight; two heavy-duty thrust bearings with hardened-steel ball bearings; fabricated from steel plate; 3/4-inch- (19-mm-) diameter, case-hardened, fully welded, steel hinge pin.
 - 1. Leaves: Drilled for countersunk security fasteners.
 - 2. Size: Minimum 5 by 5-1/4 by 1/2 inch (127 by 133 by 13 mm).
 - 3. Security Grade: 2 according to ASTM F 1758.
 - 4. Finish: BHMA 600.

2.04 MECHANICAL DETENTION LOCKS AND LATCHES

- A. Lock Mountings:
 - 1. Hollow-Metal Detention Doors: Mount detention lock to back of [0.179-inch (4.56-mm) nominal-thickness steel] [0.183-inch (4.65-mm) nominal-thickness, galvanized-steel] cover plate for installation in lock pocket fabricated into detention door. Attach cover plate to hollow-metal detention door with security fasteners.
- B. Mechanical Snaplatches, Paracentric Cylinder:
 - 1.
 - 2. Function: Automatic snaplatch when door is closed (slam locking); latchbolt retracted by half turn and extended by full turn in opposite direction of [five] [six]-tumbler paracentric cylinder; keyed [one side] [two sides].
 - a. Knob operation retracts latchbolt unless deadlocked. Locate knobs on [one side] [two sides].
 - 3. Latchbolt: 2-inch-high by 3/4-inch- (51-mm-high by 19-mm-) thick steel, with two case-hardened-steel insert pins; 3/4-inch (19-mm) throw; [1/2-inch (13-mm)] [1-1/4-inch (32-mm)] bolt projection when retracted.
 - 4. Listed and labeled for use on fire doors.
 - 5. Security Grade: [1] [2] [3] [4] according to ASTM F 1577.
- C. Mechanical Deadlatches/Deadlocks, Paracentric Cylinder:
 - 1.
 - 2. Function: Automatic snaplatch and automatic deadlock through action of actuator when door is closed (slam locking); latchbolt retracted by [five] [six]-tumbler paracentric cylinder; keyed [one side] [two sides].
 - 3. Latchbolt: 2-inch-high by 3/4-inch- (51-mm-high by 19-mm-) thick steel, with two case-hardened-steel insert pins; 3/4-inch (19-mm) throw; [1/2-inch (13-mm)] [1-1/4-inch (32-mm)] bolt projection when retracted.

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4. Deadlock Actuator: 3/4-inch-high by 3/4-inch- (19-mm-high by 19-mm-) thick steel; 1/2-inch (13-mm) throw.
5. Listed and labeled for use on fire doors.
6. Security Grade: [1] [2] [3] [4] according to ASTM F 1577.

2.05 ELECTROMECHANICAL DETENTION LOCKS AND LATCHES

- A. Connectors: Provide electromechanical detention locks and latches with factory-wired plug connector with 6-inch (152-mm) wire pigtail.
1. Provide security ring for installation of electromechanical detention lock in hollow-metal detention frame, welded to frame or access cover.
 2. Equip direct-current, solenoid-operated detention locks and latches with diode transient voltage protection at each locking device.
- B. Motor-Operated Deadlatches, Mogul Cylinder:
1. Function: Remote switch activates electric motor that retracts latchbolt; automatic latching and deadlocking when door is closed (slam locking). Latchbolt can be mechanically retracted by mogul cylinder; keyed one side.
 - a. Latchback: Latchbolt remains retracted until door is opened 2 inches (51 mm), then releases .
 - b. If power fails, latchbolt automatically deadlocks (fail secure).
 2. Latchbolt: 1-1/2-inch-high by 3/4-inch- (38-mm-high by 19-mm-) thick hardened steel; 1-inch (25-mm) throw.
 3. Provide internal deadlock indicator switch.
 4. Provide roller-type deadlock actuator.
 5. Voltage: 120-V ac.
 6. Security Grade: 1 and 2 according to ASTM F 1577.

2.06 DETENTION LOCK TRIM

- A. Levers: Solid stainless steel.
- B. Knobs: Stainless steel.
- C. Escutcheons for Paracentric Locks: 0.125-inch- (3.18-mm-) thick, 3-inch- (75-mm-) diameter stainless steel with BHMA 630 finish. Attach with security fasteners.
1. Style: Single or double wing as required by lock function.
- D. Cylinder Shields for Paracentric Locks: 0.125-inch- (3.18-mm-) thick, 3-inch- (75-mm-) diameter stainless steel with BHMA 630 finish and swinging cover to protect keyhole. Attach with security fasteners.
1. Style: Single or double wing as required by lock function.

2.07 DETENTION CYLINDERS AND KEYING

- A. Source Limitations: Subject to compliance with requirements, provide cylinders and keying for paracentric and mogul cylinders by same manufacturer as for detention locks and latches.
- B. Paracentric Cylinders: Manufacturer's standard lever-tumbler type, constructed from one-piece spring-tempered brass; with tumblers activated by phosphor bronze springs; five tumblers per lock.

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- C. Keying System: Provide a factory-registered keying system complying with the following requirements:
 - 1. Paracentric cylinders operated by change keys only.
- D. Keys: Provide cast silicon-bronze copper alloy keys complying with the following:
 - 1. Stamping: Permanently inscribe each key with a visual key-control number and include the following notation:
 - a. "DO NOT DUPLICATE."
 - 2. Quantity: In addition to one extra blank key for each lock, provide the following:
 - a. Cylinder Change Keys: Three .

2.08 SWITCHES

- A. General: Provide switches configured with contact type required for functions indicated, including multiple circuiting where required by functional performance of Section 284619 "PLC Electronic Detention Monitoring and Control Systems."
- B. Concealed, Mechanical Door Position Switches: Consist of metal track mortised into head of detention door connected by steel actuator arm to steel actuator mortised into frame; switch fully concealed when door is in closed position; with stainless-steel faceplate; 120-V ac; factory wired with plug connector. Action of door mechanically activates switch. Wire in series with lock monitors. Attach with security fasteners.
 - 1.
- C. Strike Indicator Switches: Designed to be mortised behind strike and to indicate whether door is locked or unlocked; enclosed in metal strike box. Wire in series with door position switches. Attach with security fasteners.
 - 1. Voltage: 120-V dc.
 - 2. Locations: Where indicated.
 - 3. Manufacturer: Same as detention lock.

2.09 DETENTION OPERATING TRIM

- A. Standard: BHMA A156.6, Grade 1.

2.10 DETENTION DOOR STOPS

- A. Detention Floor Stops: 1-1/2-inch-high by 2-inch- (38-mm-high by 51-mm-) diameter, rubber bumper mounted on steel lag bolt; BHMA A156.16; install in floor with nonshrink grout; for detention doors unless wall or other type stops are indicated. Do not mount floor stops where they can impede traffic.
- B. Silencers for Detention Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum 1/2-inch (13-mm) diameter; fabricated for drilled-in application to detention door frame. Attach with security fasteners.

2.11 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by Architect.

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- B. Base Metals: Produce detention door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified detention door hardware units and BHMA A156.18 finishes.
- C. Fasteners: Provide flat-head security fasteners with finished heads to match surface of detention door hardware.
 - 1. Security Fasteners: Fabricate detention door hardware using security fasteners with head style appropriate for fabrication requirements, strength, and finish of adjacent materials.
 - 2. Steel Machine Screws: For the following fire-rated applications:
 - a. Mortise detention hinges to detention doors.
 - b. Strike plates to detention frames.
 - c. Security door closers to detention doors and frames.
 - 3. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:
 - a. Surface detention hinges to detention doors.
 - b. Security door closers to detention doors and frames.
 - 4. Spacers Bolts: For through bolting of hollow-metal detention doors.
- D. Detention Lock Construction: Fabricate detention lock case and cover plate from steel plate. Fabricate bolts from solid sections; laminated construction is unacceptable.

2.12 HARDWARE FINISHES

- A. Standard: Comply with BHMA A156.18.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. BHMA Designations: Comply with base material and finish requirements indicated by the following:
 - 1. BHMA 600: Primed for painting, over steel base metal.
 - 2. BHMA 606: Satin brass, clear coated, over brass base metal.
 - 3. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
 - 4. BHMA 630: Stainless steel, satin, over stainless-steel base metal.
 - 5. BHMA 633: Satin brass plated, clear coated, over steel base metal.
 - 6. BHMA 652: Satin chromium plated over nickel, over steel base metal.

2.13 SECURITY FASTENERS

- A. Operable only by tools produced by fastener manufacturer or other licensed fabricator for use on specific fastener type. Provide drive-system type, head style, material, and protective coating as required for assembly, installation, and strength, and as follows:
 - 1. Fastener Strength: 120,000 psi (827 MPa).
 - 2. Socket Flat Countersunk Head Fasteners:
 - a. Heat-treated alloy steel, ASTM F 835 (ASTM F 835M).
 - b. Stainless steel, ASTM F 879 (ASTM F 879M), Group 1 CW.
 - 3. Protective Coatings for Heat-Treated Alloy Steel:
 - a. Zinc and clear trivalent chromium where indicated.
 - b. Zinc phosphate with oil, ASTM F 1137, Grade I, or black oxide unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine detention doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of detention door hardware connections before detention door hardware installation.
- C. Inspect built-in and cast-in anchor installations, before installing detention door hardware, to verify that anchor installations comply with requirements. Prepare inspection reports.
 - 1. Remove and replace anchors where inspections indicate that they do not comply with specified requirements. Reinspect after repairs or replacements are made.
 - 2. Perform additional inspections to determine compliance of replaced or additional work.
- D. Verify locations of detention door hardware with those indicated on Shop Drawings.
- E. Examine roughing-in for electrical power[and pneumatic] systems to verify actual locations of connections before detention door hardware installation.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Steel Detention Doors and Frames: Comply with BHMA A156.115 Series.
 - 1. Surface-Applied Detention Door Hardware: Drill and tap detention doors and frames according to SDI A250.6.

3.03 INSTALLATION

- A. Mounting Heights: Mount detention door hardware units at heights indicated in DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
- B. Install each detention door hardware item to comply with Shop Drawings and manufacturer's written instructions. Where cutting and fitting are required to install detention door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinge Installation:
 - 1. Security Fasteners: Provide socket flat countersunk head machine screws; finish screw heads to match surface of detention hinges. Install into drilled and tapped holes.
- D. Install interconnecting wiring and connectors between detention door hardware devices. Terminate device wiring for detention door hardware installed in swinging doors at a plug-type

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connector located in lock pocket or door frame junction box.

- E. Security Fasteners: Install detention door hardware using security fasteners with head style appropriate for installation requirements, strength, and finish of adjacent materials.

3.04 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
- B. Perform the following tests and inspections:
 - 1. After installing electrically powered detention door hardware and after electrical circuitry has been energized, test detention door hardware for compliance with requirements.
 - a. Test: Operate lock of each door and group of doors in normal remote, normal local, and emergency operating modes. Verify that remote controls operate correct door locks and in correct sequence.
 - 2. Verify that lock bolts engage strikes with required bolt projection.
 - 3. Verify that detention door hardware is installed, connected, and adjusted according to the Contract Documents.
 - 4. Verify that electrical wiring installation complies with manufacturer's submittal and written installation requirements.
- C. Detention work will be considered defective if it does not pass tests and inspections.
- D. Perform additional inspections to determine compliance of replaced or additional work.
- E. Prepare field quality-control certification that states installed products comply with requirements in the Contract Documents.
- F. Prepare test and inspection reports.

3.05 ADJUSTING

- A. Adjust and check each operating item of detention door hardware and each detention door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust detention door-control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

3.06 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by detention door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that detention door hardware is without damage or deterioration at time of Substantial Completion.

3.07 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain detention door hardware and detention door hardware finishes.

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3.08 DETENTION DOOR HARDWARE SCHEDULE

A. General: Provide detention door hardware for each detention door to comply with requirements in this Section and with detention door hardware sets indicated below.

B. Hardware Set No. xx

Quantity	Item
3	Full-Surface detention hinges
1	Swinging Door, Motor-operated Deadlatches, Mortise Cylinder (2-inch frame width)
1	Flush Door Pull (Prisoner side)
1	Knob Pull (Officer side)
3	Silencers
1	Detention Door Stop

END OF SECTION 087163

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SECTION 088000 - GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Plastic films.
- C. Glass coatings.
- D. Miscellaneous glazing compounds.

1.02 RELATED REQUIREMENTS

- A. Section 072700 - Air Barriers.
- B. Section 079200 - Joint Sealants: Sealants for other than glazing purposes.
- C. Section 081113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.
- D. Section 081416 - Flush Wood Doors: Glazed lites in doors.
- E. Section 088300 - Mirrors.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- F. ASTM C1036 - Standard Specification for Flat Glass.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- H. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
- J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings.
- K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

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- L. GANA (GM) - GANA Glazing Manual.
- M. GANA (SM) - GANA Sealant Manual.
- N. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.
- O. NFRC 100 - Procedure for Determining Fenestration Product U-factors.
- P. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
- Q. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.

1.04 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.06 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data on each Glazing Type: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 12 by 12 inch (305 by 305 mm) in size of glass and plastic units.
- E. Accessory Samples: Submit 12 inch (305 mm) long each product specified, including molded corners for gaskets, color as selected. Submit samples of fire knock-out decals or markings, if required by Architect.
- F. Certificate: Certify that products of this section meet or exceed specified requirements.
- G. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

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- H. Installer's qualification statement.
- I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Insulating Glass Units: One of each glass size and each glass type.
- K. Maintenance Data: For inclusion in maintenance manual in accordance with Division 01 Sections for close-out submittals, including the following:
 - 1. Manufacturer's instructions for maintenance of installed work.
 - 2. Precautions for cleaning products and methods which may be detrimental to finishes and performance.

1.07 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM) and IGMA TM-3000 for glazing installation methods.
- B. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved and certified by primary glass manufacturer.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
 - 1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
 - a. Insulating Glass Certification Council (IGCC).
- D. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years documented experience and certified by the manufacturer.
 - 1. Provide company, field supervisors, and installers that hold active accredited certifications in the following:
 - a. North American Contractor Certification (NACC) for glazing contractors.
 - b. NGS's Certified Glass Installer Program.

1.08 MOCK-UPS

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Provide on-site glazing mock-up with the specified glazing components.
- C. Locate where directed.
- D. Mock-ups may remain as part of the Work, if approved.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.10 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.11 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, crazing, delaminating, uneven color fade, and other indications of deterioration in coating.
 - 1. Low-e Coated Units: Provide a ten (10) year manufacturer warranty from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Insulating Glass Units: Provide a ten (10) year manufacturer warranty from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Source Limitations for Glass: Obtain each glass type from single source from single manufacturer.
- B. Float Glass Manufacturers:
 - 1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
 - 2. Guardian Glass, LLC: www.guardianglass.com/#sle.
 - 3. Pilkington North America Inc: www.pilkington.com/na/#sle.
 - 4. Saint Gobain North America: www.saint-gobain.com/#sle.
 - 5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
 - 6. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

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- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to verify glazing sizes and thicknesses shall withstand external loads implied within this Section.
- C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:
 - 1. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - a. Design Pressure: Calculated in accordance with ASCE 7.
 - b. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - c. Seismic Loads: Design and size glazing components to withstand seismic loads and sway displacement in accordance with the requirements of ASCE 7
 - d. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - e. Glass thicknesses listed are minimum.
 - 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
 - 3. Thermal Loads: Design glazing to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units.
- D. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
 - 1. In conjunction with weather barrier related materials described in other sections, as follows:
 - a. Air Barriers: See Section 072700.
 - 2. To utilize inner pane of multiple pane insulating glass units for continuity of air barrier seal.
- E. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 - 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
 - 2. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

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- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.
- D. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 - 2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
 - 3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 - 4. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I criteria.
 - 5. Low-E-Coated Vision Glass: ASTM C1376.
 - 6. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 - 7. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.
 - 8. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.04 GLASS FABRICATION, GENERAL

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- B. Do not nip glass edges. Do not cut, seam, nip, or abrade glass after heat treating.
- C. Edges may be wheel cut or sawed and seamed at fabricator's option.
- D. Grind smooth and polish exposed edges and corners.
- E. Clean-cut or flat-grind vertical edges of butt glazed monolithic glass to product square edges with slight bevels at junction with faces of glass.
- F. Source Quality Control: Fabricator shall, through its own laboratory testing, perform source quality control testing to establish compliance with specified requirements.

2.05 INSULATING GLASS UNITS

- A. Manufacturers:
1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
 2. Guardian Glass, LLC: www.guardianglass.com/#sle.
 3. Pilkington North America Inc: www.pilkington.com/na/#sle. Pilkington North America Inc: www.pilkington.com/na/#sle.
 4. Viracon, Apogee Enterprises, Inc: www.viracon.com/#sle.
 5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
 6. Substitutions: See Section 016000 - Product Requirements.
- B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
- C. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 3. Warm-Edge Spacers: Low-conductivity thermoplastic with desiccant warm-edge technology design.
 - a. Spacer Width: As required for specified insulating glass unit.
 - b. Spacer Height: Manufacturer's standard.
 - c. Products:
 - 1) H.B. Fuller Construction Products Inc; Kodispace 4SG: www.hbfuller.com/#sle.
 - 2) Quanex IG Systems, Inc; Super Spacer TriSeal: www.quanex.com/#sle.
 - 3) Technoform Glass Insulation; TGI-Spacer: www.glassinsulation.us/#sle.
 - 4) Substitutions: See Section 016000 - Product Requirements.
 4. Spacer Color: Black.
 5. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
 - b. Color: Black.
 6. Purge interpane space with dry air, hermetically sealed.
- D. Type **IG-1** - Insulating Glass Units: Vision safety glass, low-e, double glazed.
1. Basis of Design - Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
 2. Applications: Exterior glazing as indicated.
 - a. Glazed lites in exterior doors.
 - b. Other locations indicated on drawings.
 3. Space between lites filled with argon.
 4. Outboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E (passive type), on #2 surface.
 5. Warm-edge spacer.
 6. Inboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
 - a. Tint: Clear.

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7. Total Thickness: 1 inch (25.4 mm).
8. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.29, nominal.
9. Visible Light Transmittance (VLT): 70 percent, nominal.
10. Solar Heat Gain Coefficient (SHGC): 0.39, nominal.
11. Visible Light Reflectance, Outside: 70 percent, nominal.
12. Glazing Method: Dry glazing method, gasket glazing.

E. Substitution Procedures:

1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.06 GLAZING COMPOUNDS

- A. Type GC-2 - Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.
- B. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; _____ color.
- C. Manufacturers:
 1. Dow Corning Corporation: www.dowcorning.com/construction/#sle. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
 2. Momentive Performance Materials, Inc: www.momentive.com/#sle.
 3. Pecora Corporation: www.pecora.com/#sle.
 4. Tremco Commercial Sealants & Waterproofing; Proglaze: www.tremcosealants.com/#sle.
 5. Substitutions: See Section 016000 - Product Requirements.

2.07 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C1115, Type C. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
- D. Glazing Gaskets: Resilient EPDM or silicone extruded shape to suit glazing channel retaining slot; color black.
 1. Interior and exterior gasket profiles to be designed to product a glass edge pressure of 10 pounds per linear inch.
 2. Types:
 - a. Dense Wedge Gaskets:
 - 1) Dense EPDM: ASTM C864, Option 1.
 - 2) Silicone: ASTM C1115, Type C, Class F.

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- 3) Hardness: 75 ± 5 for hollow profiles and 65 ± 5 for solid profiles, Shore A durometer according to ASTM D2240.
- 3. Fabrication: Continuous, one-piece gaskets both sides of glass with factory formed injection molded corners to properly fit openings, with allowance for stretch during installation and with continuous mechanical engagement to framing members.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.

3.02 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.03 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry immediately before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.04 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

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- C. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- D. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- E. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- F. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- G. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.
- H. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- I. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- J. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch- (3-mm-) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- K. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.
- L. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- M. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- N. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- O. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.
- P. Installing Glass: Set in true to plane with proper clearances.
 - 1. Sealed Insulating Glass Units:
 - a. Set with void between edge of unit and glazing channels and rabbets.
 - b. Do not use glazing materials that can damage perimeter seal of unit.
 - c. Conceal edge binding of unit by gaskets.

2. Heat Treated Glass: Conceal tong marks by gaskets. Roller marks to be in the horizontal position; mixing direction is not acceptable.
3. Glass Bite: Set glass so that required bite will be achieved.
4. Gaskets: Provide factory molded corners.

3.05 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.06 INSTALLATION - DRY GLAZING METHOD (TAPE AND GASKET SPLINE GLAZING)

- A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.
- B. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- D. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- E. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- F. Carefully trim protruding tape with knife.

3.07 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- C. Monitor and report installation procedures and unacceptable conditions.

3.08 CLEANING

- A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.
- B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

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- C. Remove nonpermanent labels immediately after glazing installation is complete.
- D. Clean glass and adjacent surfaces after sealants are fully cured.
- E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.09 PROTECTION

- A. Do not mark installed glass with an "X", or other symbol, or with any material. Tapes or banners may be fastened to the frame head and suspended over glass. Stickers, separators or glass identification markings applied to glass shall be on the inboard surface.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion. Glass replacement shall be at no cost to the Owner.

END OF SECTION 088000

SECTION 088300 - MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glass mirrors.
 - 1. Annealed float glass.

1.02 RELATED REQUIREMENTS

- A. Section 102800 - Toilet, Bath, and Laundry Accessories: Metal mirror frames.

1.03 REFERENCE STANDARDS

- A. ASTM C1036 - Standard Specification for Flat Glass.
- B. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- C. GANA (GM) - GANA Glazing Manual.
- D. GANA (SM) - GANA Sealant Manual.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Samples: Submit two samples, 6 x 6 inch (150 x 150 mm) in size, illustrating mirrors edging and coloration.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.
 - 1. Maintain one copy on project site.
- B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.

1.06 FIELD CONDITIONS

- A. Do not install mirrors when ambient temperature is less than 50 degrees F (10 degrees C).

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- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Mirrors:
 - 1. Binswanger Mirror/ACI Distribution: www.binswangerglass.com/#sle.
 - 2. Lenoir Mirror Co: www.lenoirmirror.com/#sle.
 - 3. Trulite Glass and Aluminum Solutions: www.trulite.com/#sle.
 - 4. Walker Glass Company Ltd; Walker Glass Mirrors: www.walkerglass.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

- A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.
- B. Mirror Glass; Type M-1: Clear, annealed float glass; ASTM C1036, with copper and silver coatings, and protective overcoating.
 - 1. Thickness: 1/4 inch (6.4 mm).
 - 2. Edges: Arrised.
 - 3. Size: As indicated on drawings.

2.03 ACCESSORIES

- A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.
- B. Glazing Tape: Preformed butyl compound; 10 to 15 Shore A durometer hardness; on release paper.
- C. Mirror Attachment Accessories: Stainless steel clips.
- D. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.
 - 1. Application Temperature: Minus 35 to 140 degrees F (Minus 37 to 60 degrees C) at contact surfaces.
 - 2. Volatile Organic Content (VOC): Less than 7 percent by weight.
- E. Channel Frame: One piece, channel frame, stainless steel, Type 430, satin finish, 1/2 inch by 1/2 inch by 3/8 inch deep (12.7 mm by 12.7 mm by 9.5 mm deep) with 90 degree mitered corners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Prepare installation in accordance with ASTM C1193 for solvent release sealants, and install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION

- A. Install mirrors in accordance with manufacturer's recommendations.
- B. Set mirrors plumb and level, and free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.
- D. Installation in Frames:
 - 1. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
 - 2. Place setting blocks at one-quarter points with edge block no more than 6 inches (152 mm) from corners.
 - 3. Rest mirrors on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
 - 4. Place glazing tape on free perimeter of mirrors in same manner described above.
 - 5. Trim protruding tape edge.

3.04 CLEANING

- A. Remove wet glazing materials from finish surfaces.
- B. Remove labels after work is complete.
- C. Clean mirrors and adjacent surfaces.

END OF SECTION 088300

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SECTION 088800 - SPECIAL FUNCTION GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Laminated security glazing units.

1.02 RELATED REQUIREMENTS

- A. Section 081113 - Hollow Metal Doors and Frames.
- B. Section 085659 - Service and Teller Window Units: Glazing provided as part of security assembly.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- E. ASTM C1036 - Standard Specification for Flat Glass.
- F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass.
- G. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- H. GANA (GM) - GANA Glazing Manual.
- I. GANA (LGRM)
- J. GANA (SM) - GANA Sealant Manual.
- K. UL 752 - Standard for Bullet-Resisting Equipment.
- L. UL 972 - Standard for Burglary Resisting Glazing Material.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene preinstallation meeting one week before starting work of this section; require attendance by each affected installer.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.

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- B. Product Data on Glass and Polycarbonate Laminated Glazing Types: Provide structural, physical, and environmental characteristics, size limitations, special handling, and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, and special application requirements. Identify available colors.
- D. Samples: Two , 6 by 6 inches (150 by 150 mm) in size.
- E. Samples: One bead of glazing sealant, 6 inch (150 mm) in size, color as selected.
- F. Certificate: Certify that products of this section meet or exceed specified requirements.
- G. Manufacturer's qualification statement.
- H. Fabricator's qualification statement.
- I. Installer's qualification statement.
- J. Testing agency's qualification statement.
- K. Executed warranty.
- L. Specimen warranty.
- M. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements for additional provisions.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with GANA (GM), GANA (LGRM), and GANA (SM) for glazing installation methods. Maintain one copy on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.
 - 1. Provide certified glass products through ANSI-accredited certifications that include plant audits and independent laboratory performance testing.
 - a. Safety Glazing Certification Council (SGCC).
- C. Fabricator Qualifications: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
- D. Installer Qualifications: Company specializing in performing work of type specified and with at least three years documented experience.
 - 1. Provide company, field supervisors, and installers with active ANSI-accredited certifications in appropriate categories for work specified.
 - a. North American Contractor Certification (NACC) for glazing contractors.
 - b. Equivalent independent third-party ANSI-accredited certification.

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- E. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

1.07 MOCK-UPS

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Provide mock-up of door with security glazing including glass.
- C. Locate where directed.
- D. Mock-ups may remain as part of work.

1.08 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).
- B. Maintain minimum ambient temperature before, during, and 24 hours after installation of glazing compounds.

1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Laminated Glass: Provide 5-year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.
- C. Polycarbonate Glazing: Provide 5-year manufacturer warranty to include coverage for breakage, coating failure, abrasion resistance, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Cardinal Glass Industries; _____: www.cardinalcorp.com/#sle.
 - 2. Guardian Glass, LLC; _____: www.guardianglass.com/#sle.
 - 3. Pilkington North America Inc; _____: www.pilkington.com/na/#sle.
 - 4. Saint Gobain North America; _____: www.saint-gobain.com/#sle.
 - 5. Vitro Architectural Glass (formerly PPG Glass); _____: www.vitroglazings.com/#sle.
 - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Security Glass Manufacturers:
 - 1. Oldcastle Building Envelope: [www.obe.com/.](http://www.obe.com/)
 - 2. McGrory Glass, Inc.; [https://mcgrory.com/.](https://mcgrory.com/)
 - 3. SAF-GLAS: [http://www.saf-glas.com/.](http://www.saf-glas.com/)
 - 4. Substitutions: See Section 016000 - Product Requirements.

2.02 GLASS MATERIALS

- A. Float Glass: Provide float-glass-based glazing unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 - 2. Thickness: As specified; provide greater thickness as required for exterior glazing wind load design.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 - 1. Laminated Safety Glass: Comply with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.
 - 2. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch (0.762 mm) thick, minimum.

2.03 LAMINATED SECURITY GLAZING UNITS

- A. Type SG-1 - Security Glazing: Laminated glass, multi-ply.
 - 1. Applications: Locations as indicated on drawings.
 - 2. Tint: Clear.
 - 3. Thickness: 1/2 inch (12.7 mm).
 - 4. Outer Lite: Annealed glass.
 - 5. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
 - 6. Inside Lite: Annealed glass.
 - 7. Performance Criteria:
 - a. Burglary Resistance: Pass UL 972 tests to comply with multiple impact burglary and forced-entry resistance criteria.
 - 8. Manufacturers:
 - a. DefenseLite; Bullet Shield: <https://www.defenselite.com/>.
 - b. Oldcastle Building Envelope; ArmorProtect Max 133000: www.obe.com.
 - c. SAF-GLAS; Bullet Glass: <http://www.saf-glas.com/>.
 - d. Substitutions: See Section 016000 - Product Requirements.
- B. Type (SG-2) - Security Glazing: Laminated glass, multi-ply.
 - 1. Applications: Locations as indicated on drawings.
 - 2. Tint: Clear. Thickness: 1/2 inch (12.7 mm).
 - 3. Outer Lite: Annealed glass.
 - 4. Interlayer: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
 - 5. Middle Lite: Polycarbonate.
 - 6. Interlayer, Inboard Side: Polyvinyl butyral (PVB), thickness as required to meet performance criteria.
 - 7. Inside Lite: Annealed glass.
 - a. Bullet Resistance: Pass UL 752 tests to comply with Level 4: .30 caliber rifle, partial copper jacket lead core soft point ballistic criteria and weapon description.
 - b. Glazing Method: As required to meet performance criteria.
 - c. Manufacturers:
 - 1) DefenseLite; Bullet Shield: <https://www.defenselite.com/>.
 - 2) Oldcastle Building Envelope; ArmorProtect Max 133000: www.obe.com.
 - 3) SAF-GLAS; Bullet Glass: <http://www.saf-glas.com/>.
 - 4) Substitutions: See Section 016000-Product Requirements.

2.04 LAMINATED GLASS INTERLAYERS

- A. Type SLGI-1 - Safety and Security Polyvinyl Butyral (PVB) Interlayer for Laminated Glazing:

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1. Functionality: Post-breakage safety and security.
2. Applications:
 - a. Single pane, laminated glass unit.
3. Color: Clear.
4. Thickness: As required for indicated performance of laminated glass application.
5. Manufacturers:
 - a. Kuraray America, Inc; _____: www.kuraray.us.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.05 GLAZING COMPOUNDS

- A. JS-1 - Silicone Sealant: One-component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, uses M, A, and G; cured Shore A hardness range of 15 to 25; color as selected.
 1. Refer to Specification Section 079200 Joint Sealants.

2.06 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4-inch (100 mm) width of glazing rabbet space minus 1/16-inch (1.5 mm) height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one-half height of glazing stop by thickness to suit application; self-adhesive on one face.

2.07 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Provide shop inspection and testing for Type SG-1 glass.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that minimum required face and edge clearances are provided.
- C. Verify that surfaces of glazing channels or recesses are clean and free of obstructions that impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify effective sealing of joints between glass framing members.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate-compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing in accordance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Prevent glass from contact with contaminating substances resulting from construction including weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.04 INSTALLATION - WET GLAZING METHOD, SEALANT AND SEALANT

- A. Place setting blocks at 1/4 points and install glazing pane or unit.
- B. Install removable stops with glazing centered in space by inserting spacer shims on both sides at 24-inch (610 mm) intervals, 1/4 inch (6.4 mm) below sight line.
- C. Fill gaps between glazing and stops with ES-5 sealant to depth of bite on glazing, but not more than 3/8 inch (9 mm) below sight line to ensure full contact with glazing and continue air and vapor seal.
- D. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.05 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Glass and Glazing: Product manufacturers provide field surveillance of installation of their products.
- C. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

- A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.
- B. Remove excess glazing materials from finished surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- C. Remove nonpermanent labels immediately after glazing installation is complete.
- D. Clean glass and adjacent surfaces after sealants are fully cured.
- E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

- A. After installation, mark pane with 'X' using removable plastic tape or paste.
- B. Remove and replace glass damaged during construction period prior to Date of Substantial Completion.

END OF SECTION 088800

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SECTION 090561 - COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
 - 1. Resilient tile and sheet.
 - 2. Carpet tile.
 - 3. Thin-set ceramic tile and stone tile.
- B. Removal of existing floor coverings.
- C. Preparation of new and existing concrete floor slabs for installation of floor coverings.
- D. Testing of concrete floor slabs for moisture and alkalinity (pH).
- E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
 - 1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.
- F. Patching compound.
- G. Remedial floor coatings.

1.02 RELATED REQUIREMENTS

- A. Section 014000 - Quality Requirements: Additional requirements relating to testing agencies and testing.
- B. Section 017419 - Construction Waste Management and Disposal: Handling of existing floor coverings removed.

1.03 REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens).
- B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete.
- C. ASTM D4259 - Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application.
- D. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- E. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

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- F. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- G. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Visual Observation Report: For existing floor coverings to be removed.
- C. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
 - 1. Moisture and alkalinity (pH) limits and test methods.
 - 2. Manufacturer's required bond/compatibility test procedure.
- D. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
 - 1. Manufacturer's qualification statement.
 - 2. Certificate: Manufacturer's certification of compatibility with types of flooring applied over remedial product.
 - 3. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
 - 4. Manufacturer's installation instructions.
 - 5. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.
- E. Adhesive Bond and Compatibility Test Report.
- F. Copy of RFCI (RWP).

1.06 QUALITY ASSURANCE

- A. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.
- B. Contractor's Responsibility Relating to Independent Agency Testing:
 - 1. Provide access for and cooperate with testing agency.
 - 2. Confirm date of start of testing at least 10 days prior to actual start.
 - 3. Allow at least 4 business days on site for testing agency activities.
 - 4. Achieve and maintain specified ambient conditions.
 - 5. Notify Architect when specified ambient conditions have been achieved and when testing will start.
- C. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to

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provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
- B. Deliver materials in manufacturer's packaging; include installation instructions.
- C. Keep materials from freezing.

1.08 FIELD CONDITIONS

- A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).
- B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
 - 1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
 - 2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
 - 3. Products:
 - a. ARDEX Engineered Cements; ARDEX Feather Finish:
www.ardexamericas.com/#sle.
 - b. H.B. Fuller Construction Products, Inc; TEC Feather Edge Skim Coat:
www.tecspecialty.com/#sle.
 - c. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch:
www.usg.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
- B. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
 - 1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
 - 2. Products:
 - a. Specialty Products Group; Vapor Lock 5/5: <https://spggogreen.com/#sle>.
 - b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

- A. Perform following operations in the order indicated:
 - 1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
 - a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
 - b. Removal of existing floor covering.
 - 2. Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:
 - a. Do not attempt to remove coating or penetrating material.
 - b. Do not abrade surface.
 - c. Remove existing coatings and curing agents from surface according to recommendations of remedial coating manufacturer.
 - d. Prepare surface according to recommendations of remedial coating manufacturer and according to ASTM D4259.
 - 3. Preliminary cleaning.
 - 4. Moisture vapor emission tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer.
 - 5. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 - 6. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 - 7. Specified remediation, if required.
 - 8. Patching, smoothing, and leveling, as required.
 - 9. Other preparation specified.
 - 10. Adhesive bond and compatibility test.
 - 11. Protection.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

- A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.
- B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
- B. Do not use solvents or other chemicals for cleaning.

3.04 MOISTURE VAPOR EMISSION TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F1869 and as follows.
- D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet (1.4 kg per 93 square meters) per 24 hours.
- F. Report: Report the information required by the test method.

3.05 INTERNAL RELATIVE HUMIDITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F2170 Procedure A and as follows.
- D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.
- F. Report: Report the information required by the test method.

3.06 ALKALINITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
 - 1. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
 - 2. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch (25 mm) in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
 - 3. Use of a digital pH meter with probe is acceptable; follow meter manufacturer's instructions.

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- C. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.07 PREPARATION

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- D. Do not fill expansion joints, isolation joints, or other moving joints.

3.08 ADHESIVE BOND AND COMPATIBILITY TESTING

- A. Comply with requirements and recommendations of floor covering manufacturer.

3.09 APPLICATION OF REMEDIAL FLOOR TREATMENT

- A. Comply with requirements and recommendations of treatment manufacturer.

3.10 PROTECTION

- A. Cover prepared floors with building paper or other durable covering.

END OF SECTION 090561

SECTION 092116 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Acoustic insulation.
- C. Gypsum sheathing.
- D. Cementitious backing board.
- E. Gypsum wallboard.
- F. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints, And Coatings.
- B. Section 061000 - Rough Carpentry: Wood blocking products and execution requirements.
- C. Section 072100 - Thermal Insulation: Acoustic insulation.
- D. Section 078400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.
- E. Section 079200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board.
- F. Section 093000 - Tiling: Tile backing board.

1.03 REFERENCE STANDARDS

- A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing.
- B. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units.
- C. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units.
- D. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

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- G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
- H. ASTM C954 - 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.
- I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- J. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- K. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units.
- L. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
- M. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels.
- N. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- O. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- P. ASTM E413 - Classification for Rating Sound Insulation.
- Q. GA-216 - Application and Finishing of Gypsum Panel Products.
- R. ICC (IBC) - International Building Code.
- S. UL (FRD) - Fire Resistance Directory.
- T. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- C. Sequencing: Install service utilities in an orderly and expeditious manner.

1.05 SUBMITTALS

- A. Refer to Section 013300 - Submittal Procedures for submittal procedures.
- B. Product Data:
 - 1. Provide data on metal framing, gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.

- C. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
- D. Steel Framing Industry Association (SFIA) Certification:
 - 1. Submit documentation that metal studs and connectors used on project meet or exceed requirements of International Building Code.
- E. Test Reports: For stud framing products that do not comply with AISI S220 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.
- F. Evaluation Service Reports: Show compliance of grid suspension systems with specified requirements.
- G. Installer's Qualification Statement.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- B. Documents at Project Site: Maintain at the project site a copy of manufacturer's instructions, erection drawings, shop drawings, and reference standard documents containing execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.
- C. Store metal products to prevent corrosion, under cover and above grade.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
 - 1. Refer to PART 3 for finishing requirements.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC as indicated calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Grid Suspension Systems: Provide grid suspension systems in accordance with ASTM C840 and GA-216.
- D. Fire-Resistance-Rated Assemblies: Provide completed assemblies complying with applicable code.

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1. ICC IBC Item Numbers: Comply with applicable requirements of ICC IBC for the particular assembly.
2. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 BOARD MATERIALS

A. Manufacturers:

1. American Gypsum Company: www.americangypsum.com/#sle.
2. CertainTeed Corporation: www.certainteed.com/#sle.
3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
4. Gold Bond Building Products, LLC provided by National Gypsum Company: www.goldbondbuilding.com/#sle.
5. USG Corporation: www.usg.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

B. Gypsum Wallboard, General: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces, unless otherwise indicated.
2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, 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 D3273.
 - a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.
 - b. Mold resistant board is required _____.
4. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
5. Thickness:
 - a. Vertical Surfaces: 5/8 inch (16 mm).
 - b. Ceilings: 1/2 inch (13 mm).
 - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
6. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
7. Use moisture resistant Glass Mat Faced products when building is unenclosed.

C. Paper-Faced Products (GB-1x): Type X, fire rated gypsum panels for interior wall partitions. Provide one of the following, or an approved equivalent.

1. American Gypsum Company; FireBloc Type X Gypsum Wallboard: www.americangypsum.com/#sle.
2. CertainTeed Corporation; Type X Drywall: www.certainteed.com/#sle.
3. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gpgypsum.com/#sle.
4. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.
5. USG Corporation; Sheetrock Brand Firecode X Panels 5/8 in. (15.9 mm): www.usg.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

D. Mold Resistant Paper Faced Products for Walls (GB-4): Interior, 5/8-inch thickness, non-rated partitions to be painted or have perforated wall coverings applied:

1. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Gypsum Board: www.goldbondbuilding.com/#sle.

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2. CertainTeed Corporation; M2Tech Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
 3. USG Corporation; Sheetrock Brand Mold Tough Panels Firecode X: www.usg.com/#sle.
 4. Mold Resistant Paper Faced Products (**GB-4x**): Moisture and mold resistant, fire rated interior wall board panels. Provide one of the following, or an approved equivalent.
 - a. American Gypsum Company; M-Bloc Type X: www.americangypsum.com/#sle.
 - b. CertainTeed Corporation; M2Tech 5/8-inch, Type X Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
 - c. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: www.gpgypsum.com/#sle.
 - d. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Extreme Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.
 - e. USG Corporation; Sheetrock Brand Mold Tough Firecode SCX Panels 5/8 in. (15.9 mm): www.usg.com/#sle.
 - f. Substitutions: See Section 016000 - Product Requirements.
- E. Paper Faced Products for Ceilings (**GB-5**): Interior, sag-resistant gypsum ceiling panels as defined in ASTM C1396/C1396M, sizes to minimize joints in place. Provide one of the following, or an approved equivalent.
1. Application: Ceilings, unless otherwise indicated.
 2. Thickness: 1/2 inch (13 mm).
 3. Edges: Tapered.
 - a. CertainTeed Corporation; 1/2-inch, Interior Ceiling Drywall: www.certainteed.com/#sle.
 - b. Gold Bond Building Products, LLC provided by National Gypsum Company; 1/2-inch, Gold Bond High Strength Ceiling Board: www.goldbondbuilding.com/#sle.
 - c. USG Corporation; 1/2-inch, Sheetrock Brand Sag Resistant Interior Gypsum Ceiling Board: www.usg.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
 4. Glass Mat Faced Products: (**GB-5x**) Provide one of the following, or an approved equivalent.
 - a. CertainTeed Corporation; 5/8-inch, GlasRoc Interior Type X: www.certainteed.com/#sle.
 - b. Georgia-Pacific Gypsum; 5/8-inch, DensArmor Plus Fireguard C: www.gpgypsum.com/#sle.
 - c. Gold Bond Building Products, LLC provided by National Gypsum Company; 5/8-inch, Gold Bond eXP Interior Extreme Fire-Shield Gypsum Panel: www.goldbondbuilding.com/#sle.
 - d. USG Corporation; Sheetrock Brand Glass-Mat Panels Mold Tough Regular 5/8-inch: www.usg.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.
- F. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in wet areas including tub and shower surrounds and shower ceilings.
 2. Cement-Based Board (**GB-8**): Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - a. Application: Surfaces behind tile in wet areas including tub and shower surrounds and shower ceilings, and where indicated.
 - b. Thickness: 5/8 inch (16 mm) or as indicated.

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- c. Products: Provide one of the following, or an approved equivalent.
 - 1) PermaBASE Building Products, LLC provided by National Gypsum Company; PermaBase Cement Board: www.goldbondbuilding.com/#sle.
 - 2) USG Corporation; Durock Brand Cement Board Regular 5/8 in. (15.9 mm): www.usg.com/#sle.
 - 3) Substitutions: See Section 016000 - Product Requirements.

- G. Backing Board For Non-Wet Areas (**GB-7**): Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
 - 1. Application: Vertical surfaces behind thinset tile, except in wet areas.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 3. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 4. Type: Regular and Type X, in locations indicated.
 - 5. Type X Thickness: 5/8 inch (16 mm).
 - 6. Regular Board Thickness: 5/8 inch (16 mm).
 - 7. Edges: Tapered.
 - 8. Products: Provide one of the following, or an approved equivalent.
 - a. American Gypsum Company; M-Bloc Type X: www.americangypsum.com/#sle.
 - b. Georgia-Pacific Gypsum; ToughRock Mold-Guard Gypsum Board: www.gpgypsum.com/#sle.
 - c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Tile Backer Board: www.goldbondbuilding.com/#sle.
 - d. USG Corporation; Fiberock Aqua-Tough AR Interior Panels: www.usg.com/#sle.
 - e. Substitutions: See Section 016000 - Product Requirements.

- H. Ceiling Board (**GB-5**): Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Ceilings, unless otherwise indicated.
 - 2. Thickness: 1/2 inch (13 mm).
 - 3. Edges: Tapered.
 - 4. Products: Provide one of the following, or an approved equivalent.
 - a. CertainTeed Corporation; Interior Ceiling Drywall: www.certainteed.com/#sle.
 - b. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond High Strength LITE Gypsum Board: www.goldbondbuilding.com/#sle.
 - c. USG Corporation; Sheetrock Brand UltraLight Panels 1/2 in. (12.7 mm): www.usg.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.

- I. Shaftwall and Coreboard (**GB-15**): Type X; 1 inch (25 mm) thick by 24 inches (610 mm) wide, beveled long edges, ends square cut.
 - 1. Paper-Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 3. Paper-Faced Products: Provide one of the following, or an approved equivalent.
 - a. American Gypsum Company; M-Bloc Shaft Liner: www.americangypsum.com/#sle.
 - b. CertainTeed Corporation; M2Tech Type X Shaftliner: www.certainteed.com/#sle.
 - c. Georgia-Pacific Gypsum; ToughRock Shaftliner: www.gpgypsum.com/#sle.
 - d. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond Shaftliner XP: www.goldbondbuilding.com/#sle.

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- e. USG Corporation; Sheetrock Brand Mold Tough Gypsum Liner Panels 1 in. (25.4 mm) SLX: www.usg.com/#sle.
- f. Substitutions: See Section 016000 - Product Requirements.

2.03 GYP SUM BOARD ACCESSORIES

- A. Acoustic Insulation (**IN-6a**): ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness as required for STC.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
 - 1. Products:
 - a. Franklin International, Inc; Titebond Acoustical Smoke & Sound Sealant: www.titebond.com/#sle.
 - b. Liquid Nails, a brand of PPG Architectural Coatings; _____: www.liquidnails.com/#sle.
 - c. Specified Technologies Inc; Smoke N Sound Acoustical Sealant: www.stifirestop.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
- C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
 - 1. Corner Beads: Low profile, for 90 degree outside corners.
 - a. Products:
 - 1) CertainTeed Corporation; No-Coat Drywall Corner: www.certainteed.com/#sle.
 - 2) ClarkDietrich; Strait-Flex OS-300: www.clarkdietrich.com/#sle.
 - 3) Phillips Manufacturing Co; Everlast Corner Bead: www.phillipsmfg.com/#sle.
 - 4) Trim-Tex, Inc; Corner Bead: www.trim-tex.com/#sle.
 - 5) Substitutions: See Section 016000 - Product Requirements.
 - 2. L-Trim with Tear-Away Strip: Sized to fit 5/8 inch (16 mm) thick gypsum wallboard.
 - a. Products: Provided the following, or an approved equivalent.
 - 1) Phillips Manufacturing Co; gripSTIK L-Tear: www.phillipsmfg.com/#sle.
 - 2) Substitutions: See Section 016000 - Product Requirements.
 - 3. Expansion Joints:
 - a. Fire-Resistance Rated: 1 hour when joint system tested in accordance with UL 2079.
 - b. Type: V-shaped PVC with tear away fins.
 - c. Type: Off-angle inside corner expansion.
 - d. Products: Provide one of the following, or an approved equivalent.
 - 1) Phillips Manufacturing Co; 093 Expansion Control Joint: www.phillipsmfg.com/#sle.
 - 2) Trim-Tex, Inc; Fire Rated 093V Expansion Bead: www.trim-tex.com/#sle.
 - 3) Substitutions: See Section 016000 - Product Requirements.
- D. Moisture Guard Trim (For Wet Areas): ASTM C1047, rigid plastic, 48 inch (1219.2 mm) length, applied to bottom edge of gypsum board.
 - 1. Height: 1/2 inch (13 mm).
 - 2. Depth: 5/8 inch (15.9 mm).
 - 3. Products: Provide the following, or an approved equivalent.
 - a. Waterguard USA; Waterguard: www.waterguard-usa.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

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- E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - 1. Fiberglass Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
 - 2. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
 - 3. Joint Compound: Drying type, vinyl-based, ready-mixed.
 - 4. Joint Compound: Setting type, field-mixed.

- F. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
 - 1. Products: Provide one of the following, or an approved equivalent.
 - a. CertainTeed Corporation; Level V Wall and Ceiling Primer/Surfer with M2Tech: www.certainteed.com/#sle.
 - b. USG Corporation; USG Sheetrock Brand Tuff-Hide Primer-Surfer: www.usg.com/#sle.

- G. Concrete Cover Coat Compound: Ready-mix compound for filling and smoothing interior, above-grade, monolithic concrete ceilings and columns.
 - 1. Products: Provide the following, or an approved equivalent.
 - a. USG Corporation; Sheetrock Brand Cover Coat Compound: www.usg.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

- H. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

- I. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

- A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions and GA-600 requirements.

- B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.
 - 1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.
 - 2. Seal perimeter of shaft wall and penetrations with acoustical sealant.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Fire-Resistance-Rated Construction: Install wallboard in strict compliance with requirements of assembly listing.
- C. Exposed Gypsum Board: Seal joints, cut edges, and holes with water-resistant sealant.
- D. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- E. Installation on Metal Framing: Use screws for attachment of wallboard.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
 - 1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.
- D. Moisture Guard Trim: Install on bottom edge of gypsum board according to manufacturer's instructions and in locations indicated on drawings.

3.06 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
 - 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 4. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
- D. 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).

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- E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
- F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.07 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.

3.08 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

3.09 PROTECTION

- A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION 092116

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal partition, ceiling, and soffit framing.
- B. Framing accessories.

1.02 RELATED REQUIREMENTS

- A. Section 072100 - Thermal Insulation: Acoustic insulation.
- B. Section 085653 - Security Windows: Product requirements for window anchors.
- C. Section 092116 - Gypsum Board Assemblies: Execution requirements for anchors for attaching work of this section.

1.03 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members.
- B. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
- E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- F. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- G. ASTM E413 - Classification for Rating Sound Insulation.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate 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.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

1.06 MOCK-UPS

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Provide mock-up of stud wall, ceiling, and soffit framing including insulation, sheathing, window frame, and door frame and finish specified in other sections. Coordinate with installation of associated work specified in other sections.
 - 1. Mock-up Size: Full-height, minimum 12 feet (3.5 m) long, including corner.
 - 2. Mock-up may remain as part of the Work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Framing, Connectors, and Accessories:
 - 1. ClarkDietrich; _____: www.clarkdietrich.com/#sle.
 - 2. MarinoWARE; ____: www.marinoware.com/#sle.
 - 3. Super Stud Building Products, Inc; _____: www.buysuperstud.com/#sle.
 - 4. The Steel Network, Inc; ____: www.SteelNetwork.com/#sle.
 - 5. Substitutions: See Section 016000 - Product Requirements.

2.02 FRAMING MATERIALS

- A. Fire-Resistance-Rated Assemblies: Comply with applicable code and as follows:
- B. Non-Loadbearing Framing System Components: AISI S220; sheet steel, of size and properties necessary for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf (L/240 at 240 Pa).
 - 1. Studs: C-shaped with flat faces.
 - a. Products:
 - 1) ClarkDietrich; ProSTUD: www.clarkdietrich.com/#sle.
 - 2) MarinoWARE; ViperStud Drywall Framing: www.marinoware.com/#sle.
 - 3) Super Stud Building Products, Inc; The EDGE: www.buysuperstud.com/#sle.
 - 4) Substitutions: See Section 016000 - Product Requirements.
 - 2. Runners: U-shaped, sized to match studs.
- C. Shaft Wall Studs and Accessories: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.
 - 1. Products:
 - a. Same manufacturer as other framing materials.
 - b. Substitutions: See Section 016000 - Product Requirements.

- 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 S100.
 - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50.
 - 3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.

- E. Non-Loadbearing Framing Accessories:
 - 1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

- A. Comply with requirements of ASTM C1007.
- B. Install structural members and connections complying with ASTM C1007.
- C. Extend partition framing to structure where indicated and to ceiling in other locations.
- D. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
- E. 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.
- F. Align and secure top and bottom runners at 24 inches (600 mm) on center.
- G. At partitions indicated with an acoustic rating:
 - 1. Provide components and install as required to produce STC ratings as indicated, based on published tests by manufacturer conducted in accordance with ASTM E90 with STC rating calculated in accordance with ASTM E413.
 - 2. Place one bead of acoustic sealant between runners and substrate, studs and adjacent construction.
 - 3. Place one bead of acoustic sealant between studs and adjacent vertical surfaces.
- H. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- I. Install studs vertically at 16 inches (400 mm) on center, unless otherwise indicated.
- J. Align stud web openings horizontally.
- K. Secure studs to tracks using crimping method. Do not weld.

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- L. Stud splicing is not permissible.
- M. Fabricate corners using a minimum of three studs.
- N. Install double studs at wall openings, door and window jambs, not more than 2 inches (50 mm) from each side of openings.
- O. Brace stud framing system rigid.
- P. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

3.03 CEILING AND SOFFIT FRAMING

- A. Comply with requirements of ASTM C754.
- 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 them 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 inches (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.

3.04 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 092216

SECTION 093000 - TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Stone thresholds.
- D. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

- A. Section 017419 - Construction Waste Management and Disposal; Limitations on disposal of removed material; requirements for recycling.
- B. Section 018117 - Low Emitting Material Requirements; Volatile Organic Compound (VOC) Limits.
- C. Section 018119 - Construction Indoor Air Quality (IAQ) Management-test; Indoor air quality control plan.
- D. Section 079200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- E. Section 090561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.
- F. Section 092116 - Gypsum Board Assemblies: Tile backer board and cementitious board.

1.03 REFERENCE STANDARDS

- A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).
- B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar.
- C. ANSI A108.1b - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar.
- D. ANSI A108.1c - Contractor's 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 Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar.
- E. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship.

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- F. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive.
- G. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar.
- H. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy.
- I. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout.
- J. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.
- K. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework.
- L. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units.
- M. ANSI A108.12 - Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Modified Dry-Set Mortar.
- N. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
- O. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar.
- P. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs.
- Q. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation.
- R. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units.
- S. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone.
- T. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation.
- U. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar.
- V. ANSI A137.1 - American National Standard Specifications for Ceramic Tile.

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- W. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
- X. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation.
- Y. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- B. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, and setting details.
- C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches (457 by 457 mm) in size illustrating pattern, color variations, and grout joint size variations.
- D. Installer's Qualification Statement:
 - 1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation.
 - 2. Submit documentation of completion of apprenticeship and certification programs.
- E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 1 percent of each size, color, and surface finish combination installed, but no less than the following.

1.06 QUALITY ASSURANCE

- A. Maintain one copy of ANSI A108/A118/A136, TCNA (HB), and TCNA (HB-GP) on-site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
- C. Installer Qualifications: Natural Stone Institute (NSI) Accredited Commercial B Contractor (light commercial): www.naturalstoneinstitute.org/#sle.
- D. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.
 - 2. Installer Certification:

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- a. Ceramic Tile Education Foundation (CTEF): Certified Tile Installer (CTI).
- b. Advanced Certifications for Tile Installers (ACT): Certification in the installation of membranes, large format tile, and grouts.

1.07 MOCK-UPS

- A. See Section 014000 - Quality Requirements for general requirements for mock-up.
- B. Construct tile mock-up where indicated on drawings, incorporating all components specified for the location.
 - 1. Minimum 50 sq. ft. size mock-up where directed by Architect.
 - 2. Approved mock-up may remain as part of work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.09 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature above 50 degrees F (10 degrees C) and below 100 degrees F (38 degrees C) during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 SUSTAINABILITY REQUIREMENTS

- A. Comply with Sections; 017419 Construction Waste Management and Disposal for additional sustainable requirements.

2.02 TILE

- A. Manufacturers: All products of each type by the same manufacturer.
 - 1. Dal-Tile Corporation: www.daltile.com/#sle.
 - 2. Garden State Tile: <https://gstile.com/>
 - 3. Substitutions: Not permitted.
- B. Ceramic Tiles: ANSI A137.1 standard grade.
 - 1. Wall Tile (**T-6**): Modine; Garden State Tile.
 - a. Color/Pattern: Pressed Glossy, "*Powder*."
 - b. Size: 3 x 12 inches.
 - c. Thickness: 9 mm.
 - d. Grout: TBD.
 - e. Transition Strip: TBD.
 - 2. Wall Tile (**T-7**): Modine; Garden State Tile.
 - a. Color/Pattern: Pressed Glossy, "*Silver*."
 - b. Size: 3 x 12 inches.
 - c. Thickness: 9 mm.
 - d. Grout: TBD.
 - e. Transition Strip: TBD.
 - 3. Wall Tile (**T-8**): Modine; Garden State Tile.

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- a. Color/Pattern: Pressed Glossy, "Ink."
 - b. Size: 3 x 12 inches.
 - c. Thickness: 9 mm.
 - d. Grout: TBD.
 - e. Transition Strip: TBD.
 - 4. Wall Tile (T-9): Design Positive 2; Garden State Tile.
 - a. Color/Pattern: "Blanc Blanc."
 - b. Size: 8 x 20 inches.
 - c. Finish: Satin.
 - d. Thickness: 5/16-inch.
 - e. Grout: TBD.
 - f. Transition Strip: TBD.
 - 5. Wall Tile (T-10): Design Positive 2; Garden State Tile.
 - a. Color/Pattern: "Bleu Bleu."
 - b. Size: 8 x 20 inches.
 - c. Finish: Matte.
 - d. Thickness: 5/16-inch.
 - e. Grout: TBD.
 - f. Transition Strip: TBD.Wall Tile (T-11): Keystones; Daltile.
 - g. Color/Pattern: #D200. "Desert Gray Straight Joint."
 - h. Size: 2 x 2 inches.
 - i. Finish: Abrasive.
 - j. Thickness: 1/4-inch.
 - k. Grout: TBD.
 - l. Transition Strip: TBD.
 - 6. Wall Tile (T-12): Design Positive 2; Garden State Tile.
 - a. Color/Pattern: "Blanc Blanc."
 - b. Size: 4 x 20 inches.
 - c. Finish: Brilliant.
 - d. Thickness: 5/16-inch.
 - e. Grout: TBD.
 - f. Transition Strip: TBD.
- C. Porcelain Tile: ANSI A137.1 standard grade.
- 1. Porcelain Wall Tile (T-1) : Outlander; Daltile.
 - a. Color/Pattern: Palazzo Design, #OU58, "Dusk."
 - b. Size: 24 x 48 inches.
 - c. Thickness: 5/16-inches.
 - d. Grout: TBD.
 - e. Transition Strip: TBD.
 - 2. Porcelain Wall Tile (T-2) : Outlander; Daltile.
 - a. Color/Pattern: Palazzo Design, #OU57, "Sterling."
 - b. Size: 24 x 24 inches.
 - c. Thickness: 5/16-inches.
 - d. Grout: TBD.
 - e. Transition Strip: TBD.
 - 3. Porcelain Wall Tile (T-3) : Outlander; Daltile.
 - a. Color/Pattern: Palazzo Design, #OU59, "Onyx." Size: 24 x 24 inches. Thickness: 5/16-inches. Grout: TBD. Transition Strip: TBD.

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- b. Size: 12 x 24 inches.
- c. Thickness: 5/16-inches.
- d. Grout: TBD.
- e. Transition Strip: TBD.
- 4. Porcelain Bullnose Trim Tile (T-4) : Outlander; Daltile.
 - a. Color/Pattern: Palazzo Design, #P43F9, #OU58, "Dusk."
 - b. Size: 3 x 24 inches.
 - c. Thickness: 5/16-inches.
 - d. Grout: TBD.
 - e. Transition Strip: TBD.
- 5. Porcelain Tile (T-5) : Outlander; Daltile.
 - a. Color/Pattern: Palazzo Design, #OU58, "Dusk."
 - b. Size: 12 x 24 inches.
 - c. Thickness: 5/16-inches.
 - d. Grout: TBD.
 - e. Transition Strip: TBD.
 - f. Porcelain Tile (T-6) : Outlander; Daltile. Color/Pattern: Palazzo Design, #OU58, "Dusk." Size: 12 x 24 inches. Thickness: 5/16-inches. Grout: TBD. Transition Strip: TBD.

2.03 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: Finish as indicated below, style and dimensions to suit application, for setting using tile mortar or adhesive.
 - 1. Transition Types:
 - a. **TS-1**: Schluter; Reno-V; Satin Anodized Aluminum Finish.
 - b. **TS-2**: Schluter; Reno-U; Satin Anodized Aluminum Finish.
 - c. **TS-3**: Schluter; Reno-V; Satin Anodized Aluminum Finish
 - d. **TS-4**: Schluter; VinPro-U; Satin Anodized Aluminum Finish
 - e. **TS-5**: Schluter; Jolly; Satin Anodized Aluminum Finish
 - 2. Products:
 - a. Blanke Corporation; Blanke - Trims and Profiles: www.blankecorp.com/#sle.
 - b. Schluter-Systems: www.schluter.com/#sle.
 - c. Profilitec Positive Profile: www.us.profilitec.com.

2.04 SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.
- B. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.
 - 1. Applications: Use this type of bond coat where indicated, and where no other type of bond coat is indicated.
 - 2. Products:
 - a. ARDEX Engineered Cements; S 28: www.ardexamericas.com/#sle.
 - b. Custom Building Products; Complete Contact-LFT Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com/#sle.
 - c. LATICRETE International, Inc; LATICRETE 254 Platinum: www.laticrete.com/#sle.
 - d. Mapei; Mapebond 700: www.mapei.com.
 - e. Substitutions: Not permitted.

2.05 GROUTS

- A. Provide setting and grout materials from same manufacturer.
- B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
 - 1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
 - 2. Use sanded grout for joints 1/8 inch (3.2 mm) wide and larger; use unsanded grout for joints less than 1/8 inch (3.2 mm) wide.
 - 3. Color(s): As indicated below.
 - a. **GRT-1**: TBD.
 - b. **GRT-2**: TBD.
 - c. **GRT-3**: TBD.
 - d. **GRT-4**: TBD.
 - e. **GRT-5**: TBD.
 - 4. Products:
 - a. ARDEX Engineered Cements; ARDEX FL: www.ardexamericas.com/#sle.
 - b. Custom Building Products; Prism Color Consistent Grout: www.custombuildingproducts.com/#sle.
 - c. LATICRETE International, Inc; LATICRETE PERMACOLOR Select Grout: www.laticrete.com/#sle.
 - d. Mapei; Ultracolor Plus FA: www.mapei.com..
 - e. Substitutions: Not permitted.

2.06 MAINTENANCE MATERIALS

- A. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
 - 1. Composition: Water-based colorless silicone, as recommended by grout manufacturer.
 - 2. Products:
 - a. STONETECH, a Division of LATICRETE International, Inc; STONETECH Heavy Duty Grout Sealer: www.laticrete.com/#sle.
 - b. Merkrete, by Parex USA, Inc; Merkrete Revive: www.merkrete.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.

2.07 ACCESSORY MATERIALS

- A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
 - 1. Crack Resistance: No failure at 1/8 inch (3.2 mm) gap, minimum.
 - 2. Peel-and-Stick Sheet Type:
 - a. Material: Rubberized membrane laminated to reinforcing fabric.
 - b. Thickness: 20 mils (0.5 mm), maximum.
 - c. Products:
 - 1) Proflex Products, Inc; Maxxim Sim-40: www.proflex.us/#sle.
 - 2) Protecto Wrap; AFM Anti-Fracture Membrane: www.protectowrap.com/#sle.
 - 3) Sika Corp; SikaTile 225 PNS: www.sika.com/#sle.
- B. Waterproofing Membrane at Wet Areas: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.

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1. Fluid or Trowel Applied Type:
 - a. Material: Synthetic rubber.
 - b. Thickness: 40 mils (1 mm), minimum, dry film thickness.
 - c. Products:
 - 1) ARDEX Engineered Cements; ARDEX 8+9: www.ardexamericas.com/#sle.
 - 2) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
 - 3) Merkrete, by Parex USA, Inc; Merkrete Hydro Guard 2000: www.merkrete.com/#sle.
 - 4) USG Corporation; Durock Brand Liquid Waterproofing Membrane: www.usg.com/#sle.
 - 5) Sika Corp; SikaTile 100 Moisture Guard: www.sika.com/#sle.
 - 6) Substitutions: See Section 016000 - Product Requirements.
- C. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 7/16 inch (11 mm) thick; 2 inch (51 mm) wide coated glass fiber tape for joints and corners.
 1. Products:
 - a. Refer to Specification Section 092900 "Gypsum Board."
- D. Backer Board: Coated glass mat type complying with ASTM C1178/C1178M; inorganic fiberglass mat on both surfaces and integral acrylic coating vapor retarder.
 1. Refer to Specification Section 092900 "Gypsum Board."
- E. Mesh Tape: 2 inch (50 mm) wide self-adhesive fiberglass mesh tape.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- 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 tile.
- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
 1. Test in accordance with Section 090561.
 2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.
 3. Follow moisture and alkalinity remediation procedures in Section 090561.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 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 backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.
- E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.20, manufacturer's instructions, and TCNA (HB) 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, base, and wall joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install non-ceramic trim in accordance with manufacturer's instructions. Field verify heights prior to ordering transitions strips.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep control and expansion joints free of mortar, grout, and adhesive.
- I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- J. Grout tile joints unless otherwise indicated.
- K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, improved latex-portland cement mortar bond coat, with standard grout, unless otherwise indicated.
 - 1. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.
- B. Install tile-to-tile floor movement joints in accordance with TCNA (HB) Method EJ171F.

3.05 INSTALLATION - SHOWERS WALLS

- A. At tiled shower receptors install in accordance with TCNA (HB) Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.
- B. Grout with standard grout as specified above.

3.06 INSTALLATION - WALL TILE

- A. On exterior walls install in accordance with TCNA (HB) Method W244, thin-set over cementitious backer units, with waterproofing membrane.
- B. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms.
- C. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.
- D. Over interior concrete and masonry install in accordance with TCNA (HB) Method W202, thin-set with dry-set or latex-Portland cement bond coat.

3.07 CLEANING

- A. Clean tile and grout surfaces.

3.08 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 093000

SECTION 095100 - ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints, And Coatings.

1.03 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- D. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
- F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products.

1.04 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.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning.
- C. Product Data: Provide data on suspension system components and acoustical units.
- D. Samples: Submit two samples 6 by 6 inch (150 by 150 mm) in size illustrating material and finish of acoustical units.

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- E. Samples: Submit two samples each, 12 inches (305 mm) long, of suspension system main runner, cross runner, and perimeter molding.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.06 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.

1.07 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

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
 - 2. Certainteed Architectural: www.certainteed.com/ceilings-and-walls/#sle.
 - 3. USG Corporation: www.usg.com/ceilings/#sle.
 - 4. Substitutions: See Section 016000 - Product Requirements.
- B. Suspension Systems:
 - 1. Same as for acoustical units.

2.02 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category C and complying with the following:

2.03 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.
 - 1. VOC Content: As specified in Section 016116.
- B. Acoustical Panels, Type (ACP-1): Painted mineral fiber, with the following characteristics:
 - 1. Classification: ASTM E1264 Type III.
 - 2. Size: 24 by 24 inches (610 by 610 mm).
 - 3. Thickness: 3/4 inch (19 mm).

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4. Light Reflectance: 0.85 percent, determined in accordance with ASTM E1264.
5. NRC Range: 70 to 80, determined in accordance with ASTM E1264.
6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
7. Panel Edge: Angled tegular.
8. Suspension System: Exposed grid.
9. Products:
 - a. Armstrong World Industries, Inc; #584, "Cirrus Tegular":
www.armstrongceilings.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.04 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
 1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- B. Exposed Suspension System, Type ACP-1: Hot-dipped galvanized steel grid with steel cap.
 1. Application(s): Seismic.
 2. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.
 3. Profile: Tee; 15/16 inch (24 mm) face width.
 4. Finish: Baked enamel.
 5. Products:
 - a. Armstrong World Industries, Inc; 15/16-inch Prelude XL:
<https://www.armstrongceilings.com/commercial/en/suspension-systems/#sle>.
 - b. Substitutions: See Section 016000 - Product Requirements.

2.05 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch (2 mm) galvanized steel wire.
- C. Perimeter Moldings: Same metal and finish as grid.
 1. Size: As required for installation conditions and specified Seismic Design Category.
- D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

- A. Install after major above-ceiling work is complete.

- B. Coordinate the location of hangers with other work.
- C. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

3.03 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, 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. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
- E. Seismic Suspension System, Seismic Design Category C: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Maintain a 3/8 inch (9 mm) clearance between grid ends and wall.
- 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 (152 mm) of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.

3.04 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 acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.
 - 2. Double cut and field paint exposed reveal edges.
- F. Where round obstructions occur, provide preformed closures to match perimeter molding.

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3.05 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.

3.06 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Clean surfaces.
- C. Replace damaged or abraded components.

END OF SECTION 095100

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SECTION 095753 - SECURITY CEILING ASSEMBLIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Downward-locking-panel security ceiling assembly.

1.02 COORDINATION

- A. Coordinate layout and installation of security ceiling assemblies with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.03 PREINSTALLATION MEETINGS

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

1.04 ACTION SUBMITTALS

- A. Product Data:
 - 1. Downward-locking-panel security ceiling assembly.
- B. Samples for Verification: For the following products, of sizes indicated below:
 - 1. Security Ceiling Panel Units: Full cross section by 12 inches (305 mm) long for each type of panel.
 - 2. Perimeter Supports, Closures, and Exposed Molding: 12 inches (305 mm) long for each type.
 - 3. Suspension System: 12 inches (305 mm) long.

1.05 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Layout of panels, joint pattern, and transitions.
 - 2. Suspension system members.
 - 3. Method of attaching hangers to building structure.
 - 4. Size and location of access panels.
 - 5. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- B. Qualification Data: For Installer.
- C. Welding certificates.
- D. Product Test Reports: For each security ceiling assembly, for tests performed by a qualified testing agency.
- E. Attachment Device Test Reports: Indicating capability to sustain, without failure, load indicated without pulling out from substrate.

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- F. Evaluation Reports: For security ceiling assembly, from ICC-ES.
- G. Field quality-control reports.
- H. Examination reports documenting inspection of substrates, areas, and conditions.
- I. Anchor inspection reports documenting inspections of built-in and cast-in anchors.
- J. Field quality-control certification signed by Contractor.

1.06 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. Security Ceiling Panels: Full-size units equal to 2 percent of amount installed.
 - 2. Suspension System Components: Quantity of each grid and exposed component equal to 2 percent of amount installed.
 - 3. Security Fasteners: Furnish not less than 1 box for each 50 boxes or fraction thereof, of each type and size of security fastener installed.
 - 4. Tools: Provide two sets of tools for installing and removing security fasteners, packaged for easy handling and storage.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate security performance and aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of size equal to one cell of each type of security ceiling assembly. Include ceiling panels, suspension system, perimeter support, lighting unit, duct penetration, access panel, and accessories.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver security ceiling panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Handle security ceiling panels, suspension system components, and accessories carefully to avoid damaging units and finishes in any way.

1.09 REFERENCE STANDARDS

- A. ACI - American Concrete Institute.
- B. AWS - American Welding Society.
- C. ICC-ES - International Code Council Evaluation Service.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. General Performance: Security ceiling assemblies to withstand normal thermal movement and structural loads without failure, including permanent deformation of security ceiling assembly components including pans and suspension system; noise or metal fatigue caused by vibration, deflection, and displacement of security ceiling units; and permanent damage to fasteners and anchors.
- B. Acoustical Performance: Provide security ceiling assemblies with acoustical ratings indicated, as determined in accordance with ASTM E1264 and the following:
 - 1. Noise Reduction Coefficient (NRC): ASTM C423 and ASTM E795 in Type E-400 mounting.
 - 2. Ceiling Attenuation Class (CAC): ASTM E1414/E1414M.
 - a. Structural Performance: Security ceiling assemblies to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 3. Wind Loads: As indicated on Drawings.
- C. Seismic Standard: Provide ceilings designed and installed to withstand the effects of earthquake motions in accordance with ASCE/SEI 7 .

2.02 DOWNWARD-LOCKING-PANEL SECURITY CEILING ASSEMBLY

- A. Downward-Locking-Panel Security Ceiling Assembly: Provide a complete, integrated assembly, including security ceiling panels, exposed suspension system, perimeter supports, and accessories.
- B. Panels: Fabricated from a single sheet of metal, with formed upturned edges on all four sides designed to continuously engage with and lock under rectangular bulb of suspension system.
 - 1. Steel Panels: Metallic-coated steel with minimum uncoated sheet thickness of 0.043 inch (1.09 mm).
 - 2. Panel Size: 24 by 24 inches (610 by 610 mm).
 - 3. Perforation Pattern: Manufacturer's standard .
 - 4. Noise Reduction Coefficient (NRC): 0.80.
- C. Sound-Absorptive Pads: Provide sound-absorptive pads for placement over ceiling panels.
 - 1. Spacer Grids: Metallic-coated-steel grid units that provide an air cushion between security ceiling panels and sound-absorptive pads and that act to improve sound absorption.
 - 2. Support Clips: Metal clips designed to hold sound-absorptive pads above bottom face sheet.

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- D. Backer Plates: Unperforated units formed from [metallic-coated steel] [aluminum] sheet that reduces travel of sound through panel and that makes panel assembly comply with the following performance:
1. Sound-Absorptive Pads: Provide secondary sound-absorptive pads, same as specified for primary pads, for placement over backer plates to reduce plenum sound.
- E. Access Panels: Material, perforation pattern, and finish same as security ceiling panels; designed for installation by security fasteners screwed through suspension system. Provide panels at locations indicated on Drawings .
1. Size: 24 by 24 inches (610 by 610 mm).
 2. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100 "Door Hardware."
- F. Suspension System: ASTM C635/C635M, heavy-duty exposed system consisting of snap-in main runners supported by hangers attached to building structure.
1. Provide system complete with main runners, splice plates, connector and alignment clips, hangers, trim, seismic- and wind-load clips and struts, and other suspension components required to support security ceiling units and other security ceiling-supported construction.
 2. Main Runners and Cross Tees: Formed from metal sheet, 1-1/2 inches (38 mm) high, with 15/16-inch (23.8-mm) flange width and with oversized rectangular bulb for engaging panels.
 - a. Material: Galvanized steel, G90 (Z275) zinc coating.
 3. Wire Hangers, Braces, and Ties: Zinc-coated, carbon-steel wire, ASTM A641/A641M, Class 1 zinc coating, soft temper.
 - a. Size: Select wire diameter so its stress at 3 times the hanger design load (ASTM C635/C635M, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.
 4. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
 5. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
 6. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide, formed with 0.04-inch- (1.0-mm-) thick, galvanized-steel sheet, G90 (Z275) zinc coating, with bolted connections and 5/16-inch- (8-mm-) diameter bolts.
 7. Compression Struts: Fabricated from 3/4-inch- (19-mm-) diameter steel tubing, designed to fit over rectangular bulb of suspension system.
 8. Security Clips: Steel wire, designed to slip over suspension system and through holes in flanges of panel to prevent panel removal.
- G. Perimeter Supports: Wall-mounted channel moldings and wall angles; fabricated from 0.042-inch- (1.06-mm-) thick galvanized steel; finished to match suspension system.
- H. Exposed Edge Moldings and Trim: Provide exposed members as indicated or required for edges of security ceiling, fixture trim, beams, fasciae at changes in security ceiling height, and other conditions; of metal and finish matching security ceiling panels.
- I. Materials:
1. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS (Commercial Steel), Type B; with G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating designation.
 2. Steel Tubing: ASTM A513/A513M, Type B.
 3. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666 or ASTM A240/A240M, austenitic stainless steel, Type 304] .

4. Aluminum Sheet and Plate: ASTM B209 (ASTM B209M).

2.03 SOUND-ABSORPTIVE PADS

- A. Plastic-Sheet-Wrapped, Mineral-Fiber Insulation: Pads consisting of nonrigid, vinyl chloride plastic sheet encapsulating unfaced mineral-fiber insulation.
1. Plastic Sheet: Not less than 0.003 inch (0.076 mm) thick; flat black.
 2. Mineral Fiber: Glass fiber or fiber made from slag (mineral wool), complying with ASTM C553, Type I, II, or III.
 3. Thickness: As required to meet NRC rating.
 4. Mineral-Fiber Density: As required to meet NRC rating.
 5. Surface-Burning Characteristics: As determined by testing identical products in accordance with ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 50 or less.

2.04 FABRICATION

- A. Panels: Form metal panels from sheet metals selected for their surface flatness, smoothness, and freedom from surface blemishes where exposed to view in finished unit. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, or variations in flatness exceeding those permitted by referenced standards for stretcher-leveled metal sheet.

2.05 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.06 METALLIC-COATED STEEL SHEET FINISHES

- A. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780/A780M.
- B. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).
1. Color and Gloss: As selected by Architect from manufacturer's full range .

2.07 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning" or SSPC-SP 8, "Pickling." After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- B. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
 - 1. Color and Gloss: Manufacturer's standard white .

2.08 SECURITY FASTENERS

- A. Security Fasteners for Ceiling Assemblies: Operable only by tools produced by fastener manufacturer or other licensed fabricator for use on specific type of fastener. Drive-system type, head style, material, and protective coating as required for assembly, installation, and strength, and as follows:
 - 1. Drive-System Type: Pinned Torx .
 - 2. Fastener Strength: 120,000 psi (827 MPa).
 - 3. Protective Coatings for Heat-Treated Alloy Steel:
 - a. Zinc and clear trivalent chromium where indicated.
 - b. Zinc phosphate with oil, ASTM F1137, Grade I, or black oxide unless otherwise indicated.

2.09 SECURITY SEALANTS

- A. Epoxy Security Sealants: Manufacturer's standard, nonsag, tamper-resistant sealant for joints with no movement.

2.10 ACCESSORIES

- A. Concealed Bolts: ASTM A307, Grade A unless otherwise indicated.
- B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welding.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, Direct Hung, unless otherwise indicated.
- D. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated in accordance with ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of security

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ceiling assemblies.

- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of security ceiling assembly connections before security ceiling assembly installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of security ceiling assemblies.
- D. Inspect built-in and cast-in anchor installations before installing security ceiling assemblies to verify that anchor installations comply with requirements. Prepare inspection reports.
 - 1. Repair, or remove and replace, anchors where inspections indicate noncompliance with specified requirements. Reinspect after repair or replacement.
 - 2. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- E. Verify locations and layouts of security ceiling assemblies with those indicated on reflected ceiling plans and coordination drawings.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other security ceiling anchors whose installation is specified in other Sections.
- B. Measure each security ceiling area and establish layout of security ceiling panels to balance border widths at opposite edges of each security ceiling. Avoid using less-than-half-width panels at borders and comply with layout shown on reflected ceiling plans and coordination drawings.

3.03 GENERAL INSTALLATION

- A. Comply with CISCA's "Ceiling Systems Handbook" for installation of security ceiling assemblies.
- B. Install perimeter supports around perimeter of security ceiling area.
 - 1. Sealant: Apply epoxy security sealant in a continuous ribbon concealed on back of vertical legs of supports before they are installed.
 - 2. Attach supports with anchor bolts or expansion anchors spaced not more than 12 inches (305 mm) o.c. and not more than 3 inches (76 mm) from ends. Miter corners accurately.
 - a. Level perimeter supports with suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.7 m).
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim. If exposed fasteners are unavoidable, obtain prior written approval from Architect for their use and use security fasteners.
- C. Install accessories where indicated and as required to comply with performance requirements.
 - 1. Sound-Absorptive Pads: For security ceiling panels indicated, provide sound-absorptive pads of width and length to completely fill inside of each security ceiling panel.
 - a. Install sound-absorptive pads over metal spacer grids.
 - 2. Backer Plates: Install plates in areas indicated on reflected ceiling plans or in room finish schedules. Lay backer plates directly on security ceiling assembly in manner indicated and

close major openings to form complete coverage in required areas. Lay second sound-absorptive pad on backer plate.

- D. Seismic Installation: Comply with seismic standard indicated, manufacturer's written instructions, and CISCA's "Ceiling Systems Handbook."

3.04 INSTALLATION OF DOWNWARD-LOCKING-PANEL SECURITY CEILING ASSEMBLY

- A. Ceiling Hangers: Suspend from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within security ceiling plenum that are not part of supporting structure or of security ceiling suspension system.
 2. Splay hangers only where required to avoid obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in
 4. Secure wire hangers to security ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Do not support security ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts or postinstalled mechanical or adhesive anchors.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than 48 inches (1220 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
 11. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
 12. Install compression struts extending from main runners to structure above and spaced at 48 inches (1220 mm) o.c.
- B. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- C. Panel Installation: Install panels to continuously engage with and lock under rectangular bulb of suspension system. Attach panels to perimeter supports with security fasteners not more than 3 inches (76 mm) from edges of panel. Fasten through exposed face of supports into panel.
1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions unless otherwise indicated.
 2. Fit adjoining units to form flush, tight joints. Scribe and cut units for accurate fit at borders and around construction penetrating security ceiling.
 3. Install directionally patterned panels in directions indicated.

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4. Scribe and cut security ceiling panels for accurate fit at borders and at interruptions and penetrations by other work through security ceilings. Stiffen edges of cut panels as required to eliminate evidence of buckling or variations in flatness.
- D. Access Panels: Install each access panel only where indicated and within one security ceiling panel.

3.05 FIELD QUALITY CONTROL

- A. Inspect installed products to verify compliance with requirements. Prepare inspection reports and indicate compliance with and deviations from the Contract Documents.
- B. Remove and replace security ceiling assemblies where inspections indicate that work does not comply with specified requirements.
- C. Perform additional inspections to determine compliance of replaced or additional work. Prepare inspection reports.
- D. Prepare field quality-control certification that states installed products and their installation comply with requirements in the Contract Documents.
- E. Field Quality-Control Testing: Engage a qualified independent testing agency to perform field quality-control testing.
- F. Extent and Testing Frequency: Testing will take place in successive stages in areas described below. Proceed with installation of security ceiling assemblies only after test results for previously installed hangers comply with requirements.
 1. Extent of Each Test Area: When installation of security ceiling suspension systems on each floor has reached 20 percent completion, but no security panel units have been installed.
 2. Within each test area, testing agency will select 1 of every 10 anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
 3. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those fasteners and anchors not previously tested until 20 consecutively pass and then will resume initial testing frequency.
- G. Fasteners and anchors will be considered defective if they do not pass tests and inspections.
- H. Prepare test and inspection reports.
- I. Additional Testing: Where fasteners and anchors are removed and replaced, additional testing will be performed to determine compliance with specified requirements.

3.06 CLEANING

- A. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent units.
- B. Touchup Painting:

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1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as that used for shop painting; comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum dry film thickness of 2 mils (0.05 mm).
 2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Metallic-Coated Steel Surfaces: Clean field welds, bolted connections, and abraded areas and repair zinc or zinc-iron coating to comply with ASTM A780/A780M.

END OF SECTION 095753

SECTION 096500 - RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints, And Coatings.
- B. Section 017419 Construction Waste Management and Disposal; Limitations on disposal of removed materials; requirements for recycling.
- C. Section 018119 Construction Indoor Air Quality (IAQ) Management; Indoor air quality control plan.
- D. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.
- E. Section 090561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 REFERENCE STANDARDS

- A. ASTM D6329 - Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers.
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile.
- D. ASTM F1861 - Standard Specification for Resilient Wall Base.
- E. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
- F. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings.
- G. UL 2824 - GREENGUARD Certification Program Method for Measuring Microbial Resistance from Various Sources Using Static Environmental Chambers.

1.04 SUBMITTALS

- A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- B. Shop Drawings: Indicate floor patterns.
- C. Verification Samples: Submit two samples, in size illustrating color and pattern for each resilient flooring product specified.
- D. Sustainable Design Submittal: Submit VOC content documentation for flooring and adhesives.
- E. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.
- G. Installer's Qualification Statement.
- H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Wall Base: Quantity equivalent to 2 percent of each type and color.
 - 3. Extra Flooring Materials: Quantity equivalent to 2 percent of each type and color.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience and approved by flooring manufacturer.
- C. Testing Agency Qualifications: Independent firm specializing in performing concrete slab moisture testing and inspections of the type specified in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).
- D. Protect roll materials from damage by storing on end.
- E. Do not double stack pallets.

1.07 FIELD CONDITIONS

- A. 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

2.01 TILE FLOORING

- A. Vinyl Tile - LVT: Surface-decorated, with wear layer.
 - 1. Manufacturers:
 - a. Mohawk Group; Lineate Collection:
https://mohawkdirectory.blob.core.windows.net/specsheets/hard_surface/Lineate.pdf
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
 - 3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 - 4. Mold and Microbial Resistance: Highly resistant when tested in accordance with ASTM D6329; certified in accordance with UL 2824.
 - 5. VOC Content Limits: As specified in Section 016116.
 - 6. Plank Tile Size: 9 by 59 inch (229 by 1499 mm).
 - 7. Total Thickness: 0.20 inch (5 mm).
 - 8. Patterns and Colors: As indicated.
 - a. **FT-1:** Hot and Heavy Collection, #868 "*Groove.*"
 - 1) Pattern: As selected by the Architect.
 - b. **FT-2:** Hot and Heavy Collection, #948 "*Figured.*"
 - 1) Pattern: As selected by the Architect.

2.02 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TP, rubber, thermoplastic; style as scheduled.
 - 1. Manufacturers:
 - a. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
 - b. Substitutions: See Section 016000 - Product Requirements.
 - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 - 3. Thickness: 0.125 inch (3.2 mm).
 - 4. Length: Roll.
 - 5. Profile and Color: As indicated.
 - a. **WB-1:** Tarkett; Traditional Coved Base; #WG-197 "*Shaded.*"
 - 1) Height: 6-inches
 - b. **WB-2:** Tarkett; Traditional Coved Base; #WG-197 "*Shaded.*"
 - 1) Height: 4-inches.
 - c. **WB-3:** Tarkett; Traditional Coved Base; #40 "*Black.*"
 - 1) Height: 4-inches.

2.03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
 - 1. VOC Content Limits: As specified in Section 016116.
- C. Adhesive for Vinyl Flooring: As recommended by flooring manufacturer.
- D. Moldings, Transition and Edge Strips: Same material as flooring.
- E. Sealer and Wax: Types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 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. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test in accordance with Section 090561.
 - 2. Conduct tests by an independent testing agency acceptable to Owner.
 - 3. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
 - 4. Follow moisture and alkalinity remediation procedures in Section 090561.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).
- B. Prepare floor substrates for installation of flooring in accordance with Section 090561.
- C. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- D. Prohibit traffic until filler is fully cured.
- E. Clean substrate.
- F. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Fit joints and butt seams tightly.
 - 3. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 - 1. Resilient Strips: Attach to substrate using adhesive.
- F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- G. Install flooring in recessed floor access covers, maintaining floor pattern.
- H. At movable partitions, install flooring under partitions without interrupting floor pattern.

3.04 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.
- C. Install plank tile with a random offset of at least 6 inches (152 mm) from adjacent rows.

3.05 INSTALLATION - 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, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.
- C. Install base on solid backing. Bond tightly to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

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3.07 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 096500

SECTION 096566 - RESILIENT ATHLETIC FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Rubber sheet flooring, adhesively installed.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints, And Coatings.
- B. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.
- C. Section 090561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.
- D. Section 096500 - Resilient Flooring.

1.03 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension.
- B. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness.
- C. DIN EN 14904 - Surfaces for Sports Areas – Indoor Surfaces for Multi-Sports Use – Specification.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. 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.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed data sheets for products specified.
- C. Selection Samples: Manufacturer's color charts for flooring materials specified, indicating full range of colors and textures available.
- D. Verification Samples: Actual flooring material specified, not less than 12 inch (305 mm) square, mounted on solid backing.
- E. Test Reports: Submit test reports showing compliance with DIN EN 14904.
- F. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

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- G. Sustainable Design Submittal: Submit VOC content documentation for flooring and adhesives.
- H. Manufacturer's Instructions: Indicate standard and special installation procedures.
- I. Installer's qualification statement.
- J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Flooring Material: 10 square yards (9 sq m) matching installed flooring.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.07 MOCK-UPS

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Locate where directed.
- C. Mock-up may remain as part of work.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Deliver materials to project site in unopened containers clearly labeled with manufacturer's name and identification of contents.
- C. 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.

1.09 FIELD CONDITIONS

- A. Maintain temperature in spaces to receive adhesively installed resilient flooring within range of 70 to 95 degrees F (21 to 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

2.01 PREFORMED ATHLETIC FLOORING

- A. Rubber Sheet Flooring: Recycled SBR (styrene butadiene rubber) and colored EPDM granules with urethane binder, lengths to avoid transverse seams.
 - 1. VOC Content: As specified in Section 016116.
 - 2. VOC Content: Certified as Low Emission by one of the following:
 - 3. Thickness: Minimum 1/4 inch (6.35 mm).
 - 4. Tensile Strength: Minimum 150 psi (1.0 MPa), per ASTM D412.
 - 5. Durometer Hardness, Type A: Minimum of 55, when tested in accordance with ASTM D2240.
 - 6. Color: Black.
 - 7. Products:
 - a. Matter Surfaces; Decathlon: <https://mattersurfaces.com/#sle> .
 - b. Substitutions: See Section 016000 - Product Requirements.

2.02 ACCESSORIES

- A. Leveling Compound: Latex-modified cement formulation as recommended by flooring manufacturer for substrate conditions.
- B. Flooring Adhesive: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 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. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 - 1. Test in accordance with Section 090561.
 - 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Concrete: Use leveling compound as necessary to achieve substrate flatness of plus or minus 1/8 inch within 10 ft radius (1/1000).
- C. Remove coatings that are incompatible with flooring adhesives, using methods recommended by flooring manufacturer.

D. Broom clean areas to receive athletic flooring immediately before beginning installation.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Resilient Sheet Flooring:

1. Unroll flooring and allow to relax before beginning installation.
2. Mix adhesive thoroughly and apply to substrate with notched trowel. Roll flooring into fresh adhesive, overlapping end seams and double cutting, butting factory edges and compression fitting.
3. Roll entire flooring surface with steel roller to assure adhesion to substrate and eliminate air bubbles.
4. Immediately remove any adhesive from flooring surface, using chemical recommended by flooring manufacturer.
5. Apply transparent top coat over flooring if recommended by manufacturer, to achieve a uniform finished appearance.

3.04 CLEANING

A. Clean flooring using methods recommended by manufacturer.

3.05 PROTECTION

A. Protect finished athletic flooring from construction traffic to ensure that it is without damage upon Date of Substantial Completion.

END OF SECTION 096566

SECTION 096813 - TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered.
- B. Removal of existing carpet tile.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints, And Coatings.
- B. Section 017419 - Construction Waste Management and Disposal: Reclamation/Recycling of new carpet tile scrap, removed carpet tile, and _____.
- C. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.
- D. Section 090561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- B. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate layout of joints.
- D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Sustainable Design Submittal: Submit VOC content documentation for adhesives.
- F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- G. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- H. Manufacturer's Qualification Statement.

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- I. Installer's Qualification Statement.
- J. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- K. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Tile Carpeting:
 - 1. Mohawk Group; ____: www.mohawkgroup.com/#sle.

2.02 MATERIALS

- A. Tile Carpeting, Type (CPT-1): Tufted, manufactured in one color dye lot.
 - 1. Product: Motivated Movement manufactured by Mohawk Group.
 - 2. Tile Size: 24 by 24 inch (610 by 610 mm), nominal.
 - 3. Thickness: 0.236 inch (5.99 mm).
 - 4. Color: #955, "Henry".
 - 5. Pattern: Taking Steps Collection.
 - 6. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 - 7. Gauge: 1/12 inch (47 per 100 mm).
 - 8. Stitches: 13 per inch (51.18 per 10 per cm).
 - 9. Pile Weight: 18 oz/sq yd (610 gm/sq m).
 - 10. Density Factor: 6612 kilotex.
 - 11. Primary Backing Material: EcoFlex One.
- B. Tile Carpeting, Type (CPT-2): Textile Construction, manufactured in one color dye lot.
 - 1. Product: Kinetex manufactured by J&J Flooring Group.
 - 2. Tile Size: 18 by 36 inch (450 by 910 mm), nominal.
 - 3. Total Thickness: 0.205 inch.
 - 4. Color: #1799, "Eclipse Stripe".
 - 5. Pattern: Umbra Stripe II Plank 1820.

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6. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
7. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
8. VOC Content: Comply with Section 016116.

2.03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: Embossed aluminum, _____ color.
- C. Adhesives:
 1. Compatible with materials being adhered; maximum VOC content as specified in Section 016116.
- D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- 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 tile.
- C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
 1. Test in accordance with Section 090561.
 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
 3. Follow moisture and alkalinity remediation procedures in Section 090561.

3.02 PREPARATION

- A. Remove existing carpet tile.
- B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- C. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- E. Vacuum clean substrate.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in pattern as indicated on the drawings.
- F. Fully adhere carpet tile to substrate.
- G. Trim carpet tile neatly at walls and around interruptions.
- H. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- A. See Section 017000 - Execution and Closeout Requirements for additional requirements.
- B. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- C. Clean and vacuum carpet surfaces.

END OF SECTION 096813

SECTION 099123 - INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise 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, bar code labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
 - 6. Marble, granite, slate, and other natural stones.
 - 7. Floors, unless specifically indicated.
 - 8. Ceramic and other tiles.
 - 9. Brick, architectural concrete, cast stone, integrally colored plaster, and stucco.
 - 10. Glass.
 - 11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 016116 - Volatile Organic Compound (VOC) Limits For Adhesives, Sealants, Paints, And Coatings.
- B. Section 055000 - Metal Fabrications: Shop-primed items.

1.03 REFERENCE STANDARDS

- A. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating.
- B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual.
- D. SSPC-SP 1 - Solvent Cleaning.
- E. SSPC-SP 6 - Commercial Blast Cleaning.
- F. SSPC-SP 13 - Surface Preparation of Concrete.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
 - 2. MPI product number (e.g., MPI #47).
 - 3. Cross-reference to specified paint system products to be used in project; include description of each system.
 - 4. Manufacturer's installation instructions.
 - 5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, submit each color in each sheen available.
 - 3. Allow 30 days for approval process, after receipt of complete samples by Architect.
 - 4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gal (4 L) of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.06 MOCK-UP

- A. See Section 014000 - Quality Requirements, for general requirements for mock-up.
- B. Provide panel, 15 feet (____ m) long by 9 feet (3 m) wide, illustrating paint color, texture, and finish.
- C. Provide door and frame assembly illustrating paint color, texture, and finish.

- D. Locate where directed by Architect.
- E. Mock-up may remain as part of the work.

1.07 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.

1.08 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 materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
 - 2. Substitution of MPI-approved products by a different manufacturer is preferred over substitution of unapproved products by the same manufacturer.
 - 3. Substitution of a different paint system using MPI-approved products by the same manufacturer will be considered.
- B. Paints:
 - 1. Base Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 2. Benjamin Moore & Co.; <https://www.benjaminmoore.com/en-US/#sle>.
 - 3. Dunn-Edwards Corporation; _____: www.dunnedwards.com/#sle.
 - 4. PPG Paints: www.ppgpaints.com/#sle.

C. Substitutions: See Section 016000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 2. Provide paints and finishes 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.
 3. 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.
 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: See Section 016116.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: As indicated in Color Schedule.
1. Extend colors to surface edges; colors may change at any edge as directed by Architect.
 2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.
 3. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

2.03 PAINT SYSTEMS - INTERIOR

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, uncoated steel, and shop primed steel.
1. Two top coats and one coat primer.
 2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, 141, or 142.
 - a. Products:
 - 1) Sherwin-Williams Pre-Catalyzed Waterbased Epoxy, Eg-Shel. (MPI #139)
 - 2) Sherwin-Williams Pre-Catalyzed Waterbased Epoxy, Semi-Gloss. (MPI #141)
 - 3) Sherwin-Williams ProMar 200 HP Series, Low Gloss Eg-Shel. (MPI #138)
 - 4) Sherwin-Williams ProMar 200 HP Series, Eg-Shel. (MPI #139)
 3. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
1. Two top coats and one coat primer.
 2. Top Coat(s): Interior Epoxy-Modified Latex; MPI #115 or 215.

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- a. Products:
 - 1) Sherwin-Williams Pro Industrial Waterbased Catalyzed Epoxy, Gloss. (MPI #115)
 - 2) Substitutions: See Section 016000 - Product Requirements
 - 3. Primer: As recommended by top coat manufacturer for specific substrate.
- C. Paint I-OP-FL - Concrete Floors to be Painted.
- 1. Two top coats and one coat primer.
 - 2. Top Coat(s): Polyamin Enamel, Gloss.
 - a. Products:
 - 1) Armorseal 8100 Waterbased Epoxy Floor System; Sherwin Williams.
 - 2) Substitutions: See Section 016000 - Product Requirements
 - 3. Primer: As recommended by top coat manufacturer for specific substrate.

2.04 PRIMERS

- A. Primers: Provide the primer as required or recommended by manufacturer of top coats.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been adequately 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. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 3. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to 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 repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

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- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete:
 - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 - 2. Clean concrete according to ASTM D4258. Allow to dry.
 - 3. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- H. Masonry:
 - 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 - 2. Prepare surface as recommended by top coat manufacturer.
- I. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- J. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- K. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: 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.
 - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
 - 1. Color to match adjacent painted surface.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- F. Sand metal surfaces lightly between coats to achieve required finish.

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- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.07 COLOR SCHEDULE

- A. **P-1:** #SW 6246, "*North Star*," finish TBD; Sherwin Williams.
- B. **P-2:** #SW 6226, "*Lanquid Blue*," finish TBD; Sherwin Williams.
- C. **P-3:** #SW 7664, "*Steely Gray*," finish TBD; Sherwin Williams.
- D. **P-4:** #SW 6246, "*Smoky Azurite*," finish TBD; Sherwin Williams.
- E. **P-5:** Sherwin-Williams Pre-Catalyzed Waterbased Epoxy, Semi-Gloss.
 - 1. Color: TBD.
- F. **P-6:** #SW 9150, "*Endless Sea*," finish TBD; Sherwin Williams.
- G. **P-7:** #SW 6328, "*Fireweed*," finish TBD; Sherwin Williams.
- H. **P-8:** #SW 7007, "*Bright White*," finish TBD; Sherwin Williams.
- I. **P-9:** #SW 6119, "*Antique White*," finish TBD; Sherwin Williams.
- J. **P-10:** #SW 6990, "*Caviar*," semi-gloss finish; Sherwin Williams.
- K. **HPC-1:** "*18% Kodak Grey*," Sherwin Williams.
- L. **HPC-2:** Color TBD; Sherwin Williams.
 - 1. Provid Block filler.

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- M. **HPC-3:** Color TBD; Sherwin Williams.
1. Provide Block filler.

END OF SECTION 099123

SECTION 101400

INTERIOR SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following types of signs:
 - 1. Room Signage
 - 2. Way Finding Signage
 - 3. Emergency Signage

1.3 EGC REQUIREMENTS

- 1. 6.2 Low / No VOC Adhesives and Sealants

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.
- C. Shop Drawings: Provide shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
 - 1. Provide message list for each sign required, including large- scale details of wording and layout of lettering.
 - 2. Furnish full-size spacing templates for individually mounted dimensional letters and numbers.
- D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.
 - 1. Samples for verification of color, pattern, and texture selected, and compliance with requirements indicated:
 - 2. Acrylic: Samples of each finish type and color on 6" Section of extrusions and not less than 4-inch square of sheet or plate.

1.5 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.
- B. Design Criteria: The drawings indicate size, profiles, and dimensional requirements of signs and are based on the specific type and model indicated. Signs by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
 - 1. Manufacturers of Panel Signs:

ABC Architectural Signing System, Division of Nelson-Harkins Industries. APCO Graphics, Inc.
Architectural Graphics, Inc. ASI Sign Systems, Inc.
Best Manufacturing Co. Expose Signs & Graphics, Inc. Mohawk Sign Systems.
 - 2. Manufacturers of Dimensional Letters:

Andco Industries Corp.
A.R.K. Ramos Manufacturing Company, Inc. ASI Sign Systems, Inc.
Expose Signs & Graphics, Inc. Gemini, Inc.
Metal Arts, Division of L & H Manufacturing Co. The Southwell Company.
Spanjer Brothers, Inc. Steel Art Company, Inc.

2.2 MANUFACTURERS

- A. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methacrylate monomer

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plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested in accordance with ASTM D-790, a minimum allowable continuous service temperature of 176 °F (80 °C), and of the following general types:

1. Opaque Sheet: Where sheet material is indicated as “opaque.” Provide colored opaque acrylic sheet in colors and finishes indicated.
- B. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.
- C. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.
- D. Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, including inks and paints for copy and background colors, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for the application intended.

2.3 PANEL SIGNS

- A. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction. Signs must conform to current American Disability Act Guidelines and ANSI A117.1.
 1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.
 2. Unframed Panel Signs: Fabricate signs to profile indicated with edges mechanically and smoothly finished to conform with the following requirements:
 - A. Edge Condition: Square cut unless indicated otherwise.
 - B. Corner Condition: Corners 1/2" radius unless indicated otherwise.
 3. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, and other graphic devices by the Authority having jurisdiction.
 4. Raised Copy and Graphics: Machine-cut copy characters from matte-finish opaque acrylic sheet and chemically weld onto the acrylic sheet forming sign panel face. Produce precisely formed characters with square cut edges free from burrs and cut marks.
 - a. Panel Material: Section-finished opaque non-glare acrylic sheet.
- B. Raised Copy Thickness: Not less than 1/32 inch.
- C. Letter Style: Sans Serif.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following unless otherwise indicated:
1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. Sign Mounting Fasteners:
 - a. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.
- B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.
1. Uses: Securing signs with imposed loads to structure.
 2. Type: Torque-controlled, adhesive anchor or adhesive anchor.
 3. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or **ASTM F1941 (ASTM F1941M)**, Class Fe/Zn 5, unless otherwise indicated.
 4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (**A1**) stainless steel bolts, **ASTM F593 (ASTM F738M)**, and nuts, **ASTM F594 (ASTM F836M)**.
- C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Adhesive: As recommended by sign manufacturer.

2.5 FINISHES

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated, or if not indicated, as selected by the Architect from the manufacturer's standards.
- B. Provide 2 colors, base and border.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.

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1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Wall Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
1. Silicone-Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.
- C. Mounting Methods:
1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
 - c. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

3.2 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

3.3 CLEANING AND PROTECTION

- A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

3.4 SIGNAGE SCHEDULE - PANEL SIGNS

- A. Provide one (1) panel sign at each unit entrance.
 - 1. Locate unit panel signs on wall adjacent to unit entry door as directed by Architect.
 - 2. Unit signs to be rectangular with 1/2" brushed chrome backing border.
- B. Provide one (1) panel sign at each public area room (i.e. all rooms, stair and other spaces).
- C. Provide stair well signs inside every stair at each floor indicating stair #, floor landing level, floor of egress discharge, height of stair in stories, and if access to the roof is provided.
- D. Provide evacuation plans to be located at each elevator lobby.
- E. Provide identification signs to direct fire personnel to Fire Alarm Control Panel (FACP) as required.
- F. Provide signs identifying all mechanical spaces, including but not limited to mechanical room, elevator machine room, main electric room, trash rooms, electric or tel/data closets, and mechanical closets.
- G. Provide management name, contact information & hours of operation sign at main entrance.
- H. Provide at least EIGHT (8) per floor (32) of hallway directional signs listing unit groups and directional arrows.
- I. Provide FOUR (4) no-smoking signs to be located in various common areas around building.

END OF SECTION 101400

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TYPE 1

Description:

Signs

Sign Components / Graphics Process:

6" x 6" photopolymer plaque with sign insert as shown, tactile text and grade II braille raised 1/32" min.

Colors:

All sign areas shown in black = TBD

All sign areas shown in white = TBD to meet ADA code

Typography:

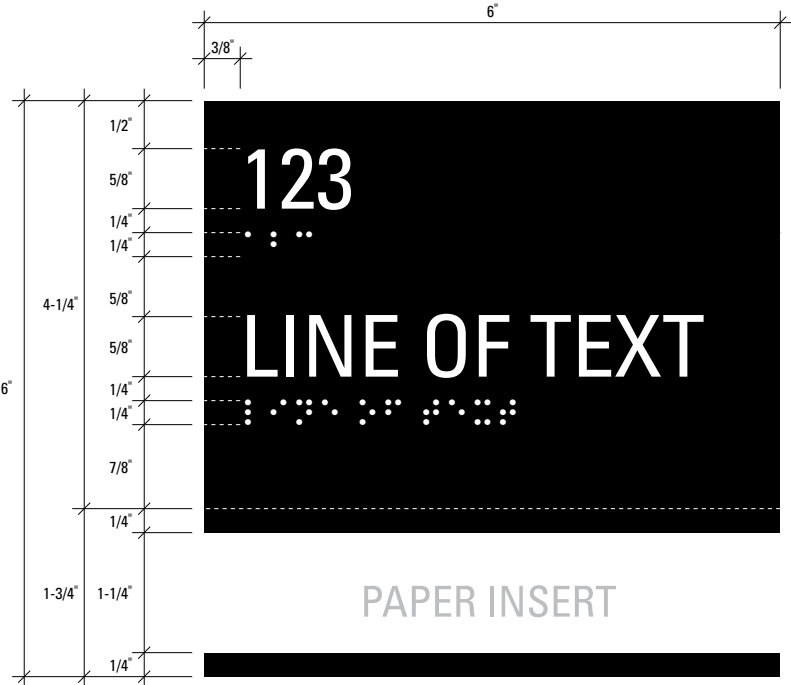
Room number - 5/8" Univers Condensed

Room name - 5/8" Univers Condensed

1/4" high braille centered below text

Paper Insert:

6" x 1.25" area on bottom of plaque to accommodate paper insert, as shown (text provided by owner).



Scale - 1:2

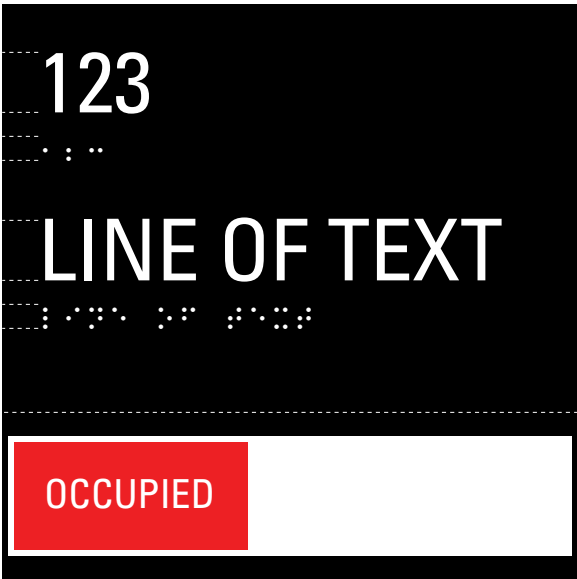
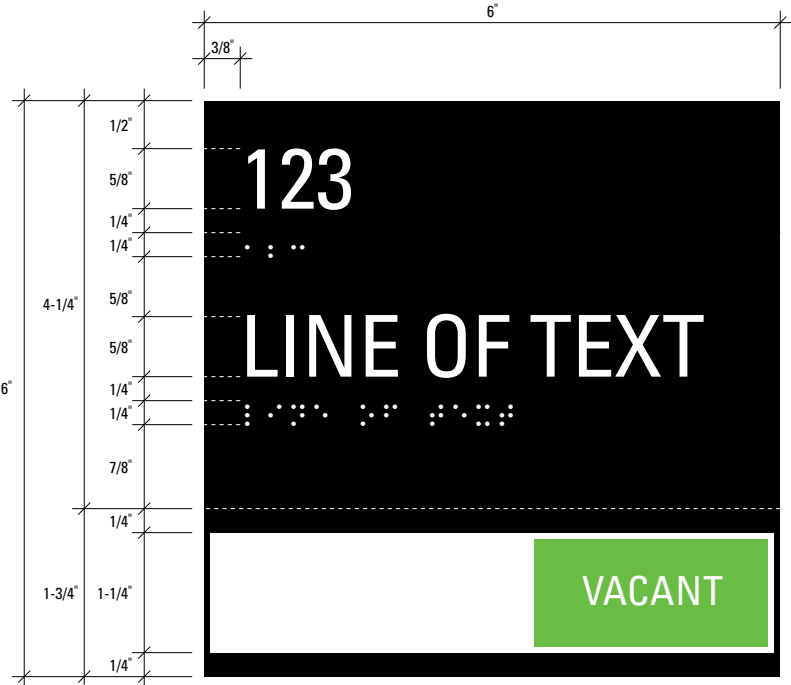
TYPE 2

Description:
 Occupied Signs

Sign Components / Graphics Process:
 6" x 6" photopolymer plaque with sign insert as shown,
 tactile text and grade II braille raised 1/32" min.
 Bottom section to have slider that indicates either
 "occupied" or "vacant"

Colors:
 All sign areas shown in black =
 TBD
 All sign areas shown in white =
 TBD to meet ADA code

Typography:
 Room number - 5/8" Univers Condensed
 Room name - 5/8" Univers Condensed
 1/4" high braille centered below text



Scale - 1:2

TYPE 3

Description:

General Room Signs

Sign Components / Graphics Process:

6" x 6" photopolymer plaque with tactile text and grade II braille raised 1/32"

Colors:

All sign areas shown in black = TBD

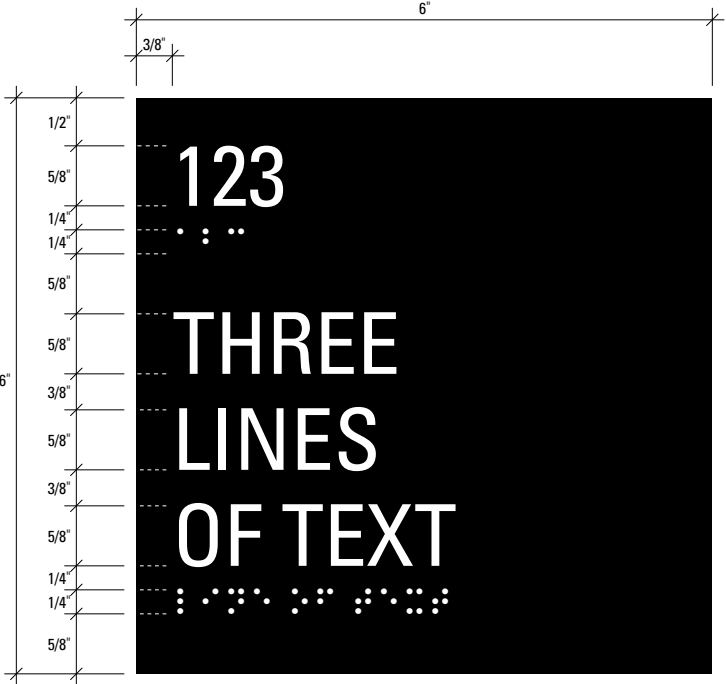
All sign areas shown in white = TBD to meet ADA code

Typography:

Room number - 5/8" Univers Condensed

Room name - 5/8" Univers Condensed

1/4" high braille centered below text



Scale - 1:2



Scale - Not to Scale

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TYPE 4

Description:

No Unauthorized Access Sign

Sign Components / Graphics Process:

8" x 4" photopolymer plaque with tactile text and grade II braille raised 1/32"

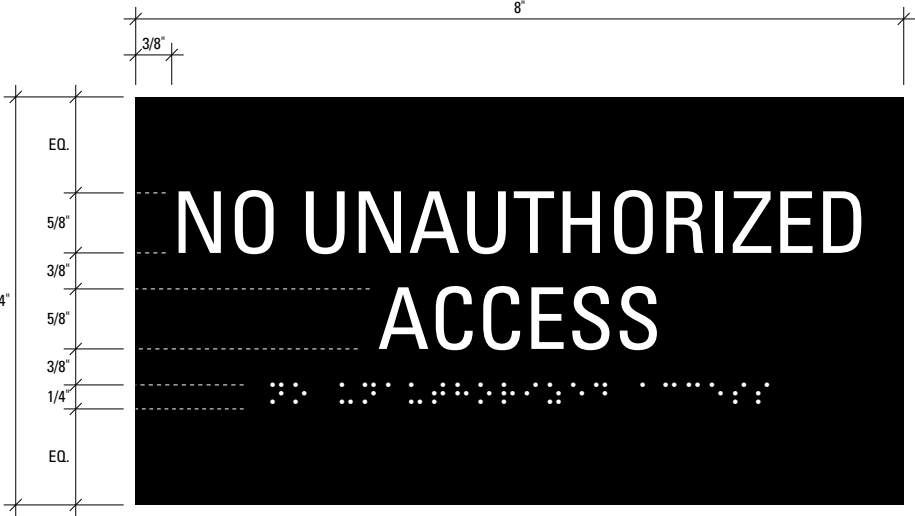
Colors:

All sign areas shown in black = TBD

All sign areas shown in white = TBD to meet ADA code

Typography:

Room number - 5/8" Univers Condensed
Room name - 5/8" Univers Condensed
1/4" high braille centered below text



Scale - 1:2

TYPE 5

Description:
 Restroom Signs

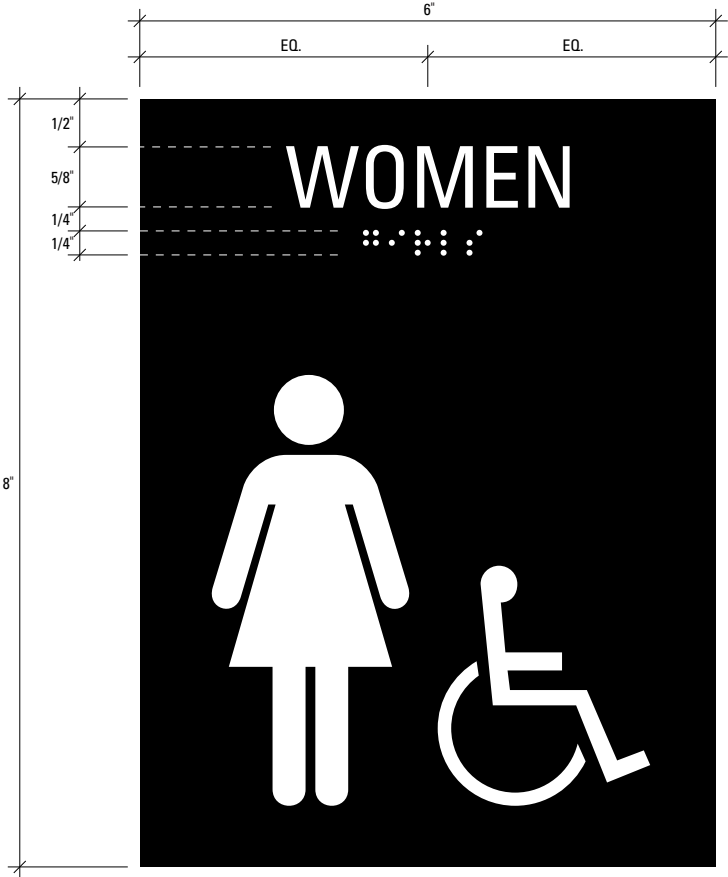
Sign Components / Graphics Process:
 6" x 8" photopolymer plaque with tactile text and pictograms, grade II braille raised 1/32" min.

Colors:
 All sign areas shown in black = TBD
 All sign areas shown in white = TBD to meet ADA code

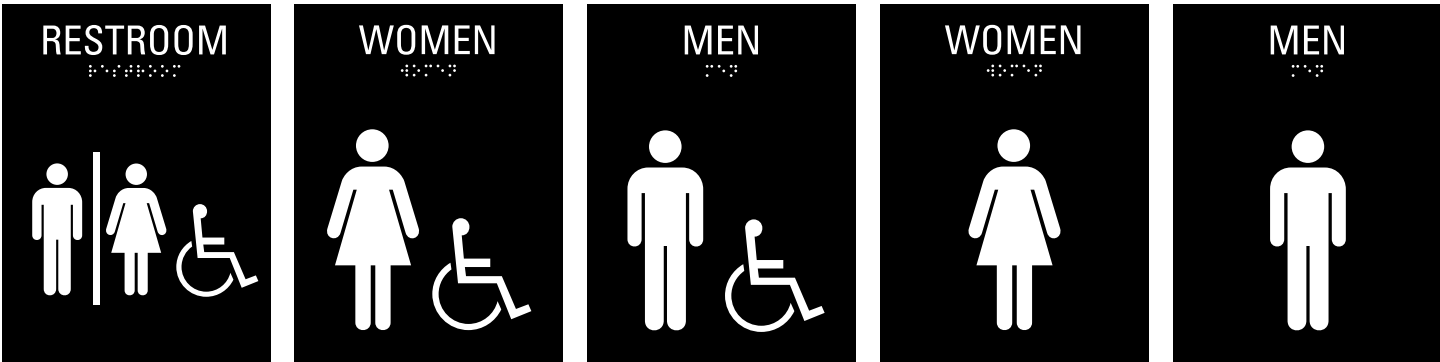
Typography: [centered left to right]
 Sign text - 5/8" Univers Condensed
 1/4" high braille centered below text

Text / Pictogram Schemes:

type	text
5.1	Restroom
5.2	Women (ADA)
5.3	Men (ADA)
5.4	Women
5.5	Men



Scale - 1:2



5.1 5.2 5.3 5.4 5.5

Scale - Not to Scale

TYPE 6

Description:

Locker Room Signs

Sign Components / Graphics Process:

7" x 9" photopolymer plaque with tactile text and pictograms, grade II braille raised 1/32" min.

Colors:

- All sign areas shown in black = TBD
- All sign areas shown in white = TBD to meet ADA code

Typography: [centered left to right]

- Sign text - 5/8" Univers Condensed
- 1/4" high braille centered below text

Text / Pictogram Schemes:

type	text
6.1	Restroom Shower/Locker
6.2	Male Shower/Locker
6.3	Female Shower/Locker

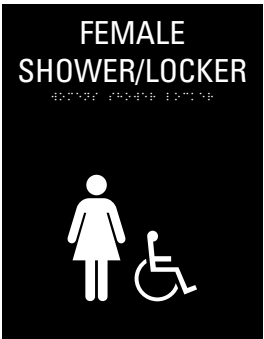


6.1

Scale - 1:2



6.2



6.3

Scale - Not to Scale

TYPE 7

Description:

Exit Sign

Sign Components / Graphics Process:

6" x 3" photopolymer plaque with tactile text
and grade II braille raised 1/32"

Colors:

All sign areas shown in black =

TBD

All sign areas shown in white =

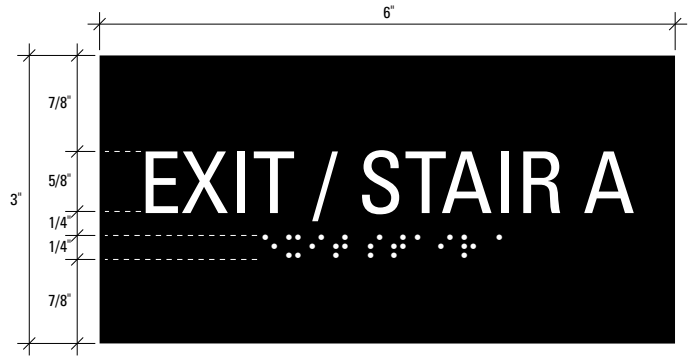
TBD to meet ADA code

Typography: [centered left to right]

Sign text - 5/8" Univers Condensed

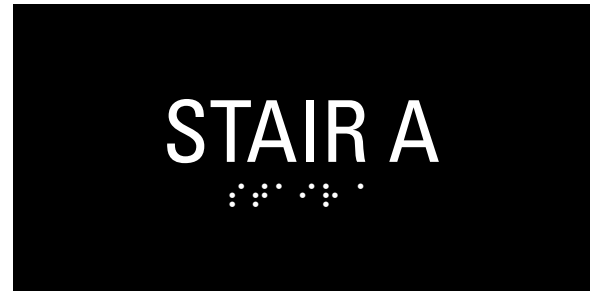
1/4" high braille centered below text

stair letter[s] to correspond to sign schedule



7.1

Scale - 1:2



7.2

Scale - 1:2

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TYPE 8

Description:

Exit Sign

Sign Components / Graphics Process:

6" x 3" photopolymer plaque with tactile text and grade II braille raised 1/32"

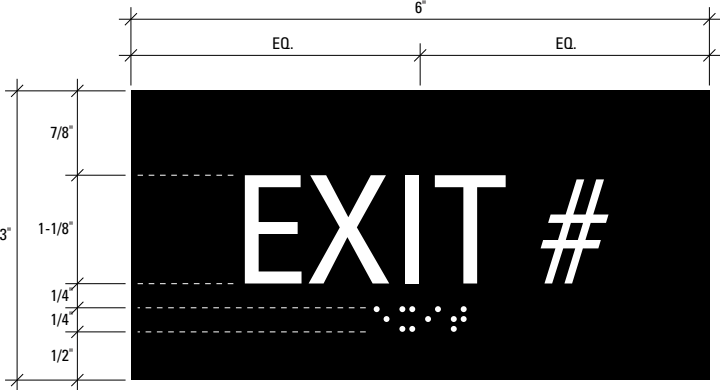
Colors:

All sign areas shown in black = TBD

All sign areas shown in white = TBD to meet ADA code

Typography: [centered left to right]

Sign text - 1 1/8" Univers Condensed Black
1/4" high braille centered below text



Scale: 1:2

SECTION 101416 - PLAQUES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Plaques.

1.02 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
- B. ADA Standards - 2010 ADA Standards for Accessible Design.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.03 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's product literature for each type of plaque sign, indicating style, font, foreground and background colors, locations, and overall dimensions of each sign.
- C. Shop Drawings: Indicate dimensions, locations, elevations, materials, text and graphic layout, and attachment details.
- D. Samples: One sample of each type of plaque sign, of size similar to that required for project, indicating style, font, and method of attachment.
- E. Selection Samples: Where materials, colors, and finishes are not specified, submit two sets of color selection charts or chips.
- F. Manufacturer's qualification statement.

1.04 QUALITY ASSURANCE

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

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Package plaque signs as required to prevent damage before installation.
- B. Store under cover and elevated above grade.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Plaques:
 - 1. A.R.K, Ramos; <https://arkramos.com/>.

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2. ASI Sign Systems; <https://asisignage.com/>.
3. Gemini Made; <https://geminimade.com/signage/>.
4. Substitutions: See Section 016000 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 PLAQUES

- A. Metal Plaques:
 1. Material: Bronze casting.
 2. Material Thickness: 1/8 inch (3 mm), minimum.
 3. Size: As indicated on drawings.
 4. Text and Typeface:
 - a. Character Font: Times or other serif font.
 - b. Character Case: Upper case only.
 - c. Character Color: Contrast with background color.
 5. Background Texture: Pebble.
 6. Surface Finish: Brushed, satin.
 7. Painted Background Color: Light oxide stain.
 8. Protective Coating: Manufacturer's standard clear coating.
 9. Mounting: Rosettes and toggle bolts.
 - a. Rosette Style: Star.
 - b. Rosette Diameter: 1/2 inch (12 mm).

2.04 ACCESSORIES

- A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.
- B. Exposed Screws: Solid brass.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.
- C. Locate plaque signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

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D. Protect from damage until mm-dd-yyyy; repair or replace damaged items.

END OF SECTION 101416

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SECTION 102113.19 - PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Solid plastic toilet compartments.
- B. Urinal screens.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Blocking and supports.
- B. Section 102800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

- A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on panel construction, hardware, and accessories.
- C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- D. Samples: Submit two samples of partition panels, 6 by 6 inch (150 by 150 mm) in size illustrating panel finish, color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Solid Plastic Toilet Compartments:
 - 1. ASI Global Partitions; Solid Plastic HDPE: www.asi-globalpartitions.com/#sle.
 - 2. Hadrian; Hadrian - Standard Series - Plastic: www.hadrian-inc.com/#sle.
 - 3. Scranton Products; Hiny Hiders Partitions: www.scrantonproducts.com/#sle.
 - 4. Substitutions: Section 016000 - Product Requirements.

2.02 PLASTIC TOILET COMPARTMENTS

- A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted unbraced.
 - 1. Color:
 - a. **TP-1:** "Shale."
 - b. **TP-2:** "Concrete."
 - 2. Texture:
 - a. **TP-1:** Orange Peel.
 - b. **TP-2:** Orange Peel.
 - 3. Doors:
 - a. Thickness: 1 inch (25 mm).
 - b. Width: 24 inch (610 mm).
 - c. Width for Handicapped Use: 36 inch (915 mm), out-swinging.
 - d. Height: 55 inch (1397 mm).
 - 4. Panels:
 - a. Thickness: 1 inch (25 mm).
 - b. Height: 55 inch (1397 mm).
 - 5. Pilasters:
 - a. Thickness: 1 inch (25 mm).
 - b. Width: As required to fit space; minimum 3 inch (76 mm).

2.03 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches (76 mm) high; concealing floor fastenings.
 - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Extruded aluminum, anti-grip profile.
 - 1. Size: Manufacturer's standard size.
- C. Wall and Pilaster Brackets: Stainless steel; continuous type.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
 - 1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- E. Hinges: Stainless steel, manufacturer's standard finish.
 - 1. Continuous-type hinge, self closing.
- F. Door Hardware: Stainless steel, manufacturer's standard finish.
 - 1. Door Latch: Slide type with exterior emergency access feature.
 - 2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
 - 3. Provide door pull for outswinging doors.
- G. Coat Hook: One per compartment, mounted on door.

PART 3 EXECUTION

3.01 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.

3.02 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch (9 mm 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.

3.03 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch (6 mm).
- B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.04 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 102113.19

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SECTION 102600 - WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Bumper rails.
- B. Corner guards.
- C. Protective wall covering.

1.02 RELATED REQUIREMENTS

- A. Section 092116 - Gypsum Board Assemblies: Placement of supports in stud wall construction.
- B. Section 092216 - Non-Structural Metal Framing: Placement of supports in stud wall construction.

1.03 REFERENCE STANDARDS

- A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
- B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- D. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies.
- E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.
- C. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.
- D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
 - 1. Submit two sections of corner guards and bumper rails, 24 inches (610 mm) long.
 - 2. Submit two samples of protective wall covering and door surface protection, 6 by 6 inches (152 by 152 mm) square.
- E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

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- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
 - 1. See Section 016000 - Product Requirements, for additional provisions.
 - 2. Extra Stock Materials: One package(s) of minimum 96 inches (2438 mm) long unit of each kind of covers for corner guards and bumper rails.
 - 3. Extra Stock Materials: 128 square feet (12 square meters) of each kind of protective wall covering.
- H. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wall protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Protect work from UV light damage.
- D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.
- E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide Limited Lifetime manufacturer warranty for rigid vinyl sheet wall covering, corner guards and wall guards. Complete forms in Owner's name and register with manufacturer.
- C. Installer Warranty: Provide 2-year warranty for rigid vinyl sheet wall covering, wall, and corner guards, commencing on Date of Substantial Completion. Complete forms in Owner's name and register with installer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Bumper Rails (**WIP-3**):
 - 1. Babcock-Davis: www.babcockdavis.com/#sle.
 - 2. Construction Specialties, Inc: www.c-sgroup.com/#sle.
 - 3. Inpro; Model 1500: www.inprocorp.com/#sle.
 - 4. Koroseal Interior Products: www.koroseal.com/#sle.

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5. Substitutions: See Section 016000 - Product Requirements.
- B. Corner Guards (**WIP-2**):
1. Babcock-Davis: www.babcockdavis.com/#sle.
 2. Construction Specialties, Inc: www.c-sgroup.com/#sle.
 3. Inpro: Model 150 High Impact: www.inprocorp.com/#sle.
 4. Koroseal Interior Products: www.koroseal.com/#sle.
 5. Substitutions: See Section 016000 - Product Requirements.
- C. Protective Wall Covering (**WIP-1**):
1. Construction Specialties, Inc: www.c-sgroup.com/#sle.
 2. Inpro; Palladium Rigid Vinyl Sheet: www.inprocorp.com/#sle.
 3. MDC Interior Solutions: www.mdcwall.com/#sle.
 4. Pawling Corp: www.pawling.com/#sle.
 5. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE CRITERIA

- A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.
- B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.
- C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.

2.03 PRODUCT TYPES

- A. Bumper Rails (**WIP-3**): Factory- or shop-fabricated, with preformed end caps and internal and external corners:
1. Performance of Installed Assembly:
 - a. Support vertical live load of 100 lb/lineal ft (1,400 N/m) with deflection not to exceed 1/50 of span between supports.
 - b. Resist lateral force of 250 lbs (1112 N) at any point without damage or permanent set.
 2. Material: High impact vinyl, color #0280, "s#0134, "Shiprock".
 3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 4. Mounting: Surface.
 5. Length: Minimum one piece length not less than 12 inches (305 mm); flush splicing.
- B. Corner Guards - Surface Mounted (**WIP-2**):
1. Material: High impact vinyl with full height extruded aluminum retainer.
 2. Performance: Resist lateral impact force of 100 lbs (445 N) at any point without damage or permanent set.
 3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 4. Width of Wings: 3 inches (76 mm).
 5. Corner: Radiused.
 6. Color: As selected from manufacturer's standard colors.

7. Length: One piece.

C. Protective Wall Covering (**WIP-1**):

1. Material: High-impact acrylic-modified vinyl.
2. Thickness: 0.060 inch (1.52 mm).
3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
4. Color: #0134, "Cadet Blue".
5. Accessories: Provide manufacturer's standard color-matched trim and moldings.
 - a. Inside Corner Trim: Standard angle
 - b. Outside Corner Trim: Standard angle.
6. Mounting: Adhesive.

2.04 FABRICATION

- A. Fabricate components with tight joints, corners and seams.
- B. Pre-drill holes for attachment.
- C. Form end trim closure by capping and finishing smooth.

2.05 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Provide wall and door protection systems of each type from a single source and manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated on drawings.
- B. Verify that substrate surfaces for adhered items are clean and smooth.
 1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.
- C. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position top of bumper rail 36 inches (914 mm) from finished floor.
- C. Position corner guard 4 inches (102 mm) above finished floor to 48 inches high (1220 mm high).
- D. Terminate rails 1 inch (25.4 mm) short of door openings and intersecting walls.

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- E. Position protective wall covering no less than 1 inch (25.4 mm) above finished floor to allow for floor level variation.
 - 1. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
 - 2. Apply adhesive with 1/8 inch (3.2 mm) V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.
 - 3. Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
 - 4. Use a roller to ensure maximum contact with adhesive.
 - 5. At inside and outside corners cut covering sheets to facilitate installation of trim pieces or corner guards.

3.03 TOLERANCES

- A. Maximum Variation From Required Height: 1/4 inch (6 mm).
- B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch (6 mm).

3.04 CLEANING

- A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.
- B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION 102600

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SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Commercial shower and bath accessories.
- C. Under-lavatory pipe supply covers.
- D. Electric hand/hair dryers.

1.02 RELATED REQUIREMENTS

- A. Section 102113.19 - Plastic Toilet Compartments: For **TP-1** and **TP-2**.
- B. Section 224000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- F. ASTM C1036 - Standard Specification for Flat Glass.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- H. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- J. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use.
- K. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

1.04 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.
- B. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

1.05 SUBMITTALS

- A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
 - 1. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 2. Include electrical characteristics.
- B. Samples: Submit two samples of each accessory, illustrating color and finish.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.
- D. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify accessories using designations indicated.

1.06 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Structural Performance: Design accessories and fasteners to comply with the following requirements:
 - 1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.
 - 2. Shower Seats: Installed units are able to resist 250 lbf applied in any direction and at any point.

2.02 MANUFACTURERS

- A. Accessories: Provide products indicated, or approved equivalent by one of the following.

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1. AJW Architectural Products: www.ajw.com/#sle.
2. American Specialties, Inc: www.americanspecialties.com/#sle.
3. Bobrick: www.bobrick.com.
4. Bradley Corporation: www.bradleycorp.com/#sle.
5. Delta: www.deltafaucet.com.
6. GAMCO: www.gamcousa.com.

B. Provide products of each category type by single manufacturer.

2.03 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 two (2) keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- F. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- G. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
- H. Adhesive: Two component epoxy type, waterproof.
- I. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- J. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.04 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

2.05 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser: Twin mini jumbo roll dispenser, surface mounted, for 1-5/8 inch (40 mm) core type rolls.
 1. Products:
 - a. Tork USA; (TA-2) Tork Twin Mini Jumbo Bath Tissue Roll Dispenser.
 - b. Substitutions: Not permitted.

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- B. Paper Towel Dispenser (**TA-3**): Hands free, roll paper type.
 - 1. Cover: Stainless steel.
 - 2. Paper Discharge: Touchless automatic.
 - 3. Mounting: Surface mounted.
 - 4. Power: AC power adapter.
 - 5. Refill Indicator: Illuminated refill indicator.
 - 6. Products:
 - a. Tork USA; Tork Matic® Hand Towel Roll Dispenser - with Intuition™ Sensor.
 - b. Substitutions: Not permitted.

- C. Waste Receptacle (**TA-3k**): Wall-mounted, stainless steel, seamless panel container, reinforced panel continuously welded bottom pan and seamless exposed flanges.
 - 1. Liner: Removable, heavy-duty vinyl liner, attached at a minimum of four points with stainless steel grommets and hooks.
 - 2. Products:
 - a. Bobrick; #B-279 Surface-Mounted; satin finish.
 - 1) Minimum capacity: 6.4 gallons (24.2 liters).
 - b. Substitutions: Section 016000 - Product Requirements.
 - 3. Waste Receptacle (**TA-3l**): Recessed, stainless steel, seamless panel container, reinforced panel continuously welded bottom pan and seamless exposed flanges.
 - a. Liner: Removable seamless stainless steel receptacle.
 - b. Liner: Removable, heavy-duty vinyl liner, attached at a minimum of four points with stainless steel grommets and hooks.
 - c. Minimum capacity: 4 gallons (15 liters).
 - d. Products:
 - 1) Bobrick; #B-43644 Recess-Mounted; satin finish.
 - 2) Minimum capacity: 12.8 gallons (48.3 liters).
 - e. Substitutions: Section 016000 - Product Requirements.

- D. Automated Soap Dispenser: Foam or dispenser, wall-mounted containereck; chrome-plated ABS plastic with bright polished finish; chrome-plated deck escutcheon.
 - 1. Minimum Capacity: 1200 ml.
 - 2. Power: Battery operated. Provide 4 alkaline D-Cell batteries.
 - 3. Products:
 - a. GOJO; (**TA-9f**) ModelLTX Foaming Soap Touchless Dispenser.

- E. Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick annealed float glass; ASTM C1036.
 - 1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
 - 2. Size: 24-inches by 36-inches.
 - 3. Frame: channel or channel shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
 - 4. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.
 - 5. Products:
 - a. Bobrick; (**TA-11a**) Model #B-290 Angle Frame Mirror; 18 x 30 inches (46 x 76 cm).

- F. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base.
 - 1. Minimum capacity: 250 seat covers.

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2. Products:
 - a. Bobrick; **(TA-6d)** ConturaSeries Model #B4221; satin finish.
 - b. Substitutions: Section 016000 - Product Requirements.

- G. Seat Cover Dispenser: Stainless steel, recessed.
 1. Minimum capacity: 500 seat covers.
 2. Products:
 - a. Bobrick; **(TA-7p)** Model #B3013; satin finish.
 - b. Substitutions: Section 016000-Product Requirements.

- H. Grab Bars:
 1. Standard Duty Grab Bars: Stainless steel, smooth slip-resistant surface.
 - a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
 - b. Dimensions: 1-1/2 inch (38 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, concealed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
 - c. Finish: Satin.
 - d. Length and Configuration: As indicated on drawings and below.
 - e. Products:
 - 1) Bobrick; **(TA-1b)** Model B-6806x18, with #252-30 mounting kits.
 - 2) Bobrick; **(TA-1d)** Model B-6806x36, with #252-30 mounting kits.
 - 3) Bobrick; **(TA-1e)** Model B-6806x42, with #252-30 mounting kits.

- I. Sanitary Napkin Disposal Unit **(TA-5)**: Stainless steel, recessed, with full-length stainless steel piano-type hinge, removable receptacle.
 1. Products:
 - a. Bobrick; **(TA-5b)** ConturaSeries Model #B-270 (surface-mount); satin finish.
 - b. Bobrick; **(TA-5)** Model #B-3513 (recess-mount); satin finish.
 - c. Bobrick; **(TA-5g)** Model #B-354 (back-to-back partition-mount with adjustable flanges); satin finish.
 - d. Substitutions: Section 016000 - Product Requirements.

2.06 COMMERCIAL SHOWER AND BATH ACCESSORIES

- A. Shower Curtain Rod: Custom stainless steel tube, 1-1/4 inch (32 mm) outside diameter, 0.047 inch (1.2 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 concealed mounting. Existing masonry opening is 40-inches.
 1. Products:
 - a. Bobrick; **(TA-17)** ClassicSeries Model #B-6047.
 - b. Substitutions: Section 016000 - Product Requirements.

- B. Shower Curtain:
 1. Material: Opaque vinyl, 0.008 inch (0.2 mm) thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
 2. Grommets: Stainless steel; pierced through top hem on 6 inch (150 mm) centers.
 3. Color: White.
 4. Products:
 - a. Bobrick; **(TA-18a)** Model #B-204-2 42 x 72 inches (1065 x 1830 mm) Shower Curtain with hemmed edges.
 - b. Substitutions: Section 016000 - Product Requirements.

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5. Shower Curtain Hooks (**TA-19**): Stainless steel spring wire designed for snap closure.
 - a. Bobrick; Model #B-204-1.
 - b. Substitutions: Section 016000 - Product Requirements.

- C. Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped, reversible seat, unless otherwise indicated.
 1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of color as selected.
 2. Size: ADA Standards compliant.
 3. Products:
 - a. Bobrick; (TA-15) Model #B-5181 Reversible Solid Phenolic Folding Shower Seat.
 - b. Bobrick; (TA-16) Model #B-5191 Rectangular Solid Phenolic Folding Shower Seat.

- D. Wall-Mounted Soap Dish: Normal duty, seamless stainless steel, surface-mounted with drain holes, without grab bar, bright polished finish; with concealed mechanical fastening suitable for substrate and backplate.
 1. Products:
 - a. Bobrick; (**TA-20**) Model #B-680.

- E. Towel Bar: Stainless steel, 3/4 inch (20 mm) round tubular bar; rectangular brackets, concealed attachment, bright polished finish.
 1. Products:
 - a. GAMCO; (**TA-21a**) Model #7674x18; 18 inch (455 mm) towel bar.
 - b. GAMCO; (**TA-21b**) Model #7674x24; 24 inch (455 mm) towel bar.

- F. Towel Pin: Stainless steel, 3 inch (75 mm) extension from wall; rectangular-shaped bracket and backplate for concealed attachment, bright polished finish.
 1. Products:
 - a. Bobrick; (**TA-21c**) Model #B-677.

- G. Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for exposed attachment, satin finish, unless otherwise indicated.
 1. Products:
 - a. Bobrick; (**TA-13a**) Model #B-233.
 - b. Bobrick; (**TA-13b**) Model #B-232x24; hook strip.
 - c. Bobrick; (**TA-13c**) ClassicSeries Model #B-6727 double robe hook with concealed attachment.

- H. Sharps Disposal: Heavy-duty stainless steel cabinet with exposed surfaces in satin finish. Door secured by piano-hinge. Removable needle disposal with tumbler lock.
 1. Products:
 - a. Bobrick; (**TA-37**) Model #B-35016 Recessed Sharps Disposal.
 2. Sharps Collector: 5.4 quarts; #305443 insert.

2.07 RESIDENTIAL TOILET, SHOWER, AND BATH ACCESSORIES

- A. Toilet Paper Holder: Surface mounted, single roll, concealed attachment.
 1. Finish: Black; matte finish.
 2. Type: Straight post holder.
 3. Products: Delta; (**TA-44**) Trinsic Model #75950-BL Tissue Holder.

- B. Towel Bar: Round tubular bar; round mounting posts, concealed attachment.

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1. Finish: Black; matte finish.
 2. Products:
 - a. Delta; **(TA-41)** Trinsic Model #759240-BL 24 inch (609.6 mm) towel bar.
 - b. Delta; **(TA-42)** Trinsic Model #75930-BL 30 inch (762 mm) towel bar.
- C. Robe Hook: Single-prong, concealed attachment.
1. Finish: Black; matte finish.
 2. Products: Delta; **(TA-43)** Trinsic Model #75935-BL Robe Hook.

2.08 UNDER-LAVATORY PIPE AND SUPPLY COVERS

- A. Under-Lavatory Pipe and Supply Covers:
1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
 2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
 3. Construction: 1/8 inch (3.2 mm) flexible PVC.
 - a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - b. Microbial and Fungal Resistance: Comply with ASTM G21.
 4. Color: White.
 5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
 6. Products: Provide products by one of the following, or approved equivalent.
 - a. McGuire Manufacturing: www.mcguiremfg.com.
 - b. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
 - c. TRUBRO.

2.09 ELECTRIC HAND/HAIR DRYERS

- A. Electric Hand Dryers: Traditional fan-in-case type, with downward fixed nozzle.
1. Operation: Automatic, sensor-operated on and off.
 2. Mounting: Wall-mounted - surface.
 3. Cover: Plastic.
 - a. Tamper-resistant screw attachment of cover to mounting plate.
 4. Electric Hand Dryer Products:
 - a. Dyson; **(TA-32a)** Model Airblade V Electric Hand Dryer.
 - b. Dyson; **(TA-32b)** Model Airblade 9kJ Hand Dryer.
 - c. Bobrick; **(TA-33)** QuietDry Series TrimDry Model #7120 (white cover) surface mounted ADA Dryer.

2.10 DIAPER CHANGING STATIONS

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
1. Minimum Rated Load: 250 pounds (113.4 kg).
 2. Products:
 - a. Koala Kare Products; **(TA-22a)** Model #KB200 Horizontal Wall Mount.
 - 1) Material: Polypropylene.
 - 2) Mounting: Surface.
 - 3) Color: As selected.
 - b. Koala Kare Products; **(TA-22b)** Model #KB301 Vertical Wall Mount.
 - 1) Material: Polypropylene.

- 2) Mounting: Surface.
- 3) Color: As selected.
- c. Koala Kare Products; (**TA-22c**) Model #KB311-SSRE Vertical Wall Mount.
 - 1) Material: Stainless steel.
 - 2) Mounting: Recessed.
- d. Koala Kare Products; (**TA-22d**) Model #KB310-SSRE Horizontal Wall Mount.
 - 1) Material: Stainless steel.
 - 2) Mounting: Recessed.

2.11 UTILITY ROOM ACCESSORIES

- A. 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: Three, 0.06 inch (1.6 mm) stainless steel rag hooks at shelf front.
 - 3. Mop/broom holders: Four spring-loaded rubber cam holders at shelf front.
 - 4. Length: 36 inches (900 mm).
 - 5. Products:
 - a. Bobrick; (**TA-14**) Model #B-224x36; satin finish.

2.12 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

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1. Remove temporary labels and protective coatings.
2. Grab Bars: Install to comply with specified structural-performance requirements.
3. Shower Seats: Install to comply with specified structural-performance requirements.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Clean and polish exposed surfaces according to manufacturer's written instructions.

3.05 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 102800

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SECTION 104300 - EMERGENCY AID SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Automated external defibrillator (AED) cabinets.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Maintenance Data: Include test schedules and recertification requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Emergency Aid Cabinets and Accessories:
 - 1. Activar Construction Products Group, Inc. - JL Industries; LifeStart 1400 Series AED Cabinet: www.activarcpg.com/#sle.
 - 2. Modern Metal Products, a division of Technico, Inc; _____: www.modern-metal.com/#sle.
 - 3. Initial Response; Recessed AED Cabinet: <https://responseready.com/products/standard-aed-cabinet-with-alarm-strobe?variant=45934236827899>.
 - a. Model 180-R1.

END OF SECTION 104300

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SECTION 105113 - METAL LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal lockers.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Wood blocking and nailers.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.
- D. ICC A117.1 - Accessible and Usable Buildings and Facilities.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's published data on locker construction, sizes, and accessories.
- C. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.
- D. Full Size Sample: One full-size locker of each construction specified for evaluation of construction.
- E. Samples: Submit two samples in manufacturer's standard size showing color and finish of metal locker material.
- F. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Lockers:
 - 1. ASI Storage Solutions; Competitor Collection: www.asi-storage.com/#sle.

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2. Lyon Workspace Products; Workspace Heavy Duty Ventilated Lockers:
www.lyonworkspace.com/#sle.
3. Republic Storage Systems Co; Heavy Duty Ventilated Lockers:
www.republicstorage.com/#sle.
4. Spacesaver Corporation; Police Lockers: www.spacesaver.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

2.02 LOCKER APPLICATIONS

- A. Box Lockers: Metal lockers, free-standing with matching closed base.
1. Width: 12 inches (305 mm).
 2. Depth: 12 inches (305 mm).
 3. Height: 18 inches (457 mm).
 4. Configuration: Four tier.
 5. Ventilation: Manufacturer's standard louvers in door panel.
 6. Locking: Built-in combination locks.
 7. Color: To be selected from manufacturer's full range by Architect.

2.03 METAL LOCKERS

- A. Accessibility: Design units indicated on drawings as 'accessible' to comply with ICC A117.1 and ADA Standards.
- B. Locker Case Construction:
1. Heavy-Duty, Welded Construction: Made of formed and welded together sheet steel; metal edges finished smooth without burrs; baked enamel or powder coat finished inside and out.
 - a. Assembly: Do not use bolts, screws, or rivets to assemble locker bodies.
 - b. Locker Body Components: Formed and flanged from steel sheet of the following type and minimum thicknesses:
 - 1) Perforated Steel Sheet: Commercial Steel (CS), Type B, supplied for exposed applications and complying with ASTM A1008/A1008M and the following:
 - (a) Zinc-Coated by the Hot-Dip Process: Comply with ASTM A653/A653M, coating designation G60/Z180.
 - (b) Perforations: Manufacturer's standard pattern of square holes.
 - 2) Body and Shelves: 16 gauge, 0.0598 inch (1.52 mm).
 - 3) Backs: 16 gauge, 0.0598 inch (1.52 mm).
 - 4) Base: 16 gauge, 0.0598 inch (1.52 mm).
 - (a) Height: 4 inches (100 mm).
 - c. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
 - 1) Door Frame: 16 gauge, 0.0598 inch (1.52 mm), minimum.
 - d. Where ends or sides are exposed, provide flush panel closures.
 - e. Provide filler strips where indicated or required, securely attached to lockers.
- C. Latches and Door Handles: Manufacturer's standard.
1. Latching: Manufacturer's standard for locking arrangement selected.
 - a. Three-Point Lift Handle Gravity Latch: Pocket-mounted, provide for doors 18 inches (457 mm) or taller.
 - 1) Handle Pocket, Recess: Stainless steel flush-mounted cup recessed into face of door.

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- 2) Handle: Steel finger lift mechanism with exposed portion encased in molded plastic trigger.
 - 3) Latching Mechanism: Spring activated nylon slide latch enclosed in steel latch channel allows closing of door while padlock or built-in lock is in position.
 - 4) Lock Hole Filler Plate: Manufacturer's standard. Provide for lockers intended to be unsecured or secured with padlocks.
 - 5) Rubber bumpers riveted to door stops for silent operation.
- b. Three-Point Pull Handle Gravity Latch (ADA Accessible): Surface-mounted, provide for doors 18 inches (457 mm) or taller.
- 1) Handle: Steel finger lift mechanism.
 - 2) Latching Mechanism: Spring activated nylon slide latch enclosed in steel latch channel allows closing of door while padlock or built-in lock is in position.
 - 3) Lock Hole Filler Plate: Manufacturer's standard. Provide for lockers intended to be unsecured or secured with padlocks.
 - 4) Rubber bumpers riveted to door stops for silent operation.
- D. Cup, Pocket: Painted steel, with integral pull, and recessed surface punched for installation of lock, latch lift mechanism, and number plate.
- E. Hinges: Continuous piano hinge with powder coat finish to match locker color.
- F. Sloped Top: 20 gauge, 0.0359 inch (0.91 mm), with closed ends.
- G. Trim: 20 gauge, 0.0359 inch (0.91 mm).
- H. Number Plates: Provide oval shaped aluminum plates. Form numbers ____ inch (____ mm) high of block font style with ADA designation, in contrasting color.
- I. Built-In Combination Locks:
1. Manufacturers:
 - a. Keyless Co: www.keyless.co/#sle.
 - b. Zephyr Lock, LLC: www.zephyrlock.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
 2. Built-In Combination Lock: Single-dial combination lock.
 - a. Single-Dial Numerical Combination Lock: Three-number dialing lock, key-controlled, capable of minimum five combination changes with key.
 - b. Latch: Deadbolt.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that prepared bases are in correct position and configuration.
- B. Verify bases and embedded anchors are properly sized.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Place and secure on prepared base.

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- C. Install lockers plumb and square.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 pounds (445 N).
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels, filler panels, and sloped tops.
- G. Install fittings if not factory installed.
- H. Replace components that do not operate smoothly.

3.03 CLEANING

- A. Clean locker interiors and exterior surfaces.

END OF SECTION 105113

SECTION 105613 - METAL STORAGE SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Case type storage cabinets.

1.02 RELATED REQUIREMENTS

- A. Section 092116 - Gypsum Board Assemblies: Blocking and reinforcement in walls for anchoring shelving units.

1.03 REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Rated uniform shelf loads.
 - 2. Details of shelving assemblies, including reinforcement.
 - 3. Accessories.
 - 4. Substrate preparation instructions and recommendations.
 - 5. Storage and handling requirements and recommendations.
 - 6. Installation methods.
 - 7. Specimen warranty.
 - 8. Maintenance methods.
- C. Test Reports: Provide independent agency test reports documenting compliance with specified structural requirements.
 - 1. In lieu of test reports, detailed drawings stamped and sealed by a Professional Engineer licensed in the State in which the Project is located will be acceptable.
- D. Shop Drawings: Indicate location, type, and layout of shelving, including lengths, heights, and aisle layout, and relationship to adjacent construction.
 - 1. Indicate methods of achieving specified anchoring requirements.
- E. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and finishes.
- F. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

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- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of documented experience and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Inspect for dents, scratches, or other damage. Replace damaged units.
- B. Store in manufacturer's unopened packaging until ready for installation.
- C. Store under cover and elevated above grade.

1.07 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide one year manufacturer warranty covering defects of manufacturing and workmanship and rust and corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Case Type Shelving Cabinets (**EQ-1**):
 - 1. Spacesaver Corporation; UWR-84: www.spacesaver.com/#sle.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Case Type Shelving Cabinets (**SL-1**):
 - 1. Tiffin Metal Products; Sidearm Locker: <https://www.steelesolutions.com/#sle>.
 - 2. Substitutions: See Section 016000 - Product Requirements.
- C. Case Type Shelving Cabinets (**SL-2**):
 - 1. Tiffin Metal Products; Pass Through Evidence Locker: <https://www.steelesolutions.com/#sle>.
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 STORAGE UNITS - GENERAL

- A. Seismic Design: Design for Seismic Zone 3, in accordance with ASCE 7, Section 9.
- B. Anchors: Provide anchoring hardware to secure each shelving unit to floor and wall.
 - 1. Provide hardware of type recommended by manufacturer for substrate.

2.03 STORAGE CABINETS

- A. Storage Cabinets (**EQ-1**): Steel, closed sides and backs, with shelving brackets, shelving surfaces, and accessories as specified.
 - 1. Unit Width: 42 inches (1067 mm), overall.
 - 2. Shelf Capacity: Uniform distributed load of 50 psf (2.4 kPa), minimum.
 - 3. Finish: Baked enamel, medium gloss.
 - 4. Color: As selected by Architect from manufacturer's standard range.
 - 5. Number of Units: As indicated on drawings.

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- B. Storage Cabinets Construction: Formed sheet metal comprising vertical support members and enclosure panels.
 - 1. Shelf Support Members: 16 gauge, 0.0598 inch (1.52 mm), minimum; manufacturer's standard profile.
 - 2. Face Width of Exposed Vertical Supports: 2 inches (51 mm), maximum.
 - 3. Panels: 24 gauge, 0.0239 inch (0.61 mm), minimum.
 - 4. Connecting Hardware: Manufacturer's standard.
 - 5. Accessories:
 - a. 20 stock cups.
 - b. 20 barrel supports.
 - c. 18 pistol brackets.
 - d. Intermediate base shelf.

2.04 STORAGE CABINETS (SL-1):

- A. Storage Cabinets: Steel, closed sides and backs and accessories as specified.
 - 1. Sidearm Storage Locker: Model WSL29082206KNAA.
 - a. Surface mounted, six compartments, fold down door, with individual keyed locks.
 - b. Powder coated finish, finish as selected by the Architect.
 - c. Felt-lined bottom.
 - d. Continuous hinge.
 - e. Door and Face: 7 gauge.
 - f. Body: 14 gauge.

2.05 STORAGE CABINETS (SL-2):

- A. Storage Cabinets: Steel, closed sides and backs and accessories as specified.
 - 1. Refrigerated Evidence Storage Cabinets: Model 05AD with base. Substitute Unit ERF42 for standard Unit HH.
 - a. Door and Frame: 16 gauge.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate is level and that clearances are as specified.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 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.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor and reinforce as specified, as indicated on drawings, and as recommended by manufacturer.
- C. Install shelving with shelf surfaces level and vertical supports plumb; adjust feet and bases as required.

3.04 CLEANING

- A. Clean shelving and surrounding area after installation.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 105613

SECTION 109113 - MISCELLANEOUS SPECIALTIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes the following:
 - 1. Key control cabinet.
 - 2. Detention Furniture.

1.03 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of miscellaneous specialties specified, including details of construction-relative materials, dimensions, profiles, component parts, accessories, and finishes.
- C. Shop drawings from manufacturer for each type of miscellaneous specialties assembly, indicating layout, details, individual unit dimensions, required clearances, component parts, method of field assembly, and anchorage to surrounding construction.

1.04 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain each type of miscellaneous specialties from a single manufacturer for entire Project.

PART 2 PRODUCTS

2.01 WEAPON STORAGE CABINET (EQ-1)

- A. Refer to Specification Section 105613 "Metal Storage Shelving."

2.02 KEY CONTROL CABINET (EQ-2)

- A. Lund Equipment Co.; Model 1301-A.
 - 1. Capacity: 90 keys.
 - 2. Mounting: Recessed.
 - 3. Tag System: Two tag.
 - 4. Size: 20 1/2"W x 25"H x 5 1/4"D.
- B. Substitutions: See Section 016000 - Product Requirements.

2.03 AED STORAGE CABINET (EQ-3)

- A. Refer to Specification Section 104300 "Emergency Aid Specialties."

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2.04 DETENTION STOOL (DF-1)

- A. PSI, LLC; Floor Mount Stool, FMS 200-10.
 - 1. Seat: 12-inch diameter. 14 gauge with 1 1/2-inch flanged edges.
 - 2. Support: 2-inches steel pipe.
 - 3. Handcuff Ring: Fully welded.
 - 4. Base Plate: 8-inch by 8-inch, 7 gauge steel with 4 pre-punched holes for anchorage.
 - 5. Finish: No. 4 satin.

2.05 DETENTION TABLE(DF-2)

- A. Norix Group, Inc.; 42-inch by 42-inch custom stainless steel detention table.
 - 1. Fully welded corners and seams.
 - 2. Anchored to floor.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of miscellaneous equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Coordinate size and location of miscellaneous equipment indicated to be attached to concrete, and furnish anchoring devices with templates, diagrams, and instructions for their installation.

3.03 INSTALLATION

- A. General: Install miscellaneous equipment, including accessories as required for a complete installation.

3.04 ADJUSTING

- A. Adjust miscellaneous equipment to function smoothly and safely, and lubricate as recommended by manufacturer.
- B. After completing installation of miscellaneous equipment, inspect exposed finishes and repair damaged finishes.

3.05 CLEANING

- A. Clean exposed surfaces and touch-up or replace damaged marred finishes.

END OF SECTION 109113

SECTION 113013 - RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Kitchen appliances.

1.02 RELATED REQUIREMENTS

- A. Section 221005 - Plumbing Piping: Plumbing connections for appliances.
- B. Section 260583 - Wiring Connections: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

- A. UL (DIR) - Online Certifications Directory.

1.04 SUBMITTALS

- A. See Section 013000 - 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 Owner's name and registered with manufacturer.

1.05 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 (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.06 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
- C. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

- A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.
- B. Refrigerator, Type (RA-1): Free-standing, bottom-mounted freezer, and frost-free.

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1. Capacity: Total minimum storage of 24 cubic ft (0.67 cu m); minimum 25 percent freezer capacity.
 2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by U.S. Department of Energy (DOE).
 3. Features: Include glass shelves and light in freezer compartment.
 4. Exterior Finish: Stainless steel, color as indicated.
 5. Manufacturers:
 - a. Frigidaire Home Products: www.frigidaire.com/#sle.
 - b. GE Appliances; Model \$GDE25EYKFS: www.geappliances.com/#sle.
 - c. Whirlpool Corp: www.whirlpool.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.
- C. Dishwasher, Type (RA-2): Undercounter.
1. Controls: Solid state electronic.
 2. Wash Levels: Three (3).
 3. Cycles: Six (6), including normal, rinse and hold, short, china/crystal, pot and pan, and _____.
 4. Features: Include rinse aid dispenser, optional no-heat dry, optional water temperature boost, adjustable upper rack, and adjustable lower rack.
 5. Finish: Porcelain enameled steel , color as indicated.
 6. Manufacturers:
 - a. Frigidaire Home Products: www.frigidaire.com/#sle.
 - b. GE Appliances; Model #PDT755SYVFS: www.geappliances.com/#sle.
 - c. Whirlpool Corp: www.whirlpool.com/#sle.
 - d. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Anchor built-in equipment in place.

3.02 ADJUSTING

- A. Adjust equipment to provide efficient operation.

3.03 CLEANING

- A. Remove packing materials from equipment and properly discard.
- B. Wash and clean equipment.

END OF SECTION 113013

SECTION 122400 - WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior manual roller shades.

1.02 RELATED REQUIREMENTS

- A. Section 061000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

- A. WCMA A100.1 - Standard for Safety of Window Covering Products.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.
- B. Sequencing:
 - 1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
 - 2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.
- D. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.
- E. Selection Samples: Include custom design image.
 - 1. Image to be provide by the Owner.
- F. Verification Samples: Minimum size 6 inches (150 mm) square, representing actual materials, color and pattern.
- G. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

- H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience with shading systems of similar size and type.
 - 1. Manufacturer's authorized representative.
 - 2. Factory training and demonstrated experience.

1.07 MOCK-UP

- A. Mock-Up: Provide full size mock-up of window shade system complete with selected shade fabric including example of seams and batten pockets when applicable.
 - 1. Obtain Architect's approval of light and privacy characteristics of fabric prior to fabrication.
 - 2. Full-sized mock-up may become part of the final installation.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.09 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
 - 1. Shade Hardware: One year.
 - 2. Fabric: One year.
 - 3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Interior Manually Operated Roller Shades (**WT-2**):
 - 1. Hunter Douglas Architectural; Custom Printed Roller Shade: : <https://www.hunterdouglasshospitality.com/#sle>.
 - 2. Urban Shades; Custom Print Roller Shades: <https://urbanshades.ca/custom-print-roller-shades/#sle>.
 - 3. Substitutions: See Section 016000 - Product Requirements.

2.02 ROLLER SHADES

- A. General:
 - 1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
 - 2. Provide shade system that operates smoothly when shades are raised or lowered.

- B. Roller Shades Type (WT-2):
 - 1. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
 - a. Drop Position: Reverse roll.
 - b. Roll Direction: Roll down, closed position is at window sill.
 - c. Mounting: Window jamb mounted - inside, between jambs.
 - d. Size: As indicated on drawings.
 - 2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
 - a. Material: Stamped steel.
 - 3. Roller Tubes: As required for type of shade operation.
 - a. Material: Extruded aluminum, clear anodized finish.
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 - c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
 - 4. Hembars: Designed to maintain bottom of shade straight and flat.
 - a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
 - 5. Manual Operation for Interior Shades:
 - a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
 - b. Drive Chain: Continuous loop beaded ball chain, 95 lb (43 kg) minimum breaking strength. Provide upper and lower limit stops.
 - c. Chain Retainer:
 - 1) Chain tensioning device complying with WCMA A100.1.
 - 6. Accessories:
 - a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; baked enamel finish.

2.03 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.

- B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
 - 1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch (13 mm) space between bottom bar and window stool.
 - 2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
- B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.
- C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.
- C. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

3.05 CLOSEOUT ACTIVITIES

- A. See Section 017800 - Closeout Submittals, for closeout submittals.

3.06 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair, or replace damaged products before Substantial Completion.

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3.07 MAINTENANCE

- A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION 122400

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SECTION 123600 - COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Countertops for architectural cabinet work.
- B. Wall-hung counters and vanity tops.

1.02 RELATED REQUIREMENTS

- A. Section 064100 - Architectural Wood Casework.
- B. Section 224000 - Plumbing Fixtures: Sinks.

1.03 REFERENCE STANDARDS

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition.
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards.
- E. ISFA 2-01 - Classification and Standards for Solid Surfacing Material.
- F. NEMA LD 3 - High-Pressure Decorative Laminates.

1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements 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. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- D. Verification Samples: For each finish product specified, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

- G. Installation Instructions: Manufacturer's installation instructions and recommendations.
- H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Natural Stone Institute (NSI) Accredited Natural Stone Fabricator; www.naturalstoneinstitute.org/#sle.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Epoxy Resin Countertops: Filled epoxy resin molded into homogenous, non-porous sheets; no surface coating and color and pattern consistent throughout thickness; with integral or adhesively seamed components.
 - 1. Manufacturers:
 - a. Durcon, Inc: www.durcon.com/#sle.
 - b. Prime Industries, Inc: www.piilab.com/#sle.
 - c. Substitutions: See Section 016000 - Product Requirements.
 - 2. Flat Surface Thickness: 1 inch (25 mm), nominal.
 - 3. Chemical-Resistance: Provide products that resist the following chemicals with not more than Moderate Effect when tested in accordance with NEMA LD 3:
 - 4. Flammability: Self-extinguishing, when tested in accordance with ASTM D635.
 - 5. Surface Finish: Smooth, non-glare.
 - 6. Color (CT-1): Black.
 - 7. Exposed Edge Shape: 3/16 inch (5 mm) radius corner.
 - 8. Back and End Splashes: Same material, same thickness; separate for field attachment.
- C. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.

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1. Flat Sheet Thickness: 1/2 inch (12 mm), minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 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.
 - a. Manufacturers:
 - 1) Avonite Surfaces; _____: www.avonitesurfaces.com/#sle.
 - 2) Dupont; _____: www.corian.com/#sle.
 - 3) Formica Corporation; _____: www.formica.com/#sle.
 - 4) LG Hausys America, Inc; HI-MACS 12mm: www.lghausysusa.com/#sle.
 - 5) Wilsonart; _____: www.wilsonart.com/#sle.
 - 6) Substitutions: See Section 016000 - Product Requirements.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - c. Color and Pattern:
 - 1) CT-2: "**Evening Prima**"; Corian.
 - 2) CT-3: "**Silverite**"; Corian.
 3. Other Components Thickness: 1/2 inch (12 mm), minimum.
 4. Back and End Splashes: Same sheet material, square top; minimum 4 inches (102 mm) high.
 5. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.
- D. Stainless Steel Countertops (CT-4): Type 304, stainless steel sheet; 16 gauge, 0.0625 inch (1.59 mm) nominal sheet thickness.
1. Manufacturers:
 - a. Inter Dyne Systems, Inc..
 - b. Substitutions: See Section 016000 - Product Requirements.
 2. Finish: 4B satin brushed finish.
 3. Exposed Edge Shape: Straight turndown with return; 1-1/2 inch (38 mm) high face, 1/2 inch (12 mm) return to face of case .

END OF SECTION 123600

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SECTION 124813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet mat with custom logo.

1.02 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating properties of walk-off surface, component dimensions.
- C. Shop Drawings: Indicate dimensions.
- D. Samples: Submit two samples, 6 by 6 inches (150 by 150 mm) in size illustrating pattern, color, finish, and edging.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Floor Mats:
 - 1. Matter Surfaces; Supreme Nop 52-Precision Inlay with Graffiti:
<https://mattersurfaces.com/logo-matting#graffiti>.
 - 2. Substitutions: See Section 016000 - Product Requirements.

2.02 MATS

- A. Carpet Mat: Cut nylon pile permanently bonded to rubber backing; 1-inch (25 mm) black matching vinyl border on all edges.
 - 1. Colors: Steel Blue.
 - 2. Size: Wall to wall, custom.
 - 3. Logo: Image to be provided by Owner.

2.03 FABRICATION

- A. Fabricate mats in single unit sizes; fabricate multiple mats where indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that floor are ready to receive work.

3.02 PREPARATION

- A. Mats: Verify size of before fabricating mats.
- B. Vacuum clean floor.

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3.03 INSTALLATION

- A. Install walk-off surface after cleaning of finish flooring.

END OF SECTION 124813



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SECTION 220000

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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 DESCRIPTION OF WORK

- A. Provide all labor, materials, equipment, services and accessories necessary to furnish and install the work of this Section, complete and functional, as indicated in the Contract Documents and as specified herein.
- B. The work covered by this Section of the Specifications includes the furnishing of all labor and materials and in performing all operations in connection with the installation of the Plumbing Work.
- C. Without limiting the generality thereof, the work to be performed under this Section includes:
 - 1. Complete Sanitary, Waste & Vent System to points of new connection inside building and/or as shown on the drawings.
 - 2. Storm drainage to points of new connection inside the building.
 - 3. Domestic Cold, Hot, and Hot Water Re-circulation System.
 - 4. Natural Gas System.
 - 5. Shop compressed Air System
 - 6. Insulation.
 - 7. Domestic Water Heating Equipment.
 - 8. Fixtures and Equipment
 - 9. Connection to Equipment Furnished by Others
 - 10. Flushing, Sterilization, and Tests
 - 11. Furnishing of Access Panels
 - 12. The work is to be phased. The Plumbing Subcontractor shall construct the project in phases as directed by the General Contractor to suit the Project progress schedule, as well as the completion dates of the various phases and the overall project. For additional information related to phasing, review the General Conditions and Supplementary Conditions and the Architectural drawings. As each phase is occupied the entire space shall be fully functional with Code required facilities for occupancy. (Proper number of toilet facilities with hot & cold water as a minimum)
 - 13. Drilling, Coring and Cutting & Patching of holes and openings where the largest dimension thereof does not exceed 16 inches for Plumbing Piping and Equipment.
 - 14. Demolition of existing Plumbing Equipment and Disconnecting, Capping, and otherwise making inactive, all existing Plumbing Services in the various areas where Demolition and Removal Work is required; and removing, relocating, and reinstalling existing Plumbing items to the extent specifically noted in the documents. Remove all piping hangers and equipment in accordance with the description in paragraph 1.21 .

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15. Provide and maintain temporary water service as directed by General Contractor. General Contractor to pay for all water use.
16. Scaffolding, Rigging, and Staging required for all Plumbing Work. Comply with Division 1 requirements.
17. Provide Seismic Restraints for all Plumbing Systems conforming to the requirements of Section 230548 which Section is herein incorporated by reference. Seismic restraints are required on all new systems whether in new or existing building.
18. Preparation of Co-ordination Drawings.
19. Smoke and Firestopping Seals and sealing of all wall and floor penetrations as detailed on the drawings. Refer to Section 078400 which defines the firestopping materials and methods.
20. When open-flame or spark producing tools such as blower torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch, paying all fees, where work is being performed and until it is completed. Fee for fire watch shall be included in the bid.

1.3 RELATED WORK

- A. The following Related Work will be performed under the designated Sections:
1. Cutting and Patching beyond 1.2 C.13 above: SECTION 010450 - CUTTING AND PATCHING
 2. Electric Power Wiring: SECTION 260000 - ELECTRICAL
 3. HVAC Equipment: SECTION 230000 - HVAC
 4. Excavation and Backfill: DIVISION 31 - EARTHWORK
 5. Finish Painting: SECTION 099000 - PAINTING
 6. Installation of Access Panels: SECTION describing material in which panel is installed.
 7. Toilet Room Accessories: SECTION 108000 - TOILET ACCESSORIES
 8. Temporary Facilities: SECTION 015000 - TEMPORARY FACILITIES

1.4 CODES, ORDINANCES, AND PERMITS

- A. Perform all work in accordance with the requirements of the City of East Providence Building Department, Rhode Island State Plumbing and Fuel Gas Codes, D.E.P., A.D.A., NFPA, The Architectural Barrier Code, and applicable State and Federal Laws. Give all requisite notices, file all requisite plans, and obtain all permits required to perform all Plumbing Work. Where the Contract Documents indicate more stringent requirements than the above Codes and Ordinances, the Contract Documents shall take precedence.
- B. Obtain all permits, inspections, and approvals, from the governing authorities and pay all fees and include cost in the bid.
- C. Owner will pay all related Gas Utility Company back charges.

1.5 DISCREPANCIES IN DOCUMENTS

- A. Where Drawings or Specifications conflict or are unclear, advise Designer in writing before Award of Contract. Otherwise, Designer's interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or unclarities thus resolved.
- B. Where Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert Designer in writing before installation. Otherwise, make changes in installed work as Designer requires within Contract Price.
- C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, this contractor shall provide that material, installation, or work which is of the higher standard.
- D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the contractor has failed to notify the Designer of the situation in accordance with the paragraph above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.
- E. In cases covered by the paragraph above, where the contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Designer shall review, note if necessary, and approve the sketch.

1.6 MODIFICATIONS IN LAYOUT

- A. HVAC, Plumbing, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.
- B. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer.
- C. Check Contract Drawings as well as Shop Drawings of all subcontractors to verify and coordinate spaces in which work of this Section will be installed.
- D. Maintain maximum headroom at all locations. All piping and associated components to be as tight to underside of structure as possible.
- E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C, D above. Systems shall be run in a rectilinear fashion.

- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

1.7 SHOP DRAWING AND MATERIAL SCHEDULES

- A. Refer to SECTION 013000 - SUBMITTALS for submittal of Shop Drawings. If apparatus or materials are substituted for those specified, and such substitution necessitates changes in or additional connections, piping, supports or construction, same shall be provided as the responsibility, and at the expense, of the Plumbing Subcontractor.
- B. Fabrication of any material or performing of any work prior to the final approval of the Submittals will be entirely at the risk of the Subcontractor. The Subcontractor is responsible for furnishing and installing materials called for in the Contract Documents, even though these materials may have been omitted from approved Submittals.
- C. Submit Shop Drawings for the following materials and equipment.
 - 1. Valves, Piping, couplings and Fittings
 - 2. Fixtures, Drains and Equipment including Supports
 - 3. Access Panels and Covers
 - 4. Insulation
 - 5. Drains, and Hydro Mechanical Specialties
 - 6. Hose Bibs
 - 7. Hangers, Anchors, Guides, and Supports including Seismic Restraints
 - 8. Cleanouts
 - 9. Piping Identification System
 - 10. Water Heating Equipment

1.8 COORDINATION DRAWINGS

- A. Before materials are purchased or Work is begun, prepare and submit to the Architect, Coordination Drawings showing the size and location of all equipment and piping lines relevant to the complete system. Ensure that these Drawings are compatible and correctly annotated and cross-referenced at their interfaces (match lines).
- B. Coordination Drawings are for the Contractor's and the Architect's use during Construction and shall not be construed as replacing any Shop or Record Drawings required elsewhere in these Contract Documents.
- C. Detailed procedures for Coordination Drawings are contained in DIVISION 01 - GENERAL REQUIREMENTS of these Contract Documents.

1.9 RECORD DRAWINGS

- A. General: Refer to DIVISION 01 - GENERAL REQUIREMENTS for general requirements for maintaining as-built drawings and submitting final reproducible record documents.

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- B. The General Contractor will provide two sets of Drawings to the Plumbing Subcontractor, one set of which shall be maintained at the site and which shall, at all times, be accurate, clear, and complete, showing the actual locations of all equipment and piping as it is being installed. The Record Drawings shall be available to the Architect/Engineer's field representative at all times.
- C. Provide electronic AutoCAD drawings to indicate revisions to piping size and location both exterior and interior; including locations of valves and other equipment requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; concealed equipment, dimensioned to column line; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located.
- D. Include in the Record Drawings any addenda, sketches, and supplementary Drawings issued during the course of construction.
- E. Non-availability of Record Drawings or inaccuracies therein will postpone the final inspection until they are available.
- F. All valves shown on these Drawings shall be numbered with numbers corresponding to those on the valve charts.
- G. All costs related to the foregoing requirements shall be paid by the Plumbing Subcontractor.

1.10 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

- A. Provide operating instructions to the Owner's designated representative with respect to operation functions and maintenance procedures for all equipment and systems installed. At the completion of the project, turn over to the Architect four (4) complete manuals, in three-ring, loose-leaf binders, containing the following:
 - 1. Complete Shop Drawings of all equipment.
 - 2. Operation description for all systems.
 - 3. Names, addresses, and telephone numbers of all suppliers of the system.
 - 4. Preventative maintenance instructions for all systems.
 - 5. Spare parts lists of all system components.
 - 6. Valve tag chart.
 - 7. Provide USB Drive with electronic copies of Items 1-6 above.
- B. Provide USB Drive recording of operation and maintenance training sessions and include as part of O & M Manual submittal. Training session video recording and USB Drives shall be performed by a professional videographer. Provide indexed table of contents for USB Drive recording.
- C. Both O&M's and training Videos shall be saved on BMS server and provide a Control page weblink to O&M's and Training videos.

1.11 GUARANTEE

- A. Refer to Division 1 of the Contract. Guarantee all work under this Section free from defects in workmanship and materials for a period of one (1) year from the date of final acceptance of the building, as set forth in the Contract. Replace any such defective work developing during this period, unless such defects are clearly the result of bad usage of equipment by others. Where such defective work results in damage to work of other Sections of the Specifications, restore such work to its original condition by mechanics skilled in the affected trade.

1.12 DRAWINGS

- A. All work shown on the Drawings is intended to be approximately correct to scale, but shall be taken in a sense as diagrammatic. Sizes of pipes and general method of running them are shown, but it is not intended to show every offset and fitting. To carry out the true intent and purpose of the plans, furnish all necessary parts to make complete working systems ready for use. The Plumbing Drawings are intended to show the main stacks and risers and may or may not necessarily show all runout piping particularly in lavatories and gang toilet areas. Contractor shall include all runout piping to all referenced scheduled fixtures and equipment appearing on the Plumbing Drawings.
- B. All floor drains installed on this project shall be equipped with trap primers. The trap primer and piping is not shown on the drawings and shall be located in the field by the Contractor as dictated by field piping conditions.
- C. The Plumbing Drawings and Specifications are intended to supplement each other so that any details shown on the Drawings and not mentioned in the Specifications, or vice-versa, shall be executed the same as if mentioned in the Specifications and shown on the Drawings.
- D. Refer to the Architectural, Structural, and other Mechanical and Electrical Drawings, which indicate the construction in which this Work shall be installed. Locations shown on the plans shall be checked against the general and detailed Drawings of the construction proper. All measurements shall be taken at the Building.

1.13 VALVE TAGS, NAMEPLATES, AND CHARTS

- A. All valves on pipes of every description shall have neat circular brass valve tags at least 1-1/2 in. in diameter attached with brass hook to each valve stem. Stamp on these valve tags, in letters as large as practical, the number of the valve and the service, such as "H.W., C.W., GAS", for hot water, cold water, and gas respectively. The numbers for each service shall be consecutive. Where valves are located above ACT ceilings, furnish and install valve finder ceiling tack, tack shall be minimum 7/8 in. diameter with 1/2 in. steel point, color as determined by Owner.
- B. Nameplates, catalog numbers, and rating identifications shall be securely attached to Electrical and Mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

1.14 PIPE MARKER IDENTIFICATION SYSTEM

- A. Mark all piping installed under this Section and at all Access Panels with a marking system in basic colors conforming to those specified in ANSI/ASME A-13.1. Markings shall indicate pipe content and direction of flow. Markers shall be applied at all valves and tee joints, and on straight runs of pipe at every 20 ft.-0 in. on center.
- B. Markers shall be vinyl snap-around pipe type system. Adhesive markings are not acceptable.
- C. Clearly mark potable and non-potable water system with 4 inch wide colored bands, with arrow for direction of flow, every twenty-five (25) feet on center on all piping installed whether it is concealed or exposed and also on both sides of floor and/or wall penetrations. Mark potable water green and non-potable yellow. Within 6 in. of each band identify with letter "Potable C.W.", Non-Potable H.W." Color of letter shall match banding.

1.15 SANITARY, WASTE, VENT AND STORM SYSTEMS

- A. Furnish and install complete Sanitary, Waste, Vent and Storm Drainage Systems (all hereinafter called Drainage Systems) to convey wastes from all Soil and Waste Stacks, Fixtures, Equipment and Roof Drains as indicated and/or described in these Plans and Specifications. Urinal waste shall be 2 in. cast iron or sizes indicated on the drawings. Waste piping smaller than 3 in. shall not be used underground. The use of double "Y's" in the horizontal shall not be permitted. All piping shall be installed straight and true and located concealed within building construction.
- B. All horizontal Drainage Systems Piping within the building, 3 in. and smaller, shall be pitched at least 1/4 in. per ft. in the direction of flow. Drainage Piping 4 in. and larger shall be pitched at least 1/8 in. per ft. Make changes in direction of drainage lines with 45 wyes, long turn wyes, or sweep bends.
- C. Furnish and install all cleanouts indicated on the Drawings and/or where required in Drainage Pipes regardless of size so that the distance between cleanouts does not exceed 45 ft. o.c. Cleanouts shall be installed at the base of all risers and at each change of direction.
- D. Refer to drawings for termination points, which generally are connection to existing piping.

1.16 DOMESTIC WATER SYSTEMS (POTABLE & NON-POTABLE)

- A. Furnish, install, sterilize, and test in accordance with the documents and the Plumbing Code, complete Domestic Cold, Hot, and Hot Water Recirculating Systems including all piping, valves, low point drains, shock absorbers, hangers, insulation, backflow preventers and water heating equipment. Clearly mark the systems as provided above. This work shall start as indicated on the Drawings.
- B. In general, piping shall pitch upward in the direction of flow with each branch and riser separately valved and with 1/2 in. hose end drain on the outlet side of the valve and at all low points in the system. Install shutoff valves for each battery of fixtures and other valves as necessary to isolate any part of each system.

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- C. Install shock absorbers on hot and cold water piping to each fixture. Provide shock absorbers at all quick closing valves and as shown on the Drawings and/or specified.
- D. Install a 1/2 inch hose bibb in each toilet room provided with a floor drain. The hose bibb shall be installed under a lavatory.

1.17 COMPRESSED AIR SYSTEM

- A. Furnish and install a complete compressed air system as shown on the drawings and herein specified including all valves, piping, fittings, outlets and any incidentals to make a complete and operable system.
- B. This work includes furnishing and installing the air outlets as detailed on drawings.
- C. Piping shall be run straight and true and shall be rigidly supported from the building construction. All turns and offsets shall be made with fittings as specified elsewhere. Bending of pipe shall not be permitted in this installation.

1.18 EMERGENCY TEMPERED WATER SUPPLY

- A. Furnish, Install, Sterilize and Test utilizing the same materials, methods, etc. as specified above in 1.16. A tempered water supply to service all emergency showers and eye wash units. This piping shall be hung and insulated the same as above. Piping shall start at the tempering valve.

1.19 FUEL GAS SYSTEM

- A. Furnish and install a complete Natural Gas Supply System including pipe, fittings, valves, connections to all gas fired equipment requiring gas, and all accessories and incidentals as indicated or specified. Installation shall be made in accordance with the State Gas Code requirements. Piping shall be installed with an 8 in. long sediment leg at the base of all risers. All changes in direction shall be made with plugged tees for cleaning piping out.
- B. All horizontal Gas Piping shall be pitched not less than 1/4 in. in 15 ft. to prevent traps. Pitch piping to risers. Install an 8 in. long sediment leg at the base of all risers. All changes in direction shall be made with plugged tees for cleaning piping out. All horizontal branch outlet pipes shall be taken from the top or side of horizontal mains and not from the bottom. Install shutoff valves for each battery of equipment and other valves as necessary to isolate any part of each system.
- C. Where interior gas vented appliances are provided provide a battery powered, carbon monoxide detector adjacent to the appliance.
- D. Provide seismic restraints for all gas piping per requirements of the Mass. Building Code. Refer also to Section 230548.
- E. Plumbing Sub-Contractor shall furnish and install all gas vents for all knockdown regulators whether furnished by this Section, HVAC, or any other Section.

1.20 EQUIPMENT FURNISHED BY OTHERS

- A. Miscellaneous items, including but not necessarily limited to the following, shall be furnished and set by others as specified in other SECTIONS of the Documents.
 - 1. Dishwashers
 - 2. Kitchen Equipment
- B. Verify the extent of the connection requirements from the General, Architectural, and Mechanical Plans and Specifications and be responsible for: Setting in place, all such sinks and furnishing and installing trim and roughing including, but not limited to, drains, vent, water or other plumbing piping, traps, tailpiece, nipples, escutcheons, faucets, and stop valves for all items which above are not so supplied. The equipment sections specify sinks including faucets and tailpieces. Include for all sinks which are installed in cabinet work a pair of 1/2 in. ball valve stops (same as specified under 2.04) and a rough bronze p-trap, as required.
- C. The Plumbing Subcontractor shall be responsible in making final connections to all equipment furnished by others, to ascertain complete cross-connection prevention compliance, and to furnish and install vacuum breaker and backflow preventers which may be required to be Code compliant and are not so furnished with the equipment.
- D. All sinks are intended to be "Accessible" and all drain outlets on all sinks and lavatories where furnished by the Plumbing Subcontractor or the other SECTIONS shall have an off-set drain. Set all roughing tight to wall in all cases to comply with ADA Standards. Provide where required ADA insulation kits to prevent injury where a barrier is not included in the casework. Refer to Equipment Drawings.

1.21 DEMOLITION

- A. When and as directed by the General Contractor perform all demolition work.
- B. All hangers, valves, piping, pumps, fixtures, controllers, and other miscellaneous equipment and materials in the existing building not specifically designated for reuse in the documents shall remain the property of the Owner.
- C. Remove as indicated existing Plumbing piping, fixtures, and equipment including all hangers and supports and disconnect all Plumbing connections to equipment to be removed under other Sections of the Specifications. Clean, recondition, and relocate where indicated all items to be reused.
 - 1. Carefully remove shower and toilet room fixtures and trim and deliver in good condition to an on-site location designated by the Architect. The Owner will review all the fixtures and trim and select the items to be kept and the items to be disposed. The disposal of all items not wanted by Owner is specified by the Demolition Section.
 - 2. In cases where main piping is to remain, remove all existing piping to fixtures being removed and cap said piping back to riser or main. All caps or plugs to be installed shall be of like material as pipe being capped or plugged.
 - 3. All piping, valves, hangers, and fittings shall be removed from ceiling and walls as indicated and placed on the floor by this Section. The General Contractor shall remove from the floor and dispose.

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4. Any disputes between this Subcontractor and other Contractors or Subcontractors relative to the responsibility for removal of equipment shall be referred to the Architect for decision. The Architect's decision shall be firm and binding and to whomever he designates responsibility for removal of equipment shall do so without any additional cost to the Owner.

1.22 PAINTING

- A. All interior exposed piping is to be painted and all painting, except as noted, will be done by the Painting Subcontractor. All uncovered piping and hangers shall be thoroughly cleaned of rust, oil, and other containments by the Plumbing Subcontractor and left ready to receive primer coat.
- B. Painting for pipe markings shall be done under this Section.

1.23 HOISTING EQUIPMENT AND MACHINERY

- A. Unless otherwise specified, all hoisting and rigging equipment and machinery required for the proper and expeditious prosecution and progress of the Work of this Section shall be furnished, installed, operated and maintained in safe condition by each sub-contractor, as specified under Section 015000, TEMPORARY FACILITIES AND CONTROLS.

1.24 STAGING AND SCAFFOLDING

- A. Unless otherwise specified, each sub-contractor shall provide all lifts and man-lifts, and furnish, erect and maintain in safe condition, all staging and scaffolding as specified under Section 015000 Temporary Facilities and Controls, as needed for proper execution of the work of this Section. Staging and scaffolding shall be of adequate design, erected and removed by experienced stage builders having all accident prevention devices required by Federal, state and local laws.

1.25 BREAKDOWN

- A. Submit a breakdown of the contract price to aid the Architect in determining the value of the work installed as the job progresses.
- B. No requisition will be approved until the breakdown is delivered to the Architect.

1.26 VISIT TO SITE

- A. Prior to submitting a Bid, visit the site of work and become familiar with existing conditions. Any assumptions made are at this Subcontractor's expense.

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PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials and equipment furnished under this SECTION shall be new, unused, first quality of a manufacturer of established reputation. Each valve, fitting, section of pipe, and piece of equipment supplied to project shall have cast or indelibly stamped thereon the manufacturer's name, pressure rating where applicable, type, and any other specific information provided by manufacturer. Materials shall conform to Rhode Island Code as a minimum requirement and shall appear on the Rhode Island Approved Plumbing Products list.

2.2 PIPE AND FITTINGS

- A. Pipe and fittings shall conform to the latest A.S.A., A.S.T.M., C.A., and F.S. standards.
- B. All piping installed under this SECTION shall be in accordance with the following:

<u>Service</u>	<u>Material</u>
Underground Drainage and Vent piping	Service weight cast iron soil pipe-coated bearing collective trademark of the Cast Iron Soil Pipe Institute (CISPI)
Above ground Drainage and Vent, piping 2 in. and larger	No Hub cast iron soil pipe and fittings bearing collective trademark of the CISPI
Above ground drainage, and Vent piping 2 in. and smaller	Type 'L' hard tempered copper tubing
Trap primer piping from Primer to floor drain	Type 'K' soft rolled copper tubing with Swaged ends
Domestic water piping above ground piping	Type 'L' hard tempered copper tubing
Indirect waste piping	Type 'L' hard tempered copper tubing coated with two (2) coats of white epoxy paint
Compressed Air Piping	High density polyethylene piping and socket fittings, PE100, ASTM D-3350, chemical resistant, pressure rating of 230 PSI, Air-Pro Piping by Asahi/America or equal.
Gas piping above ground	ASTM A-53 Schedule 40 black steel pipe

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- C. Fittings for underground Drainage Piping shall be service weight bell and spigot pattern C.I. soil pipe fittings. Above ground shall be no hub C.I. soil pipe fittings, Rhode Island Standard.
- D. Fittings for sweat drainage piping and force main piping shall be cast bronze or wrought copper of recessed drainage pattern.
- E. Fittings for Type 'L' hard tempered copper tubing for potable and non-potable water piping 2-1/2 inch in size and smaller shall be copper press fittings.
 - 1. Acceptable Manufacturers:
 - a. Viega North America,
 - b. Elkhart Products Corporation
 - c. Victaulic
 - d. Or equal
 - 2. Material:
 - a. ASTM B88 and ANSI/ASME B16.22. O-rings for copper press fittings shall be EPDM.
 - 3. Installation of copper press fittings and installation are to be made in strict accordance with the manufacturers installation instructions. All tubing is to be reamed prior to the installation of the fitting. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.
- F. Fittings for polyethylene compressed air shall be injected molded, socket fusion joints with same wall thickness and pressure rating as the pipe, as manufactured by Asahi/America, Inc. or equal.
- G. Fittings for gas piping 2-inch and smaller shall be threaded malleable iron gas pattern fittings for screwed pipe. All elevated pressure gas piping regardless of size and low pressure gas piping 2 1/2 inch in size and larger shall be welded and shall utilize butt welded steel pipe fittings.

2.3 JOINTS

- A. Joints for underground cast iron bell and spigot soil pipe shall be made up with resilient gaskets. Above ground shall be made up of heavy duty – 4 band stainless steel clamps, and gaskets. Couplings shall be in compliance with CISPI 310 and shall bear the mark of NSF International. Couplings shall be Husky “SD 4000”, Clamp - All HI-TORQ 125, Mission “HW”, or equal.
- B. Copper water tubing and fittings shall be assembled with press or grooved fittings depending on pipe size.
- C. Grooved Joint Lubricants: Lubricate gasket in accordance with the manufacturer’s published instructions with lubricant approved for the gasket elastomer and fluid media.

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- D. Copper waste and vent tubing and force main tubing with sweat fittings shall be assembled with lead free solder, Silverbrite, Oatey, Harris, or equal, and a non-corrosive flux recommended by the manufacturer.
- E. Joints between copper waste/vent tubing and cast iron shall be made with cast iron threaded fittings and copper thread by sweat fittings.
- F. Joints between copper tubing and ductile iron water pipe or at flanged joints to tanks shall be made with a combination iron and brass flange with composition gasket and iron bolts.
- G. Joints at water heaters or other tanks having threaded connections shall be made up with dielectric unions.
- H. Joints between floor or wall flanges and fixtures shall be made with one-piece special molded neoprene gaskets which shall be furnished by the fixture manufacturer.
- I. Threaded pipe joints including plastics shall be made up with teflon tape.
- J. Joints on screwed gas piping shall be made up with thread compound on male threads only. Welded joints shall be made up by certified welders. All joints on piping 2-1/2 in. and larger, and on emergency generator exhaust regardless of size shall be welded. Joints for plastic gas piping shall be performed by the heat fusion method by Mass. Certified Technicians.

2.4 VALVES

- A. Furnish and install valves where indicated on the Drawings or where specified and located so that they may be operated, repaired, or replaced with a minimum effort and repacked under pressure.
- B. The following list of valves is intended only as a guide for type and quality. Valves shall be as manufactured by Apollo, Milwaukee, Nibco, Elkhart, Watts, Victaulic, or approved equal.

Shutoff valves	Apollo #94VLF-A lead-free ball valves
Stop and waste valves 1 in. and smaller	Apollo #95LF-203 through #95LF-205, lead-free
Check valves	Walworth #406 SJ
Gas service stops, 2 in. and smaller	Apollo #70-102-07 through #70-108-07 with tee handle
Gas service stops, 2-1/2 in. and larger	Rockwell #143 lubricated plug valve
Drain valves	Apollo #77WLF-HC ball valve with cap and chain 1/2 in. x 3/4 in. hose end

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Compressed air line
Shutoff valves

Apollo #70-100 Series-threaded
ends

Compressed air outlet valves

Apollo #70-100 Series with
automatic drain

2.5 INSULATION

- A. Insulation for all water piping and all horizontal roof leaders whether concealed or exposed shall be 1 in. thick, heavy density, preformed snap-on insulation equal to Johns Manville Micro-Lok HP, 850 degrees snap-on system. Insulation for cold water piping shall have a factory applied vapor barrier with ends and butts sealed with overlapping 4 in. sealing strips.
- B. Valves, fittings, and the underside of roof drain bodies shall be insulated with pre-formed fiberglass fitting insulation cut from dense fiberglass blanket and covered with pre-molded P.V.C. fitting covers. P.V.C. covers shall overlap the adjoining insulation and shall be secured with pressure sensitive vinyl tape over a vapor barrier adhesive seal at the joints. (Note: Staples or tacks are not permitted on covers).
- C. All insulation shall have self-sealing type, all service jacket (ASJ-SSL) factory applied. At all exposed piping, cover jacket with continuous P.V.C. jacket.
- D. Sealers, solvents, tapes, and adhesives, and mastics used in conjunction with the installation of insulation under this Section shall possess the maximum possible fire safe qualities available and shall be NFPA approved.
- E. Covering shall be applied over clean and dry surfaces. No covering shall be applied until after the approval of all pressure and leakage tests.
- F. Insulation shall be as manufactured by Johns Manville, Inc., Owens-Corning Fiberglass Corporation SSL II-ASJ, or Knauf Insulation 1000. Insulation shall be applied by skilled insulation mechanics in a first class manner.

2.6 TRAPS

- A. Furnish and install traps with cleanouts on all fixtures and equipment requiring connection to the sanitary system of the same size and material as the pipe on which they occur. Traps installed on threaded pipe shall be recessed drainage pattern.

2.7 DRAIN VALVES

- A. It shall be possible to drain the water from all sections of the Potable and Non-Potable Hot and Cold Water Piping. Furnish and install 1/2 in. x 3/4 in. hose end ball valves with cap and chain. (see 2.04 for model no.)

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2.8 SHOCK ABSORBERS

- A. Furnish and install, where shown on Drawings and where required to prevent water hammer, Zurn Manufacturing Company model 1260-XL lead free shock absorbers, or equal, as manufactured by J.R. Smith Manufacturing Company, Watts Manufacturing Company, or equal.
- B. Installation of absorbers shall be as per manufacturer's recommendations.

2.9 PIPING ACCESSORIES

- A. Trap primer connections are required on all floor drains to maintain trap seal. The requirement for trap primer connections shall include all floor drains in the kitchen including trough drains furnished by others. Trap primers shall be Precision Plumbing Products, Inc., Model PRO1-500 flow activated prime-pro trap-primer valve or shall, where appropriate, be Zurn, Watts, Smith or equal in-line connections installed on flush valve supply. Furnish distribution units as required. Provide PPP AG-500 air gap fitting at all locations.

2.10 HOSE BIBB

- A. Hose bibb shall be T & S Brass or equal model #B-720 modified, chrome plated, 3/4 in. hose end, integral stop, vacuum breaker, modified with lock shield and loose tee handle.
- B. Hose bibbs shall be manufactured by T&S Brass, Speakman, Chicago, or equal.

2.11 CLEANOUTS

- A. Cleanout plugs on the Sanitary System shall be of heavy cast brass of the screwed type. Plugs shall be full size up to and including 4 inch.
- B. For piping running under floor slab, cleanouts shall be brought up to just under the floor slab level. Furnish and install access cover for all floor-type cleanouts, Zurn ZN-1400 Series with scoriated nickel bronze or by Watts, J.R. Smith, or equal.

2.12 ACCESS DOORS

- A. Furnish Access Doors for access to all concealed control valves, cleanouts, valves, expansion joints, and to all other concealed parts of the Plumbing System that require accessibility for the proper operation and maintenance of the system. These doors shall be installed under the appropriate SECTION of the Specifications as determined by the surface upon which the panels are mounted.
- B. All Access Doors shall be located in a workmanlike manner in closets, storage rooms, and/or other non-public areas, positioned so that the valve or part can be easily reached, and the size shall be sufficient for this purpose (minimum size 12 in. x 16 in.). Furnish Access Doors for each pipe space to permit thorough inspection of same. When access doors are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the Architect.

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- C. Refer to Section 083100 - Access Doors and Frames, for all product requirements for furnishing access panels.
- D. Coordinate locations and schedule with the work of trades involved with construction in which access panels will be installed.
- E. Access Door Shop Drawings shall be submitted to the Architect for approval.
- F. All access panels shall be provided with cylinder lock and key, and shall be keyed alike. Coordinate keying with other trades.

2.13 SUPPLEMENTARY STEEL, CHANNEL, AND SUPPORTS

- A. Furnish and install all supplementary steel, channels, and supports required for the proper installation, mounting, and support of all equipment.
- B. Supplementary Steel and Channels shall be firmly connected to building construction in a manner approved by the Architect.
- C. The type and size of the Supporting Channels and Supplementary Steel shall be determined by the Plumbing Subcontractor and shall be sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.
- D. All Supplementary Steel and Channel shall be installed in a neat and workmanlike manner parallel to the walls, floor, and ceiling construction. All turns shall be made with 90 deg. fittings, as necessary to suit the construction and installation conditions.

2.14 HANGERS, ANCHORS, GUIDES, AND PIERS

- A. All piping shall be supported from the Building Structure by means of approved hangers and supports. Piping shall be supported to maintain required grading and pitching of lines, to prevent vibration, and to secure piping in place, and shall be so arranged as to provide for expansion and contraction.
- B. Hangers shall not be installed directly into the roof deck. Provide supplementary steel per paragraph 2.13 above as required to support piping from structure.
- C. The spacing for hangers for horizontal piping shall be in accordance with the following:
 - 1. Cast Iron Soil Pipe: 5 ft.-0 in. at the hubs for 5 ft. lengths. For 10 ft. lengths, use one (1) hanger at the hub and one (1) at midpoint of the length. Install cast iron pipe in accordance with CISPI Handbook - latest edition.
 - 2. Copper Tubing: 6 ft.-0 in. o.c. for 1-1/4 in. and smaller, and 10 ft.-0 in. o.c. for 1-1/2 in. and larger.
 - 3. Steel Pipe: 10 ft.-0 in. o.c. for 1-1/2 in. and over; 8 ft. - 0 in. for 1-1/4 in.; 6 ft. - 0 in. for 1 in. and smaller.

D. Hanger rod diameter shall be as follows:

Pipe Size	Rod Diameter
1/2 in. thru 2 in.	3/8 in.
2-1/2 in. and 3 in.	1/2 in.
4 in. and 5 in.	5/8 in.
6 in.	3/4 in.
8 in. and over	7/8 in.

- E. Vertical lines shall be adequately supported at their bases by a suitable hanger placed in the horizontal line near the riser and at every 10 ft. interval.
- F. All Hangers shall be adjustable Clevis Hanger. Hanger rods shall have machine threads. Malleable iron brackets of approved type shall be used along the walls. All Hangers for copper tubing shall be copper plated except where pipe is insulated, in which case, Steel Clevis Hanger and pipe shield shall be used.
- G. Piping shall not be hung from the hangers of other trades.
- H. Provide seismic restraints for all piping per requirements of the State Building Code and Section 230548. All gas piping shall be seismically restrained.
- I. Hangers shall be manufactured by Grinnell, Carpenter and Paterson, Fee and Mason, or equal.
- J. Wire and strap hangers will not be permitted in this installation.
- K. Install a 14 gauge metal pipe shield between pipe insulation and all pipe hangers. Hangers shall be sized so that the pipe insulation passes through the hanger and is supported on the shield.

2.15 DRAINS

- A. Furnish and install all floor drains and roof drains where shown on the Drawings.
- B. All floor drains in flooring systems without waterproofing membranes shall have galvanized iron clamping rings with 6-pound lead flashing to bond 9 in. in all directions. All drains shall be checked with Architect's Drawings to determine depth of the flashing collar. Brass extension pieces shall be provided if necessary.
- C. All floor drains installed on this project shall be fitted with Automatic Trap Primer Connections. Field determine appropriate location for Trap Primer valve and drain piping.

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- D. Drain Schedule:
 - 1. Type "A" – (General) Zurn #ZN-415-5BZ-P dura coated cast iron body with bottom outlet, combination invertible membrane clamp, adjustable collar, seepage slots, type BZ polished nickel bronze, light-duty, leveling strainer, trap primer connection.
- E. Drains shall be of one manufacturer, by Zurn, J.R. Smith, Watts, or equal.
- F. In bathrooms, coordinate all floor drain locations in field with Architect. Floor drains shall be set at an elevation/grade to allow for floor drainage from all directions. Drain locations shall not conflict with toilet partition walls.

2.16 PLUMBING FIXTURES

- A. Furnish and install all fixtures and equipment, including supports, connections, fittings, and any incidentals, to make a complete installation in accordance with the Drawings and as specified.
- B. The Architect shall be final judge as to whether fixtures and trim fulfill the requirements of the Specifications and as to whether they are of suitable quality.
- C. All fixtures requiring hot and cold water shall have the cold water faucet on the right hand side of the fixture and the hot water faucet on the left hand side of the fixture.
- D. Escutcheons shall be furnished and installed on all supplies and traps. Escutcheons shall be one (1) piece chrome plated brass with set screws.
- E. All fixtures shall have the manufacturer's guaranteed label or trademark indicating first quality. All acid resisting enameled ware shall bear the manufacturer's symbol signifying acid resisting material.
- F. Unless otherwise specified, faucets and all exposed fittings shall be chromium plated.
- G. All supply pipes shall run in a reasonable straight vertical line from the stops to faucets. Traps shall be installed perpendicular to walls.
- H. Vitreous china and acid resisting enameled fixtures shall be of one manufacturer by Sloan, American Standard, Toto, or equal. Trim shall be Symmons, Speakman, Chicago, T & S Brass, or equal. Flush valves shall be Sloan, Toto, Zurn, or equal. Water coolers and drinking fountains shall be manufactured by Elkay, Just, Filtrine, or equal. Stainless steel sinks shall be Elkay, Just, Kindred, or equal.
- I. Note: All fixtures and fittings shall be vandal proof mounted, unless specifically noted otherwise.
- J. Carefully coordinate roughing for flush valves so that the dimension from top of fixture to C-L of flush valve is a minimum of 6 in..

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K. Fixture Schedule:

1. P-1 Water Closet:

American Standard #2294.011EC "Afwall", 1.28 gallon per flush bowl, vitreous china, wall hung, elongated, siphon jet bowl, 1-1/2 in. top spud.

Sloan "Royal" 111-1.28, manually operated flush valve.

Olsonite #95-C Lustra solid plastic white open front seat with check hinge.

Zurn 300-pound carrier as required to suit. Carefully coordinate with Architect's plans to fit wall. Use Z-1209 where dictated by conditions.

2. P-1A Water Closet:

American Standard #2294.011EC "Afwall", 1.28 gallon per flush bowl, vitreous china, wall hung, elongated, siphon jet bowl, 1-1/2 in. top spud.

Sloan "Royal" 111 ESS-1.28-YO-TMO-HW, sensor operated, hard wired flush valve with true manual override include 24 V transformer.

Olsonite #95-C Lustra solid plastic white open front seat with check hinge.

Zurn 300-pound carrier as required to suit. Carefully coordinate with Architect's plans to fit wall. Use Z-1209 where dictated by conditions.

Mounting height shall conform to Accessibility Standards. Refer to Architect's Drawings for the exact location of fixture and mounting height and re-verify during construction with the Field Architect.

3. P-2 Urinal, Accessible:

Sloan Model WEUS 1000.1001-0.13, complete urinal system with exposed, manual 0.13 gallon per flush flushometer and wall hung vitreous china urinal.

Zurn Z-1222 concealed support.

Mounting height shall conform to Accessibility Standards. Locate handle of flush valve to wide side of toilet stall. Refer to Architect's Drawings for the exact location of fixture and mounting height and re-verify during construction with the Field Architect.

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4. P-3 Wall Hung Lavatory, Accessible (Public):

Kohler K-2054 "Soho", wall mounted, 20 in. x 18 in., white vitreous china lavatory, 4-inch centers, punched for concealed arm chair carrier.

Chicago EQ-A11A-51ABCP, 4-inch centers, electronic hard-wired sensor faucet, self-sustaining power system, 0.35 gpm laminar flow outlet and integral thermostatic mixing valve with checks on each supply.

McGuire Model 155 WC offset drain with open grid strainer.

McGuire H167 LK (pair) C.P., 3/8 IPS angle supply with loose key stop.

McGuire B-8902 C.P., 1-1/4 in. x 1-1/2 in. cast brass adjustable 'P' trap with cleanout and 17 GA tubing outlet to wall.

Zurn #ZR-1231 floor mounted concealed arm chair carrier.

Conceal all exposed roughing and electrical wiring components under lavatory with Truebro Model #2018 rigid PVC enclosure.

5. P-3A Countertop Lavatory, Accessible (Staff):

American Standard model 0495.221, under counter mounted, 15"x12", vitreous china lavatory.

Symmons SLS-3512-0.5-DP4-MB, matte black, deck mounted, 4-inch centers with deck plate, single lever handle, pop-up drain, 0.5 GPM outlet.

Symmons 4-10 mechanical mixing valve set to 110 deg F. outlet temperature.

McGuire Model 155 WC offset drain.

McGuire H167 LK (pair) C.P., 3/8 IPS angle supply with loose key stop.

McGuire B-8902 C.P., 1-1/4 in. x 1-1/2 in. cast brass adjustable 'P' trap with cleanout and 17 GA tubing outlet to wall.

Zurn #ZR-1231 floor mounted concealed armchair carrier.

Conceal all exposed roughing and electrical wiring components under lavatory with Truebro Model #2018 rigid PVC enclosure.

6. P-4 Shower:

Symmons 3501-CYL-B-MB-1.5-TRM, Dia shower trim, include S261Temptrol pressure balancing shower valve, factory pre-set temperature limit stops, integral service stops with 1.5 GPM flow shower head with arm and flange.

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7. P-5 Emergency Shower/Eye Wash:

Guardian model GBF-1994, all stainless-steel barrier free combination Emergency Shower and Eye/Face Wash station, 10 in. stainless steel deluge shower with 20 GPM flow control. Barrier free eye/face spray head with stainless steel panic bar and stay open C.P. brass ball valve. Provide waste to discharge to floor.

Provide Guardian Model G3800LF thermostatic mixing valve with surface mounted stainless-steel cabinet.

8. P-6 Sink, Accessible:

Elkay LRAD-2222 single bowl, 22 in. x 22 in., self-rimming countertop mounted 5 1/2 in. deep, 18 ga. type 316 stainless steel sink with rear outlet; three (3) hole punched faucet ledge.

Chicago Faucet 201A-GN8A-E2805-369 concealed deck faucet with 8 in. swing gooseneck spout, 2-3/8 in. wrist blade handles, vandal resistant 0.5 GPM aerator.

Elkay LKAD-35-316 crumb cup strainer with 1-1/2 in. offset tailpiece and stainless steel ground seat stopper.

1-1/2 in. x 2 in. chrome plated P-trap with cleanout, waste outlet with escutcheon.

Pair of 1/2 in. x 3/8 in. supplies with stops and escutcheons.

Furnish and install T&S Brass B-1220 glass filler, 8-inch high deck mount glass filler with polished chrome brass body, adjustable flow outlet, push arm, pedestal mounted with deck flange.

Furnish and install 3M model AP Easy Cyst-FF full flow filter on water supply to filler. Filter to have a minimum flow rate of 1.5 GPM and minimum capacity of 2,000 gallons.

9. P-7 Sink, Accessible:

Elkay LRAD-221955 single bowl, 22 in. x 19 in., self-rimming countertop mounted 5 1/2 in. deep, 18 ga. type 304 stainless steel sink with rear center drain outlet; three (3) hole punched faucet ledge.

Chicago model 201-AE35ABCP, deck mounted faucet, deck faucet with 8 in. swing gooseneck spout, 2-3/8 inch blade handles, vandal resistant 1.5 GPM aerator.

Elkay LKAD-35 crumb cup strainer with 1-1/2 in. offset tailpiece and stainless steel ground seat stopper.

1-1/2 in. x 2 in. chrome plated P-trap with cleanout, waste outlet with escutcheon.

Pair of 1/2 in. x 3/8 in. supplies with stops and escutcheons.

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10. P-4 Electric Water Cooler with Bottle Filler, Accessible:

Elkay LVRCTL8WSK, Barrier Free, Hi-Lo electric water cooler, tandem mounting, #4 satin finish stainless steel bowls, chrome plated bubbler, push button actuator, ADA compliant with cane touch apron, and sensor-activated bottle filling station.

1-1/4 in. x 1-1/2 in. rough p-trap with cleanout; 1/2 in. ball valve stop.

2.17 BACKFLOW PREVENTERS

- A. Backflow preventers shall be reduced pressure type furnished complete with shutoff valves, Rhode Island Approved. Backflow preventers 2-1/2 inch and smaller shall be Watts #LF009-QT-S. Backflow preventers 3 inch and larger shall be Watts 957-QT. Backflow preventers shall be lead free, all bronze, complete with strainer and soft seated check valve. Size shall be as indicated on Drawings.
- B. Mount backflow preventer 3 ft.(+/-) above finished floor. Provide indirect waste funnel and run pipe to an air gapped discharge at sink or floor drain. Furnish a spare parts kit and parts list mounted in the vicinity of the device.
- C. Prior to the installation of devices in the name of the Owner file for, pay for, and obtain all required permits and approvals for cross connection control devices from the Authority having Jurisdiction.
- D. Backflow preventers shall be of one manufacturer, by Watts, Wilkins, Beeco, or equal.

2.18 UNION AND NIPPLES

- A. All connections between copper tubing and galvanized piping or between copper tubing and all tanks (such as water heaters, chillers, and similar equipment) shall be made with dielectric unions and nipples.
- B. All connection to Water Heaters, Meters, Pumps, and other equipment requiring maintenance or alteration shall be made up with unions. Unions on brass piping, 2 in. and smaller, shall be brass composition "E" in strict accordance with Federal Specification WW-U-516. On plastic piping, use unions of the same material as the piping.
- C. All close and shoulder nipples shall be corresponding materials as the pipe and shall be extra heavy.

2.19 CONDENSATE NEUTRALIZING TUBES

- A. Contractor shall furnish and install condensate neutralizing tubes for new boilers condensate drains and flue pipe condensate drains.

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- B. Neutralizer tubes shall be as manufactured by JJM Boiler Works, Neutra-Safe, Fireside Condensate Neutralizers, or approved equal, and sized according to input rating of each piece of equipment.
- C. The boiler/water heater and flue condensate drains shall not be combined, Provide separate neutralizing tubes for boiler/water heater and flue condensates. All piping shall be per manufacturer's piping diagrams and directions. Secure neutralizing tubes to the floor.

2.20 INSTANTANEOUS ELECTRIC WATER HEATERS

- A. Furnish and install electric instantaneous water heaters at locations shown.
- B. Water heaters shall meet the thermal efficiency and standby heat loss requirements of ASHRAE 90.1 – 2010. Water heater rated for energy star certification for commercial applications.
- C. Heaters to be installed level and plumb in accordance with manufactures written instructions and referenced standards.
- D. Water heaters to be manufactured by EEMAX, Chronomite, Stiebel-Eltron, or approved equal.

2.21 CARBON MONOXIDE DETECTORS

- A. Where interior gas vented appliances are provided provide a battery powered, carbon monoxide detector adjacent to the appliance.
- B. Detector shall be installed per manufacturer's installation requirements.
- C. Detector shall be manufactured as follows or approved equal:
 - 1. Defender CA6100
 - 2. Kidde Model C3010
 - 3. First Alert CO910

2.22 COMPRESSED AIR REGULATORS

- A. At all compressed air connections, furnish and install "Parker-Watts" model C105-04BLWJDWR, 1/2" combination air filter and pressure regulator. Install quick connect at outlet. Manufacturers shall be Parker- Watts, Ingersoll Rand, Control Air or approved equal.

2.23 FIRESTOP SYSTEMS

- A. General: Provide firestopping at all new fire-rated construction where penetrated by the Work of this Section.
- B. Refer to Section 078400 - Firestopping, for all product requirements for maintaining integrity of fire-rated construction at penetrations.

2.24 SCAFFOLDS AND STAGING

- A. General: Trade Contractors shall obtain required permits for, and provide scaffolds, staging, and other similar raised platforms, required to access their Work as specified in Section 01 50 00 - Temporary Facilities and Controls and herein.
 - 1. Scaffolding and staging required for use by this Trade Contractor pursuant to requirements of Section 01 50 00 - Temporary Facilities and Controls shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by this Trade Contract requiring such scaffolding.
 - 2. Each Trade Contractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover scaffolding for inclement weather conditions other than those required to be provided, maintained and removed by the General Contractor pursuant to MGL (Refer to Section 01 50 00 - Temporary Facilities and Controls and as additionally required for dust control).
 - 3. General Contractor is responsible to provide enclosures required for temporary heat; refer to Section 01 50 00 - Temporary Facilities and Controls.
 - a. Furnishing portable ladders and mobile platforms of all required heights, which may be necessary to perform the work of this trade, are the responsibility of this Trade Contractor.

2.25 HOISTING MACHINERY AND EQUIPMENT

- A. All hoisting equipment, rigging equipment, crane services and lift machinery required for the work by this Trade Contractor shall be furnished, installed, operated and maintained in safe conditions by this Trade Contractor, as referenced under Section 01 50 00 - Temporary Facilities and Controls.

PART 3 - EXECUTION

3.1 WORKMANSHIP AND INSTALLATION METHODS

- A. All work shall be installed in a first-class manner consistent with the best current practices. All materials shall be securely installed plumb and/or level, and all flush mounted equipment shall have front edge flush with finished wall surface.
- B. All piping shall be installed true to line and grade in the case of underground piping. All piping above ceilings or exposed shall be grouped together, be parallel to each other, and be either parallel or perpendicular to the structure. Utilize gang hangers wherever feasible. Group all valves together where feasible.
- C. Training:
 - 1. Train the Owner's maintenance personnel on troubleshooting procedures, and servicing and preventative maintenance schedules and procedures.
 - 2. Schedule training with Owner through the Architect with at least 7 days prior notice.

3.2 WORK COORDINATION AND JOB OPERATIONS

- A. The equipment shall not be installed in congested and possible problem areas without first coordinating the installation of same.
- B. Particular attention shall be directed to the coordination of piping and other equipment installed in the ceiling areas. Coordinate the elevations of all piping in hung ceiling areas to insure adequate space for the installation of recessed lighting fixtures before other mechanical equipment is installed.
- C. Furnish to the General Contractor, and all other Subcontractors, all information relative to the portion of the Plumbing installation that will affect them, sufficiently in advance so that they may plan their work and installation accordingly.
- D. In case of failure to give proper information as indicated above sufficiently in advance, pay for all back-charges for the modification, renovation, and relocation of any portion of the work already performed.
- E. Obtain from the other trades, all information relative to the Plumbing Work to be executed in conjunction with the installation of their respective equipment.

3.3 CUTTING AND CORE DRILLING

- A. Perform all cutting and core drilling operations that are outlined in Part 1 of this SECTION. Throughout the performance of the cutting and coring work, ensure that the structural integrity of the walls, floors, overhead structure, and other structural components, which are to remain, is maintained until permanent work is installed. Prior to any coring or cutting, verify all locations of same with the General Contractor. All cutting and coring is to be performed in accordance with approved Coordination Drawings
- B. Cut all masonry and concrete with an approved diamond blade concrete saw in a neat straight direction, perpendicular to the plane of the wall or floor.
- C. Use a core drilling process which produces clean, sharp edges and the minimum hole size which will accommodate the size of pipe sleeve specified. Submit procedures for cutting thru existing steel beams to Architect for review.
- D. The patching of holes shall be performed by Plumbing Sub-contractor utilizing methods outlined for the finish trade involved. Holes shall be patched to the satisfaction of the Architect.

3.4 CLEANING AND PROTECTION

- A. Protect all materials and equipment during shipment and so as to prevent damage. Water closets, lavatories, and sinks shall be boarded over and all other fixtures shall be protected with pasted on paper. Post notice prohibiting the use of the fixtures prior to completion. Assume full responsibility for protection of work until its completion and final acceptance.
- B. Keep the premises reasonably clean at all times and remove rubbish caused by the Plumbing Work as directed by the Architect.

- C. Upon completion of this work, clean all fixtures and equipment installed herein and replace damaged parts. Failure to fulfill this obligation will result in back-charges for correction of the defective work.

3.5 SLEEVES, INSERTS, AND ESCUTCHEONS

- A. All piping passing through slabs, floors, walls, partitions, foundation walls and grade beams, shall be sleeved and all such sleeves shall be furnished and installed by the Plumbing Subcontractor as detailed on the Drawings and herein specified. Set sleeves in concrete floors and walls as soon as forms are set and before concrete is poured. Core drilling openings shall have a sleeve caulked and grouted in place.
- B. All pipes passing through floor, whether slab-on grade or above grade levels, shall be sleeved with sleeve extending 1 in. above floor. This includes all piping in toilet room pipe space, stairwells, closets, partitions and pre-cast planks.
- C. All sleeves shall be Schedule 40 galvanized steel and shall be reamed. There shall be a minimum of 1 in. annular space between the sleeve and pipe provide greater clearance where seismic requirements dictate. Sleeves on insulated pipe shall be large enough to allow insulation to pass through sleeve. Sleeves on drywall, masonry, or concrete walls and partitions, shall be flush with wall on both sides.
- D. The space between sleeve and pipe in all cases shall be filled with a U.L./F.M. approved caulking compound. This includes pipes concealed in chases and/or partitions.
- E. Inserts where required shall be furnished and set by the Plumbing Subcontractor and where necessary may be drilled or power driven and shall be sized such that the insert will not exceed a depth of penetration of 1 in. into concrete.
- F. Escutcheons: All exposed pipe, uncovered, passing through walls or floors or ceilings shall be fitted with C.P. brass spun or split type escutcheons with approved clamping device for holding in position. Floor escutcheons shall be deep enough to fit over sleeves, fastened to pipe, and extend down to floor.

3.6 TESTING

- A. Test all Work in the presence of the Architect and/or Engineer and as required by Local Codes.
- B. After Soil, Storm, Waste, and Vent Piping is in place and before being buried or furred in, plug lower ends and fill the system with water up to the top of stacks. Piping is to be left tight under these conditions and water level shall be maintained intact for the period of at least four (4) hours.
- C. Test all water piping by applying a hydrostatic pressure of 150 PSIG using a pump for this purpose. Make sure that all lines are properly plugged or capped and that air has been vented before applying pressure which shall remain constant without pumping for two (2) hours at least.

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- D. Test gas piping per State Gas Code.
- E. Any leaks in joints or evidence of defective pipe on fittings disclosed by test shall be immediately corrected by replacing defective parts with new joints or materials. No makeshift repair effected by caulking threaded pipe with lead wool, application or Wilky or patented compounds will be permitted.
- F. Provide testing report for all systems tested.

3.7 CHLORINATION

- A. Upon completion of the Plumbing Work, thoroughly chlorinate the entire domestic water system before putting same in service. Chlorinate all work in the presence of the Architect and/or Engineer. The chlorinating agent shall be as a solution of sodium hypochlorite. Water shall be fed slowly into the new line with chlorine in the proper amount to produce a dosage of 50 PPM. Open and close all valves while system is being chlorinated.
- B. After the sterilization agent has been applied for 24 hours, pay for an independent testing agency to test for residual chlorine and for presence of bacteria. A residual of not more than 5 PPM shall be required in all parts of the line.
- C. If test show 5 PPM or greater of residual chlorine, flush out system until all traces of the chemical used are removed.
- D. Provide testing report from independent testing agency.

3.8 INSTALLATION OF FIRESTOP SYSTEMS

- A. General: Install firestop systems at all fire-rated construction where penetrated by the Work of this Section.
- B. Refer to Section 078400 - Firestopping, for all installation requirements for maintaining integrity of fire-rated construction at penetrations.

3.9 SEISMIC RESTRAINTS

- A. The independent engineer responsible for design of seismic restraints shall visit the project upon completion of the work to certify the installation is consistent with the approved shop drawings. The certification shall be submitted to the Architect and must precede the closing in of ceilings.

3.10 SYSTEM SHUTDOWNS

- A. Coordinate shutdowns of existing systems with the Owner and submit a written request at least ten working days in advance. Minimize system shut downs as much as possible. Submit a list of all affected areas, the proposed work to be performed, and the expected length of the shut-down including time for retesting.

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- B. Provide temporary services to maintain active system during extended shut-downs as required for demolition and construction phasing.

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SECTION 23 00 00

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SECTION 23 00 00

HEATING, VENTILATING & AIR-CONDITIONING (HVAC)

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 DESCRIPTION OF WORK

A. General:

1. The work described herein shall be interpreted as work to be done by the HVAC Subcontractor. Work to be performed by other trades will always be specifically referenced to that trade.
2. Furnish all staging, rigging, temporary support, labor, materials, and perform all operations in connection with the installation of the HVAC work.
3. The building is to be commissioned and this contractor shall provide all labor required to fully test and demonstrate that all systems operate as designed.

B. Without limiting the generality thereof, the work to be performed under this Section includes:

1. Heating Hot Water Piping System with Insulation, Hangers, Valves, etc.
2. Rooftop Units
3. Ductwork With Insulation, Hanger, Damper, etc.
4. Pumps, Accessories, and Equipment insulation
5. Direct digital automatic temperature controls.
6. Testing, Adjusting & Balancing of all Ducted and Piped Systems and Equipment
7. Equipment Nameplates
8. Factory Tests

1.3 DEFINITIONS

- A. Most terms used within the documents are industry standard. Certain words or phrases shall be understood to have specific meanings as follows:
- B. Provide: Furnish and install completely connected up and in operable condition, ready for the intended use.
- C. Furnish: Purchase and deliver to a specific location within the building or site, ready for unloading, unpacking, assembly, installation, and similar operations.
- D. Install: With respect to equipment furnished by others, install means to receive, unpack, move into position, mount and connect, including removal of packaging materials.
- E. Conduit: Raceways of the metallic type which are not flexible. Specific types as specified.
- F. Connect: To wire up, including all branch circuitry, control and disconnection devices so item is complete and ready for operation.

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- G. Subject to Mechanical Damage: Equipment and raceways installed exposed and less than eight feet above finished floor in mechanical rooms or other areas where heavy equipment may be in use or moved.

1.4 RELATED WORK

- A. Cutting beyond the requirements as stated herein, and patching of all openings regardless of size, is specified in the respective Sections of the trade responsible for furnishing and installing similar new materials.
- B. For temporary controls refer to Section 01 50 00 – TEMPORARY FACILITIES AND CONTROLS.
- C. For flashing of vents through roof and setting of roof curbs and flashing of such, refer to Section 07 62 00 – SHEET METAL FLASHING AND TRIM and Section 07 00 02 Roofing and Flashing.
- D. For excavation and backfill of below grade mechanical and related systems refer to Division 31.
- E. For open web steel joists refer to Division 05 – Metals.
- F. For firestopping referenced in this Section refer to Section 07 84 13 – PENETRATION FIRESTOPPING for products and installation requirements.
- G. For finished painting of mechanical systems not called for in this Section refer to Section 09 91 00 – PAINTING and Section 09 00 04 – PAINTING FILED SUB-BID REQUIREMENTS.
- H. For interior concrete work relating to this Section refer to Section 03 30 00 – CAST-IN-PLACE CONCRETE.
- I. For exterior concrete work relating to this Section refer to Section 03 30 00 - CAST-IN-PLACE CONCRETE.
- J. Section 01 91 13 – GENERAL COMMISSIONING REQUIREMENTS.
- K. Furnish access panels and doors for installation in walls, ceiling and floors at locations to permit access for adjustment, removal, replacement and servicing of all concealed equipment, valves, volume dampers, materials, etc. installed under this Section of the specifications.
- L. Access panels will be installed under this Section of the related trades of the finished surfaces in which they are located.
- M. Access panels shall be located in closets, storage rooms and/or other non-public areas if possible, positioned so that the equipment can be easily reached, and the size shall be sufficient for this purpose (min. 16” x 16”). When access panels are required in corridors, lobby or other habitable areas, they will be located as directed by the Owner’s Representative.
- N. Access panels shall be per Division 08 spec for products and installation requirements. Required fire resistance of walls and ceilings shall be maintained.

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1.5 PRODUCTS FURNISHED, BUT NOT INSTALLED UNDER THIS SECTION

- A. Furnish pipe sleeves for placement into formwork by the General Contractor, Refer to Section 03 30 00.

1.6 CODES, ORDINANCES, AND PERMITS

- A. Perform all work in accordance with the requirements of the Town of Hudson Building Department, State of Massachusetts Building Code, and applicable State and Federal Laws. Give all requisite notices, file all requisite plans, and obtain all permits required to perform HVAC Work. Pay all fees and include in the Bid. All HVAC equipment shall be installed to meet all State, Local and Federal sound ordinances.
- B. Refer to GENERAL CONDITIONS for local connection and permit fees and information regarding Utility Company back charges.
- C. Codes, laws and standards provide a basis for the minimum installation criteria acceptable. The drawings and specifications illustrate the scope required for this project, which may exceed minimum codes, laws and standards.
- D. Give all notices, file all plans, obtain all permits and licenses, and obtain all necessary approvals from authorities having jurisdiction. No work shall be covered before examination and approval by the Owner's Representative, inspectors, and authorities having jurisdiction. Replace imperfect or condemned work to conform to requirements, satisfactory to Owner's Representative, and without extra cost to the Owner. If work is covered before examination and approval, this Contractor shall pay costs of uncovering and reinstalling the covering, whether it meets contract requirements or not.

1.7 PHASING

- A. The mechanical subcontractor shall construct the subject project in phases as directed by the Architect to suit the project progress schedule, as well as the completion date of the project.
- B. For additional information related to phasing, review the General Conditions and Supplementary Conditions and the Architectural drawings.

1.8 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. HI Compliance: Design, manufacture, and install HVAC pumps in accordance with HI Hydraulic Institute Standards".
 - 2. UL Compliance: Design, manufacture, and install HVAC pumps in accordance with UL 779 "Motor Operated Water Pumps".
 - 3. ANSI Standards: Comply with ANSI A13.1 for pipe, valve, and equipment identification.
 - 4. I=B=R Compliance: Provide boilers that have been tested and rated in accordance with Institute of Boiler and Radiator Manufacturers (I=B=R) "Testing and Rating Standard for Cast Iron and Steel Heating Boiler", and bear I=B=R emblem on nameplate affixed to boiler.

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5. ASME Compliance: Construct boilers in accordance with ASME Boiler and Pressure Vessel Code, Section IV "Heating Boilers".
 6. UL and NEMA Compliance: Provide boiler ancillary electrical components, which have been listed and labeled UL, and comply with NEMA Standards.
 7. FM Compliance: Provide control devices and control sequences in accordance with requirements of Factory Mutual System (FM).
 8. IRI Compliance: Provided control devices and control sequences in accordance with requirements of Industrial Risk Insurance (IRI).
 9. AMCA Compliance: Test and rate air handling units in accordance with AMCA standards.
 10. AGA Compliance: Provide gas controls and devices in accordance with American Gas Associates.
 11. ARI Compliance: Test and rate air handling units in accordance with ARI 430 "Standard for Central-Station Air Handling Units", display certification symbol on units of certified models.
 12. ASHRAE Compliance: Construct and install refrigerant coils in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".
 13. NFPA Compliance: Provide air handling unit internal insulation having flame spread rating not over 25 and smoke developed rating no higher than 50; and complying with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".
 14. UL and NEMA Compliance: Provide electrical components required as part of air handling units, which have been listed and labeled by UL and comply with NEMA standards.
 15. NEC Compliance: Comply with National Electrical Code (NFPA 70) as applicable to installation and electrical connections of ancillary electrical components of air handling units. MSS Standard Practices: Comply with the following standards for valves:
 16. MSS SP-45: Bypass and Drain Connection Standard
 17. MSS SP-67: Butterfly Valves
 18. MSS SP-70: Cast Iron Gate Valves, Flanged and Threaded Ends
 19. MSS SP-71: Cast Iron Swing Check Valves, Flanged
 20. MSS SP-72: Ball Valves with Flanged or Butt-Welding Ends for General Service
 21. MSS SP-78: Cast Iron Plug Valves, Flanged and Threaded Ends
 22. MSS SP-80: Bronze Gate, Globe Angle and Check Valves
 23. MSS SP-84: Steel Valves - Socket Welding and Threaded Ends
 24. MSS SP-85: Cast Iron Globe and Angle Valves, Flanged with Threaded Ends
 25. MSS SP-92: MSS Valve User Guide
- B. Automatic Temperature Control Contractor Qualifications: Firms specializing in installation of Automatic Temperature control system for not less than 5 years.
1. Codes and Standards:
 - a. Electrical Standards: Provide electrical components of control systems which have been UL-listed and labeled, and comply with NEMA standards.

- b. NEMA Compliance: Comply with NEMA standards pertaining to components and devices for control systems.
- c. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.

1.9 DEMOLITION

- A. Where existing heating equipment (i.e. coils, fans, radiation, pumps etc.) are called to be removed, it shall include all associated piping, valves, wiring, controls, hangers, associated ductwork, and all associated appurtenances.
- B. Where existing piping (i.e. water, steam, condensate, drain etc.) and ductwork are called to be removed, it shall include all associated hangers, insulation, valves, controls, dampers and all associated appurtenances.
- C. This Sub-contractor shall disconnect, lower to floor, and stack near-by all noted mechanical systems being removed. The General Contractor shall remove from the building and dispose of in a legal manner.

1.10 DISCREPANCIES IN DOCUMENTS

- A. Where Drawings or Specifications conflict or are unclear, advise Architect in writing before Award of Contract. Otherwise, Architect's interpretation of Contract Documents shall be final, and no additional compensation shall be permitted.
- B. Where Drawings or Specifications do not coincide with manufacturer's recommendations, or with applicable codes and standards, alert Architect in writing before installation.
- C. Of the required material, installation, or work can be interpreted differently from drawing to drawing, for between drawings and specs, this contractor shall provide that material, installation, or work which is of the more stringent.
- D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a system. In cases such as this, where the contractor has failed to notify the Architect of the situation in accordance with Paragraph (A) above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner.

1.11 CONTRACT DRAWINGS

- A. All work shown on the Drawings is intended to be approximately correct to scale, but shall be taken in a sense as diagrammatic. Sizes of ductwork and pipes and general method of running them are shown, but it is not intended to show every offset and fitting which is only possible after final coordination with all sub-contractors and submission of coordination drawings. No additional compensation will be allowed for offsets and fittings not specifically shown of the contract drawings. To carry out the true intent and purpose of the plans, furnish all necessary parts to make complete working systems ready for use.

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- B. The HVAC Drawings and Specifications are intended to supplement each other so that any details shown on the Drawings and not mentioned in the Specifications, or vice-versa, shall be executed the same as if mentioned in the Specifications and shown on the Drawings.
- C. Refer to the Architectural, Structural, Plumbing, Mechanical and Electrical Drawings which indicate the construction in which this work shall be installed. Locations shown on the plans shall be checked against the general and detailed Drawings of the construction proper. All measurements must be taken at the building.

1.12 COORDINATION DRAWINGS

- A. Before materials are purchased or work is begun, the respective Subcontractor shall prepare and submit to the Architect Coordination Drawings showing the size, elevation and location of his equipment, fixtures, ductwork, conduit, and piping lines relevant to the complete system. He shall ensure that these drawings are compatible and correctly annotated and cross-referenced at their interfaces.
- B. Coordination drawings are for the Contractor's and the Architect's use during construction and shall not be construed as replacing any shop or record drawings required elsewhere in the Contract Drawings.
- C. All coordination drawings shall be prepared in a large enough scale to accurately identify work of each trade and in addition to each sub-contractors systems, shall also show architectural floor plan, reflected ceiling plan, and structural framing with grid identification.
- D. The coordination drawing shall be started by the sheet metal sub-contractor and after applying all ductwork, the drawing shall be submitted for ductwork approval by the engineer. After approval, the drawing shall be circulated to the remaining sub-contractors for application of their work.
- E. During coordination drawing preparation the sub-contractors shall meet periodically to discuss overall coordination of all sub systems, and shall adjust their systems accordingly. When all drawings are complete the general contractor shall submit to the architect and engineers for review.
- F. Areas of conflict that cannot be resolved between the sub-contractor must be flagged on the drawings with adequate information to assist the architect and engineer in resolving noted issues.
- G. Refer to DIVISION 01 – GENERAL REQUIREMENTS of these Contract Documents for additional procedures relative to the preparation of Coordination Drawings.
- H. Any additional time required to draw and/or re-draw coordination drawings due to conflicts shall be completed at no additional cost to the Owner and/or Project.

1.13 ACCESSIBILITY

- A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for service and removal of all parts that require replacement or servicing.
- B. Extend all grease fittings to an accessible location.

1.14 ROUGH IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. This Sub-contractor shall disconnect, lower to floor, and stack near-by all noted mechanical systems being removed. The General Contractor shall remove from the building and dispose of in a legal manner.

1.15 NOTIFICATION OF RELATED TRADES

- A. Notify all other trades responsible for installing chases, inserts, sleeves, anchors, louvers, etc. when ready for such installation and for final checking immediately before concrete is placed. Cooperate with such trades to obtain proper installation.
- B. Leave openings in walls for pipes, ducts, etc. for mechanical and electrical work as shown on Drawings or required by layout of mechanical or electrical systems.

1.16 MECHANICAL INSTALLATIONS

- A. Coordinate mechanical equipment and materials installation with other building components.
- B. Verify all dimensions by field measurements.
- C. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.
- D. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.
- E. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
- F. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.
- G. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.
- H. Install mechanical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
- I. Coordinate connection of mechanical system with overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

1.17 CUTTING AND PATCHING

- A. Drilling, coring, and cutting of new and existing structures (through walls, floors, ceiling, etc.) where the largest dimension does not exceed 12" shall be by this Contractor.

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- B. Throughout the performance of the cutting and coring work, ensure that the structural integrity of the existing walls, floors, overhead structure, and other structural components, which are to remain, is maintained until permanent work is installed. Prior to any coring or cutting verify all locations of same with the General Contractor. All cutting and coring is to be performed in accordance with approved coordination drawings. All cutting or coring of structural must receive approval of the Architect prior to proceeding.
- C. No additional compensation will be authorized for cutting and patching work that is necessitated by ill-timed, defective, or non-conforming installations.
- D. Patching of surfaces shall be by the trade responsible for the surface penetrated.

1.18 SUBMITTALS

- A. Refer to SECTION 01 33 00 – SUBMITTAL PROCEDURES for submittal definitions, requirements, and procedures. The following paragraphs supplement the requirements of Section 01 33 00.
- B. Submittal of Shop Drawings, product data, and samples will be accepted only when submitted by the General Contractor. Data submitted by Sub-contractors and material suppliers directly to the Architect/Engineer will not be processed. Submittals will be electronic unless physical sample are required.
- C. Provide submittals for the following equipment:
 - 1. Valves
 - 2. Meters and Gauges
 - 3. Hangers and Attachments
 - 4. Mechanical Identification
 - 5. Mechanical Insulation
 - 6. Hydronic Piping
 - 7. HVAC Pumps
 - 8. Rooftop Units
 - 9. Metal Ductwork
 - 10. Automatic Temperature Controls
 - 11. Air and Water Testing and Balancing
- D. If a Shop Drawing is not accepted after two submissions, a third submission from the same manufacturer will not be considered.
- E. Check Shop Drawings and other submittals to assure compliance with contract documents before submittal to A/E.
- F. Review of Shop Drawings is final and no further changes shall be considered without written application. Shop Drawings review does not apply to quantities, nor relieve this Contractor of his responsibility for furnishing materials or performing his work in full compliance with these Contract Drawings and Specifications. Review of these shop drawings shall not be considered a guarantee of the measurements of this building or the conditions encountered.

1.19 SUBSTITUTIONS

- A. Refer to, SECTION 01 60 00 – PRODUCT REQUIREMENTS for requirements in requesting substitutions. The following paragraphs supplement the requirements of Section 01 60 00.
- B. If materials or equipment are substituted for specified items that alter the systems shown or its physical characteristics, or which have different operating characteristics, clearly note the alterations or difference and call it to the attention of the a/e. Under no circumstances shall substitutions be made unless material or equipment has been successfully operated for at least three consecutive years.
- C. Any modifications to the design, as a result of approving a substitution, shall be the responsibility of this contractor. Any additional cost to this contractor or any other contractor, directly or indirectly, as a result of such substitutions, shall be the responsibility of this contractor.

1.20 PRODUCT LISTING

- A. Prepare listing of major mechanical equipment and materials for the project.
- B. Provide all necessary information.
- C. Submit to the A/E through the General Contractor, within twenty (20) days of signing contract, this listing indicating all equipment and manufacturers, as a part of the submittal requirement. If the product list is not submitted, it will be the responsibility of the sub-contractor to submit one (1) of the three (3) named equal manufacturers.
- D. When two or more items of same material or equipment are required they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in work, except as otherwise indicated.
- E. Provide products, which are compatible within systems and other connected items.

1.21 NAMEPLATE DATA

- A. Provide permanent operational data nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, mode, number, serial number, capacity, operating, and power characteristics labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

1.22 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section General Conditions for delivery, storage, and handling of equipment. The following paragraphs supplement the requirements of Section General Conditions.
- B. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.
- C. Store equipment and materials off-site. Protect stored equipment and materials from damage.

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- D. Coordinate deliveries of mechanical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

1.23 RECORD DOCUMENTS

- A. Refer to Section 01 78 39 – PROJECT RECORD DOCUMENTS for requirements for record documents. The following paragraphs supplement the above.
- B. Provide electronic drawings in PDF and AutoCad 2014 or newer format. Modify electronic Drawings to indicate revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; concealed equipment, dimensioned to column line; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located. Also provide ATC Drawings showing As-Built conditions indicating point to point wiring from field devices to the control panels as well as floor plans indicating actual controller locations and communication wiring routes, modified sequences, field changes and any additional HVAC items added through change orders, ASI & RFI.

1.24 OPERATION AND MAINTENANCE DATA

- A. Refer to Section 01 78 23 – OPERATION AND MAINTENANCE DATA for procedures and requirements for preparation and submittal of maintenance manuals. The following paragraphs supplement the requirements of Section 01 78 23.
- B. In addition to the information required by Section 01 78 23 for maintenance data, include the following information:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and user summer and winter operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and trouble-shooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - 4. Servicing instructions and lubrication charts and schedules.
 - 5. Provide DVD recording of operation and maintenance training sessions and include as part of O & M Manual submittal. Provide indexed table of contents for DVD recording.
 - 6. ATC Drawings/Submittal of As-Built conditions including building CAT6 wiring, field devices, controllers, etc. for a complete as built condition.

1.25 WARRANTIES

- A. The contractor shall provide a one (1) year minimum warrantee on all product (unless otherwise stated in the product specification for a specific product) and labor for work under this section.
- B. Refer to Section General Conditions and Section 01 77 00 CLOSEOUT PROCEDURES for additional procedures and submittal requirements for warranties.

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- C. In addition to the one year warranty period against component and/or workmanship defects, the 40 hours of training and the 40 hours of extra programming as it relates to the control system and as indicated in section 23 00 00 paragraph 2.15 & 3.15, the ATC contractor shall provide a seasonal site visit to confirm, verify and modify as required the sequence and/or programming of each piece of equipment to ensure the system is functioning as required and per the sequence of operations. The ATC contractor shall provide 16 labor hours per season (four times within a year, total of 64 hours). During each visit they shall, for each piece of equipment confirm operation and functionality, modify and/or repair any control related issues and/or programming and provide training as requested by the owner. This requirement will ensure the equipment/building is operating properly and efficiently as it cycles through each season. These seasonal site visits shall begin the following season after substantial completion of the project is issued. Upon substantial completion the HVAC contractor shall issue four dates to the engineer of record and owner. Signatures and time logs will be kept by both parties to ensure these visits occur.

1.26 COMMISSIONING

- A. Where indicated in the equipment or commissioning specifications, engage a factory-authorized service representative, to perform startup service as per functional test sheets and requirements of Section 01 91 13 – GENERAL COMMISSIONING REQUIREMENTS.
- B. Complete installation and startup checks and functional tests according to Section 01 91 13 – GENERAL COMMISSIONING REQUIREMENTS and manufacturers written instructions.
- C. Operational Test: After electrical system has been energized, start units to confirm proper unit operation. Rectify malfunctions, replace defective parts with new one and repeat the start up procedure.
- D. Verify that equipment is installed and commissioned as per requirements of Section 01 91 13 – GENERAL COMMISSIONING REQUIREMENTS and manufacturer’s written instructions/requirements.

1.27 TRADE RESPONSIBILITY FOR INTERCONNECTIONS MATRIX

Device	Furnished By	Installed By	Power Wiring	Control Wiring	Fire Alarm Wiring	Notes
Smoke Detectors (Area type)	26 00 00	26 00 00	26 00 00	23 00 00 (ATC)	26 00 00	
Smoke Detectors (Duct mounted)	26 00 00	23 00 00	26 00 00	23 00 00 (ATC)	26 00 00	
Smoke & Fire/Smoke Dampers	23 00 00	23 00 00	N/A	N/A	N/A	
Smoke & Fire/Smoke Damper Actuators	23 00 00	23 00 00	26 00 00 & 23 00 00 (ATC)	23 00 00 (ATC)	26 00 00	2
Fire Dampers	23 00 00	23 00 00	N/A	N/A	N/A	
VAV Boxes	23 00 00	23 00 00	26 00 00	23 00 00 (ATC)	N/A	2

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Device	Furnished By	Installed By	Power Wiring	Control Wiring	Fire Alarm Wiring	Notes
VAV Box Damper Actuator	23 00 00 (ATC)	23 00 00 (ATC)	23 00 00 (ATC)	23 00 00 (ATC)	N/A	2
VAV Box DDC Controller	23 00 00 (ATC)	23 00 00 (ATC)	23 00 00 (ATC)	23 00 00 (ATC)	N/A	2
Hydronic Control Valves	23 00 00 (ATC)	23 00 00	N/A	23 00 00 (ATC)	N/A	1
Hydronic Control Valve Actuator	23 00 00 (ATC)	23 00 00	23 00 00 (ATC)	23 00 00 (ATC)	N/A	1
Sheet Metal Damper	23 00 00	23 00 00	N/A	N/A	N/A	1
Sheet Metal Damper Actuators	23 00 00 (ATC)	23 00 00 (ATC)	23 00 00 (ATC)	23 00 00 (ATC)	N/A	1
Electrical Energy Meters	26 00 00	26 00 00	26 00 00 & 23 00 00 (ATC)	23 00 00 (ATC)	N/A	3
Domestic Water Meters	22 00 00	22 00 00	26 00 00 & 23 00 00 (ATC)	23 00 00 (ATC)	N/A	3
HVAC Hydronic Energy Meters	23 00 00	23 00 00 (ATC)	26 00 00 & 23 00 00 (ATC)	23 00 00 (ATC)	N/A	3
Airflow Measuring Stations	23 00 00 (ATC)	23 00 00 (ATC)	N/A	23 00 00 (ATC)	N/A	
DDC Panels	23 00 00 (ATC)	23 00 00 (ATC)	26 00 00 & 23 00 00 (ATC)	23 00 00 (ATC)	N/A	4
VFDs at Pumps, EFs	26 00 00	26 00 00	26 00 00	23 00 00 (ATC)	N/A	5
VFDs at RTUs	23 00 00	23 00 00	26 00 00	23 00 00	26 00 00	
Elevator Hoistway Vent Damper	23 00 00	23 00 00	N/A	N/A	N/A	
Elevator Hoistway Vent Damper Actuator	23 00 00 (ATC)	23 00 00 (ATC)	23 00 00 (ATC)	23 00 00 (ATC)	26 00 00	
Boiler/DHW Intake & Exhaust Breeching	22 00 00	22 00 00	N/A	N/A	N/A	

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Device	Furnished By	Installed By	Power Wiring	Control Wiring	Fire Alarm Wiring	Notes
Generator Exhaust Breeching	26 00 00	26 00 00	26 00 00	26 00 00	26 00 00	

Notes:

1. Division 22 00 00 and Division 23 00 00 (ATC) Contractors shall fully coordinate all airflow damper and hydronic valves sizes and quantities.
2. Smoke Damper and VAV Box power wiring shall be provided by Division 26 00 00 to junction box locations shown on electrical drawings; Division 23 00 00 (ATC) Contractor shall provide final power wiring from junction box to end device location.
3. Division 26 00 00 Contractor shall provide all line-voltage power wiring required for meters; Division 23 00 00 (ATC) Contractor shall provide all low-voltage power wiring required for meters.
4. Division 26 00 00 shall provide power at main DDC Panel. Division 23 00 00 (ATC) shall provide power to all other DDC Panels.
5. VFDs at exhaust fan are not provided by Division 26 00 00 if exhausts are specified and/or scheduled with ECM motors.

1.28 HAZARDOUS MATERIALS

- A. The HVAC Sub-contractor shall be responsible for removing and legally disposing of any and all hazardous waste associated with HVAC systems, including but not limited to:
 1. All chemical treatment used in flushing out HVAC piping systems.
 2. Un-used excess material such as adhesives used in ductwork and piping installations.
 3. Refrigerant in all AC systems.
 4. Propylene Glycol (where applicable)
 5. Items specifically noted on drawings.

1.29 HOISTING EQUIPMENT AND MACHINERY

- A. Unless otherwise specified, all hoisting and rigging equipment and machinery required for the proper and expeditious prosecution and progress of the Work of this Section shall be furnished, installed, operated and maintained in safe condition by each sub-contractor, as specified under Section 015000, TEMPORARY FACILITIES AND CONTROLS and Section 007225 – CM Supplemental Conditions.

1.30 STAGING AND SCAFFOLDING

- A. Unless otherwise specified, each sub-contractor shall provide all lifts and man-lifts, and furnish, erect and maintain in safe condition, all staging and scaffolding as specified under Section 015000 Temporary Facilities and Controls and Section 00 72 00 – Supplementary Conditions, as needed for proper execution of the work of this Section. Staging and scaffolding shall be of adequate design, erected and removed by experienced stage builders having all accident prevention devices required by Federal, state and local laws.

PART 2 - PRODUCTS

2.1 ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT (Refer to SECTION 019113 – GENERAL COMMISSIONING REQUIREMENTS for additional contract requirements)

A. Pursuant to Massachusetts General Laws Chapter 141, a Massachusetts Licensed electrician shall install all low voltage wiring required by this section.

B. General: The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications.

1. All motors for all mechanical equipment shall be NEMA premium efficiency matching the following and all motors associated with variable frequencies drives shall be inverted duty motor with Aegis bearing protection rings:

HP	RPM	Efficiency
1	1800	85.5 percent
1.5	1800	86.5 percent
2	1800	86.5 percent
3	1800	89.5 percent
5	1800	89.5 percent
7.5	1800	91.0 percent
10	1800	91.7 percent
15	1800	93.0 percent
20	1800	93.0 percent
25	1800	93.6 percent
30	1800	94.1 percent
40	1800	94.1 percent
50	1800	94.5 percent

2. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.

3. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.

4. Temperature Rating: Rated for 40 degrees C. environment with maximum 50 degrees C temperature rise for continuous duty at full load (Class F Insulation). All ratings shall be for inverter duty applications.

5. Starting Capability: Frequency of starts as indicated by automatic control system and not less than five evenly time spaced starts per hour for manually controlled motors.

6. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.

7. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.

8. Frames: NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.

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9. Bearings:
 - a. Ball or roller bearings with inner and outer shaft seals.
 - b. Re-greasable, except permanently sealed where motor is normally inaccessible for regular maintenance.
 - c. Designed to resist thrust loading where belt drivers or other drives produce lateral or axial thrust in motor.
 - d. For fractional horsepower, light duty motors, sleeve type bearings are permitted.
 10. Enclosure Type:
 - a. Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation.
 - b. Guarded drip-proof motors where exposed to contact by employees or building occupants.
 - c. Weather protected Type I for outdoor use, Type II where not housed.
 11. Overload Protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.
 12. Noise Rating: "Quiet".
 13. Efficiency: "Premium Efficient" motors shall have a minimum efficiency as scheduled in accordance with IEEE Standard 112, test method B. If efficiency not specified, motors shall have a higher efficiency than "average standard industry motors", in accordance with IEEE Standard 112, Test Method B.
 14. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.
 15. Provide AEGIS magnetic bearing protection ring for all inverter rated motors that are controlled by variable speed drives. The bearing protection ring shall channel harmful shaft voltages to ground to protect bearing races from pitting.
- C. Starters, Electrical Devices, And Wiring: (Provided By The HVAC Subcontractor For Each Packaged Piece Of HVAC Equipment Requiring Such):
1. Motor Starter Characteristics:
 - a. Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R with conduit hubs, or units in hazardous locations which shall have NEC proper class and division.
 - b. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition.
 2. Manual Switches shall have:
 - a. Pilot lights and extra position for multi-speed motors.
 - b. Overload Protection: Melting alloy type thermal overload relays.
 3. Magnetic Starters:
 - a. Maintained contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated.
 - b. Trip-free thermal overload relays, each phase.
 - c. Interlocks, pneumatic switches and similar devices as required for co-ordination with control requirements of Division 23 Controls Sections.

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- d. Built-in 120 volts control circuit transformer, fused from line side, where service exceeds 240 volts.
 - e. Externally operated manual reset.
 - f. Under-voltage release or protection.
4. Capacitors:
- a. Individual unit cells.
 - b. All welded steel housing.
 - c. Each capacitor internally fused.
 - d. Non-flammable synthetic liquid impregnant.
 - e. Craft tissue insulation.
 - f. Aluminum foil electrodes.
 - g. KVAR size shall be as required to correct motor power factor to 90 percent or better and shall be installed on all motors one horsepower and larger, that have an uncorrected power factor of less than 85 percent at rated load.
5. Disconnect Switches:
- a. Fusible Switches: Fused, each phase; general duty; horsepower rated; non-teasible quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "OPEN" position; arc quenchers; capacity and characteristics as indicated.
 - b. Non-fusible Switches: For equipment two horsepower and smaller, shall be horsepower rated; toggle switch type; quantity of poles and voltage rating as indicated. For equipment larger than two horsepower, switches shall be the same as fusible type.

2.2 VALVES

A. General:

- 1. Comply with ASME B31.9 for building services piping, and ASME B31.1 for power piping.
- 2. Valves shall have rising stem, or rising outside screw and yoke stems; except, non-rising stem valves may be used where headroom prevents full extension of rising stems.
- 3. Pressure and temperature ratings shall be as required to suit system pressures and temperatures.
- 4. Unless otherwise indicated, provide valves of same size as upstream pipe size. Automatic control valves shall be sized by the ATC Contractor and shall not exceed a 3 PSI drop.
- 5. Provide the following special operator features:
 - a. Handwheels fastened to valve stem, for valves other than quarter turn, by brass nut on a square-topped stem.
 - b. Lever handle on quarter-turn valves 6" and smaller, except for plug valves. Provide one wrench for every 10 plug valves, and one year's supply of recommended lubricant and sealant.

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- c. Chain-wheel operators for valves 2-1/2" and larger installed 72" or higher above finished floor elevation. Extend chains to an elevation of 5'-0" above finished floor elevation.
- d. Gear drive operators on quarter-turn valves 8" and larger.
- 6. Where insulation is indicated or specified, provide extended stems arranged to receive insulation.
- 7. Bypass and drain connections shall comply with MSS SP-45.
- 8. End connections shall be as specified in the individual valves specifications.
 - a. Threads: Comply with ANSI B2.1.
 - b. Flanges: Comply with ANSI B16.1 for cast iron ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.
- 9. Solder-Joint: Comply with ANSI B16.18.
Caution: Where soldered end connection are used, use solder having a melting point below 840° F. for gate, globe, and check valves; below 421° F. for ball valves.

B. Gate Valves:

- 1. Gate Valves (Heating Hot Water) - 2" and smaller: MSS SP-80; Class 150, body and union bonnet of ASTM B 62 cast bronze, threaded ends, solid disc, bronze alloy stem with less than 6% zinc content, brass packing gland, "Teflon" impregnated packing, and malleable iron handwheel.

THREADED

MANUFACTURER	NRS	RS
Crane:	x	431UB
Jenkins:	x	47CU
Lunkenheimer:	x	3151
Nibco:	T-136	T-134
Stockham:	B-130	B-120
Milwaukee:	141M	1151M

- 2. Gate Valves (Heating Hot Water) 2-1/2" and larger: MSS SP-70; Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A 126 Class B, flanged ends, and "Teflon" impregnated packing and two-piece backing gland assembly.

MANUFACTURER	OS&Y RS	NRS
Crane:	465-1/2	461
Jenkins:	651C	326C
Lunkenheimer:	1430	1428
Nibco:	F-617-0	F-619
Stockham:	G-623	G-612
Milwaukee:	F-2885-M	F-2882-M

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C. Ball Valves:

1. Ball Valves (Heating Hot Water) 1" and smaller: Rated for 150 psi saturated steam pressure, 600 psi WOG pressure, 2-piece construction, bronze body conforming to ASTM B 62, standard (or regular) port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide threaded ends for heating hot water, soldered for chilled water.

	THREADED	SOLDER
MANUFACTURER	ENDS	ENDS
Milwaukee:	BA-100	BA-150
Conbraco (Apollo)	70-100	70-200
Crane:	9302	9322
Jamesbury:	21-1000TT	x
Jenkins:	900A	902A
Lukenheimer:	AQ311	x
Nibco:	T-585	S-585
Watts:	B-6000	B-6001
Stockham:	S-216 BR-R-T	S-216 BR-R-S

2. Ball Valves (Heating Hot Water) 1-1/4" to 2": Rated for 150 psi saturated steam pressure, 600 psi WOG pressure; 3-piece construction, bronze body conforming to ASTM B 62, conventional port, chrome-plated brass ball, replaceable

"Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide threaded ends for heating hot water, soldered for chilled.

	THREADED	SOLDER
MANUFACTURER	ENDS	ENDS
Milwaukee:	BA-300	BA-350
Conbraco (Apollo):	82-100	82-200
Nibco:	T-595-Y	S-595-Y
Watts:	B-6800	B-6801
Stockham:	S-216 BR-R-T	S-216 BR-R-T

For grooved end connections use Victaulic Style 721.

D. Plug Valves:

1. Plug Valves - 2" and smaller: 150 psi WOG, bronze body, straightaway pattern, square head, threaded ends.

MANUFACTURER	
Rockwell:	214.
Lunkenheimer:	454.
Crane:	250.

2. Plug Valves - 2-1/2" and larger: MSS SP-78; 175 psi, lubricated plug type, semi-steel body, single gland, wrench operated, flanged ends.

MANUFACTURER	
Rockwell:	305.
Nordstrom:	143.
Serck-Audco:	LSW-133-GG.
Homestead:	612.

(8" and larger to be Gear Operated).

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E. Globe Valves:

1. Globe Valves (Heating Hot Water) - 2" and smaller: MSS Sp-80; Class 150, body and union bonnet of ASTM B 62 cast bronze, threaded ends, brass or replaceable composition disc, bronze alloy stem with less than 6% zinc content, brass packing gland, "Teflon" impregnated packing, and malleable iron handwheel.

MANUFACTURER

Jenkins: 106-B.
Lunkenheimer: 407.
Nibco: T-235-Y.
Stockham: B-22.

2. Globe Valves (Heating Hot Water) - 2-1/2" and larger: MSS SP-85; Class 125 iron body and bolted bonnet conforming to ASTM A 126, Class B; outside screw and yoke, bronze mounted, flanged ends, and "Teflon" impregnated packing and two-piece backing gland assembly.

MANUFACTURER	STRAIGHT BODY	ANGLE BODY
Milwaukee:	F-2981-M	x
Crane:	351	353
Jenkins:	613C	x
Lunkenheimer:	1123	x
Nibco:	F-718-B	x
Stockham:	G-512	G-515

F. Butterfly Valves:

1. Butterfly Valves (Heating Hot Water) - 2-1/2" and larger: MSS SP-67; 200 psi, cast iron body conforming to ASTM A 126, Class B. Valves shall have field replaceable EPDM sleeve, with aluminum bronze disc, stainless steel, and EPDM O-ring stem seals. Sizes 2 through 6" shall have lever operators with locks, and sizes 8 through 24" shall have gear operators with position indicator. Valves on dead end service or requiring additional body strength shall be lug-wafer type, drilled and tapped.

MANUFACTURER	LEVER	WAFER LUG	GEAR
Milwaukee:	x		MW-123-E
Center Line:	x		Series A
Crane:	42		x
Keystone:	100		x
Nibco:	WD-20003		WD-20003
Stockham:	LG-512-BS3E		LG-522-BS3E
		LUG	
		LEVER	GEAR
Milwaukee:	x		ML-123-E
Center Line:	x		Series LT
Crane:	44		x
Keystone:	129		x
Nibco:	LD-20003		LD-20005
Stockham:	LG-712-BS3E		LG-722-BS3E
Grooved Ends:	Victaulic Series 704.		

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G. Check Valves:

1. Swing Check Valves (Heating Hot Water) - 2" and smaller: MSS SP-80; Class 150, cast bronze body and cap, conforming to ASTM B 62, horizontal swing, with a Teflon disc, and having threaded ends. Valve shall be capable of being repaired while the valve remains in the line.

MANUFACTURER

Milwaukee:	510T
Crane:	x
Jenkins:	352C
Lunkenheimer:	230-70
Nibco:	T-433-Y
Stockham:	B-321

For grooved connections us Victaulic Series 712.

2. Swing Check Valves (Heating Hot Water) - 2-1/2" and larger: MSS SP-71; Class 125 (Class 175 FM approved for fire protection piping systems), cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal swing, with a bronze disc or cast iron disc with bronze disc ring, and flanged ends. Valve shall be capable of being refitted while the valve remains in the line.

MANUFACTURER	CLASS 125	CLASS 175
Milwaukee:	F-2974-M	x
Crane:	373	375
Jenkins:	624C	477
Lunkenheimer:	1790	x
Nibco:	F-918B	x
Stockham:	G-931	G-940

3. Wafer Check Valves (Heating Hot Water) - (Non-Slam): Class 250, cast iron body, replaceable lapped bronze seat, lapped and balanced twin bronze flappers and stainless steel trim. Valve shall be designed to open and close at approximately one foot differential pressure. Twin flappers shall be loaded with a stainless steel torsion spring to minimize flapper drag and assure even non-slam checking action.

MANUFACTURER

Milwaukee:	1400-2C
Center Line:	CLC
Metraflex:	hexx
Mission:	12HMP
Stockham:	WG970

For grooved connection use Victaulic Series 710 and 711.

4. Lift Check Valves - 2" and smaller: Class 125, cast bronze body and cap conforming to ASTM B 62, horizontal, lift type valve, bronze disc and threaded ends. Valve shall be capable of being refitted and ground while the valve remains in the line.

MANUFACTURER	HORIZONTAL
Milwaukee:	544
Hammond:	901
Jenkins:	17C
Lunkenheimer:	142

2.3 METERS AND GAUGES

A. Glass Thermometers:

1. General: Provide glass thermometers of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.
2. Case: Die cast aluminum finished in baked epoxy enamel, glass front, spring secured, 9" long.
3. Adjustable Joint: Die cast aluminum, finished to match case, 180° adjustment in vertical plane, 360° adjustment in horizontal plane, with locking device.
4. Tube and Capillary: Blue Spirit filled, magnifying lens, 1% scale range accuracy, shock mounted.
5. Scale: Satin faced, non-reflective aluminum, permanently etched markings.
6. Stem: Copper-plated steel, or brass, for separable socket, length to suit installation.
7. Range: Conform to the following:
 - a. Hot Water: 30° - 240° F. with 5° F. scale.
8. Manufacturer: Subject to compliance with requirements, provide glass thermometers of one of the following:
 - a. Ernst Gage Co.
 - b. Marshalltown Instruments, Inc.
 - c. Terice (H.O.) Co.
 - d. Weis Instruments, Inc.
 - e. Or equal

B. Thermometer Wells:

1. General: Provide thermometer wells constructed of brass or stainless steel, pressure rated to match piping system design pressure. Provide 2" extension for insulated piping. Provide cap nut with chain fastened permanently to thermometer well.
2. Manufacturer: Same as thermometers.

C. Pressure Gauges:

1. General: Provide pressure gauges of materials, capacities, and ranges indicated, designed and constructed for use in service indicated.
2. Type: General use, 1% accuracy, ANSI B40.1 grade A, phosphor bronze bourdon type, bottom connection.
3. Case: Drawn steel or brass, glass lens, 4-1/2" diameter.
4. Connector: Brass with 1/4" male NPT. Provide protective siphon when used for steam service.
5. Scale: White coated aluminum, with permanently etched markings.
6. Range: Conform to the following:
 - a. Water: 0 - 100 psi.
50 - 300 psi.

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7. Manufacturer: Subject to compliance with requirements, provide pressure gauges of one of the following:
 - a. Ametek/U.S. Gauge.
 - b. Marsh Instrument Co., Unit of General Signal.
 - c. Marshalltown Instruments, Inc.
 - d. Trerice (H.O.) Co.
 - e. Weiss Instruments, Inc.
 - f. Or equal

- D. Pressure Gauge Cocks:
 1. General: Provide pressure gauge cocks between pressure gauges and gauge tees on piping systems. Construct gauge cock of brass with 1/4" female NPT on each end, and "T" handle brass plug.
 2. Siphon: 1/4" straight coil constructed of brass tubing with 1/4" male NPT on each end.
 3. Snubber: 1/4" brass bushing with corrosion resistant porous metal disc, through which pressure fluid is filtered. Select disc material for fluid served and pressure rating.
 4. Manufacturer: Same as for pressure gauges.

- E. Annular Element Flow Meters and Fittings:
 1. General: Provide as indicated, flow metering elements constructed of brass and stainless steel, equipped with readout valves to facilitate connecting of differential pressure meter to flow meter. Equip each readout valve with integral shut-off valve designed to minimize system fluid loss during monitoring process. Provide ball type brass isolation valve. Provide calibrated nameplate with flow meter detailing its flow range through range of differential head pressures. Each element shall be of the bi-directional type having four diametrically opposed sensing ports on both upstream and downstream sides in order to ensure average velocity and static pressure. Elements shall be capable of operating at a maximum temperature of 300° F. and maximum pressure of 250 psig.
 2. Manufacturer: Subject to compliance with requirements, provide flow meters of one of the following:
 - a. Preso Industries Corp.
 - b. Meriam Instrument.
 - c. Dieterich Standard Corp.
 - d. Or equal

- F. Calibrated Balance Valves:
 1. General: Provide as indicated, calibrated balance valves equipped with readout valves to facilitate connecting of differential pressure meter to balance valves. Equip each readout valve with integral EPT check valve designed to minimize system fluid loss during monitoring process. Provide calibrated nameplate to indicated degree of closure of precision machined orifice. Construct balancing valve with internal EPT O-ring seals to prevent leakage around rotating element. Provide balance valves with preformed polyurethane insulation suitable for use on heating and cooling systems, and to protect balance valves during shipment.

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2. Manufacturer: Subject to compliance with requirements, provide calibrated balance valves of one of the following:
 - a. Bell & Gossett ITT; Fluid Handling Div.
 - b. Taco, Inc.
 - c. Armstrong Pumps Inc.
 - d. Or equal

2.4 HANGERS AND ATTACHMENTS

A. Horizontal-Piping Hangers and Supports:

1. General: Except as otherwise indicated, provide factory-fabricated horizontal piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacture for each piping service. Select size of hangers and supports to exactly fit pip size for bare piping, and to insulated piping. Provide copper-plated hangers and supports for copper-piping systems.
 - a. Adjustable Steel Clevises Hangers: MSS Type 1.
 - b. Steel Pipe Clamps: MSS Type 4.
 - c. Pipe Slides and Slide Plates: MSS Type 35, including one of the following plate types:
 - 1) Plate: Unguided type.
 - 2) Plate: Guided type.
 - 3) Plate: Hold-down clamp type.
 - d. Pipe Saddle Supports: MSS Type 36, including steel pipe base-support and cast-iron floor flange.
 - e. Pipe Stanchion Saddles: MSS Tube 37, including steel pip base support and cast-iron floor flange.
 - f. Adjustable Pipe Saddle Supports: MSS Type 38, including steelpipe base support and cast-iron floor flange.
 - g. Single Pipe Rolls: MSS Type 41.
 - h. Adjustable Roller Hangers: MSS Type 43.
 - i. Pipe Roll Stands: MSS Type 44.
 - j. Pipe Rolls and Plates: MSS Type 45.
 - k. Adjustable Pipe Roll Stands: MSS Type 46.
2. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
 - a. Carpenter and Patterson, Inc.
 - b. Corner & Lada Co., Inc.
 - c. Elcen Metal Products Co.
 - d. Fee & Mason Mfg. Co.; Div. Figgie International
 - e. ITT Grinnel Corp.

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f. Or equal

B. Vertical-Piping Clamps:

1. General: Except as otherwise indicated, provide factory-fabricated vertical-piping clamps, complying with MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.
 - a. Two-Bolt Riser Clamps: MSS Type 8.
 - b. Four-Bolt Riser Clamps: MSS Type 42.
2. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
 - a. Carpenter and Patterson, Inc.
 - b. Corner & Lada Co., Inc.
 - c. Elcen Metal Products Co.
 - d. Fee & Mason Mfg. Co.; Div. Figgie International
 - e. ITT Grinnel Corp.
 - f. Or equal

C. Hanger-Rod Attachments:

1. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-pipe hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.
 - a. Steel Turnbuckles: MSS Type 13.
 - b. Swivel Turnbuckles: MSS Type 15.
 - c. Malleable Iron Sockets: MSS Type 16.
2. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
 - a. Carpenter and Patterson, Inc.
 - b. Corner & Lada Co., Inc.
 - c. Elcen Metal Products Co.
 - d. Fee & Mason Mfg. Co.; Div. Figgie International
 - e. ITT Grinnel Corp.
 - f. Or equal

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D. Building Attachments:

1. General: Except as otherwise indicate, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.
 - a. Concrete Inserts: MSS Type 18.
 - b. Top Beam C-Clamp: MSS Type 19.
 - c. Side Beam or Channel Clamps: MSS Type 20.
 - d. Center Beam Clamps: MSS Type 21.
 - e. Welded Beam Attachments: MSS Type 22.
 - f. C-Clamps: MSS Type 23.
 - g. Top Beam Clamps: MSS Type 25.
 - h. Side Beam Clamps: MSS Type 27.
 - i. Steel Beam Clamps W/Eye Nut: MSS Type 28.
 - j. Linked Steel Clamps W/Eye Nut: MSS Type 29.
 - k. Malleable Beam Clamps: MSS Type 30.
 - l. Steel Brackets: One of the following for indicated loading:
 - 1) Light Duty: MSS Type 31.
 - 2) Medium Duty: MSS Type 32.
 - 3) Heavy Duty: MSS Type 33.
 - m. Side Beam Brackets: MSS Type 34.
 - n. Plate Lugs: MSS Type 57.
 - o. Horizontal Travelers: MSS Type 58.
 - p. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
 - 1) Carpenter and Patterson, Inc.
 - 2) Corner & Lada Co., Inc.
 - 3) Elcen Metal Products Co.
 - 4) Fee & Mason Mfg. Co.; Div. Figgie International
 - 5) ITT Grinnel Corp.
 - 6) Or equal

E. Saddles and Shields:

1. General: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
2. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.

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3. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
4. Manufacturer: Subject to compliance with requirements, provide thermal hanger shields of one of the following:
 - a. Elcen Metal Products Co.
 - b. Pipe Shields, Inc.
 - c. Carpenter Patterson, Inc.
 - d. ITT Grinnel Corp.
 - e. Or equal

F. Miscellaneous Materials:

1. Metal Framing: Provide products complying with NEMA STD ML 1.
2. Steel Plates, Shapes, and Bars: Provide products complying with ASTM A 36.
3. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.
4. Heavy Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards.
5. Pipe Guides: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of bolted two-section outer cylinder and base with two-section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

2.5 MECHANICAL IDENTIFICATION

A. Plastic Pipe Markers:

1. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ANSI A13.1
2. Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1
3. Insulation: Furnish 1 in. thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125 degrees F (52 degrees C) or greater. Cut length to extend 2 in. beyond each end of plastic pipe marker.
4. Small Pipes: For external diameters less than 6 in. (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
 - a. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
 - b. Adhesive lap joint in pipe marker overlap.
 - c. Laminated or bonded application of pipe marker to pipe (or insulation).
 - d. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4 in. wide; full circle at both ends of pipe marker, tape lapped 1-1/2 in.

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- B. Application: Provide pipe labels for the following piping system:
1. Heating Hot water supply and return.
 2. Refrigerant liquid and suction.
 3. Condensate drain.
- C. Valve Tags:
1. Brass Valve Tags: Provide 19-gage polished brass valve tags with stamp-engraved piping system abbreviation in 1/4 in. high letters and sequenced valve numbers 1/2 in. high, and with 5/32 in. hole for fastener.
 - a. Provide 1-1/2 in. diameter tags, except as otherwise indicated.
 - b. Provide size and shape as specified or scheduled for each piping system.
 - c. Fill tag engraving with black enamel.
 2. Valve Tag Fasteners: Provide manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.
- D. Valve Schedule Frames:
1. General: For each page of valve schedule, provide glazed display frame, with screws for removable mounting on masonry walls. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.
- E. Plastic Equipment Markers:
1. General: Provide manufacturer's standard laminated plastic, color-coded equipment markers. Conform to the following color code:
 - a. Green: Cooling equipment and components.
 - b. Yellow: Heating equipment and components.
 - c. Yellow/Green: Combination cooling and heating equipment and components.
 - d. Blue: Equipment and components that do not meet any of the above criteria.
 2. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
 - a. Equipment label "ID" from schedules.
 - b. Design capacity from schedules.
 3. Size: Provide approximate 2-1/2 in. x 6 in. markers for each piece of equipment.
 4. Application: Provide equipment labels for the following equipment:
 - a. Boilers
 - b. Pumps
 - c. Expansion Tanks
 - d. Rooftop Units (RTU)
 - e. Indoor Air Handling Units (AHU)
 - f. Exhaust Fans
 - g. Air Cooled Condensing Units
 - h. Terminal Heating Units GAS/HW/ELEC equipped with fans

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- i. Ductless Cooling Unit Systems (locate on inside panel)
- j. Glycol Feeder
- k. Air Separator
- l. Variable Air Volume Boxes (VAV)
- m. Heat Recovery Unit (located on inside panel)

F. Ductwork Labels:

- 1. Provide painted stencils or standard laminated plastic, color coded labels for the following systems:
 - a. Supply Ductwork
 - b. Return Ductwork
 - c. Exhaust Ductwork
 - d. Hazardous Exhaust
 - e. Outside Air Ductwork

2.6 MECHANICAL INSULATION

A. Piping Insulation Materials:

- 1. Glass Wool Piping Insulation:
 - a. Manufacturers:
 - 1) Knauf Insulation; Earthwool 1000° Pipe Insulation with ECOSE Technology
 - 2) Knauf Insulation; Earthwool Redi-Klad 1000° Pipe Insulation with ECOSE Technology
 - 3) Or similar as manufactured by Johns Manville, Manson, or Owens Corning
 - a) UL/ULC Classified per UL 723 or FHC 25/50 per ASTM E 84; EPD Certified by UL Environment; Living Building Challenge – Declare Red List Free for unjacketed Earthwool Pipe and composite Redi-Klad Pipe; meeting ASTM C 547, Type IV (1000° F.) or Type I (850° F.) ; ASTM C 585; ASTM C 411 and ASTM C 795; Verified to be formaldehyde free by UL Environment.
 - b. Vapor Retarder Jacket: ASJ+/SSL+ conforming to ASTM C 1136 Type I,II, III, IV, &VIII secured with self-sealing longitudinal laps and matching butt strips.
 - c. Redi-Klad Jacket: VentureClad 5-ply weather and abuse resistant with self-sealing lap. Zero permeability per ASTM E 96-05; puncture resistance 35.4 kg (189.3 N) per ASTM D 1000; tear strength 4.3 lb (19.4 N) per ASTM D 624; thickness 14.5 mils (0.0145”); tensile strength 68 lb/inch width [306 N (32 kg)/25 mm]
- 2. Flexible Unicellular Piping Insulation: ASTM C 534, Type as required.
 - a. Type I - tubular; Type II - sheet. For use between -40 degrees F and 200 degrees F.
- 3. Encase pipe fittings insulation with one-piece pre-molded PVC fitting covers, fastened as per manufacturer's recommendations.

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4. Encase straight pipe insulation, where exposed in occupied areas, using Redi-Klad Pipe Insulation or cover “standard” insulation with one piece 20-mil thick PVC Jacketing. Fasten and seal as per manufacturer's recommendations.
 5. Encase exterior piping insulation using Redi-Klad Pipe Insulation or cover “standard” insulation with aluminum jacket with weather-proof construction.
 6. Staples, Bands, Wires and Cement: As recommended by insulation manufacturer for applications indicated.
 7. Adhesives, Sealants and Protective Finishes: As recommended by insulation manufacturer for applications indicated.
- B. Piping Insulation Application and Thickness:**
1. Application: Cold Piping (40 Degrees F to Ambient):
 - a. Insulate the following cold HVAC piping systems:
 - 1) Air conditioner condensate drain piping.
 - 2) Refrigerant liquid and suction piping.
 - b. Insulate piping system specified above with the following type and thickness of insulation:
 - 1) Glass Wool: 1-1/2 in. thick for all pipe sizes.
 - 2) Flexible Unicellular: (Refrigerant piping only) 1 in. thick.
 2. Application: Hot HVAC Piping (to 200 Degrees F)
 - a. Insulate the following hot HVAC piping systems
 - 1) HVAC hot water supply and return piping.
 - 2) Hot gas refrigerant piping.
 - b. Insulate each piping system specified above with the following type and thickness of insulation:
 - 1) Glass Wool: 1-1/2 in. thick for pipe sizes up to and including 1-1/4 in, 2 in. thick for all 1-1/2 in. pipe and larger.
 - 2) Flexible Unicellular: (Refrigerant piping only) 1 in. thick.
- C. Insulation on Piping Exposed to Weather:** Protect outdoor insulation from weather by installing Redi-Klad Pipe Insulation or adding an outdoor protective finish aluminum jacketing installed to “standard” insulation as recommended by the manufacturer. Insulation thickness shall be increased by one size versus specified pipe insulation thickness.
- D. Ductwork and Equipment Insulation Materials:**
1. Glass Wool Manufacturers:
 - a. Knauf Insulation
 - b. Or similar as manufactured by CertainTeed, Johns Manville, Manson or Owens Corning
 2. Rigid Glass Wool Ductwork Insulation (R-12): UL/ULC Classified unfaced, ASJ+, ASJ and FSK; FHC 25/50 per ASTM E 84 for PSK only; meeting ASTM C 612, Type IA and IB; rigid. Verified to be formaldehyde free by UL Environment.

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3. Flexible Glass Wool Ductwork Insulation (R-6): UL/ULC Classified; meeting ASTM C 553 Types I, II and III; ASTM C 1136 Type II and ASTM C 1290. UL GREENGUARD Gold Certified; Verified to be formaldehyde free by UL Environment; does not contain polybrominated diphenyl ethers (PBDE) such as Penta-BDE, Octa-BDE or Deca-BDE; Certified to meet all requirements of EUCEB. Flexible, limited combustible.
4. Jackets for Ductwork Insulation: ASTM C 1136 Type II, with vapor barrier.
5. Ductwork Insulation Accessories: Provide staples, bands, wire, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.
6. Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.

E. Ductwork Insulation Application and Thickness:

1. Application: Ventilation and AC System Ductwork:
 - a. Insulate the following ductwork:
 - 1) Outdoor air ductwork.
 - 2) HVAC supply ductwork between HVAC unit discharge and room terminal outlet.
 - 3) Insulate neck, bells and plenums of supply diffusers.
 - 4) HVAC return ductwork between room terminal inlet and HVAC unit inlet.
 - 5) HVAC plenums and unit housing not pre-insulated at factory or lined.
 - 6) Exhaust ductwork between in-line exhaust fan or HVAC unit outlet to point of exit in building.
 - 7) Combustion air ducts associated with boilers.
 - b. Insulate each ductwork system specified above with the following type and thickness of insulation:
 - 1) Rigid Glass Wool: In machine rooms, fan rooms, and mechanical spaces insulate all supply air, return air, exhaust air and outside air ductwork with 3 in. thick rigid (minimum R-12). All exposed ductwork in occupied areas shall be internally insulated with same thickness and material.
 - 2) Flexible Glass Wool: 2" in thickness (minimum R-6).
 - 3) All outside air ductwork shall be 3 in. rigid (R-12).
 - 4) All exterior ductwork insulation shall be 3" rigid (minimum R-13) and shall be covered with weather and ultraviolet resistant duct insulation wrap as manufactured by Polyguard Alumaguard All-Weather Cool Wrap, FlexClad Ideal Seal 777, or equal.
2. Equipment Insulation Materials:
 - a. Rigid Glass Wool Equipment Insulation (R-12): UL/ULC Classified; unfaced, ASJ+, ASJ and FSK; FHC 25/50 for PSK only; meeting ASTM C 612, Type IA and IB : rigid. Verified by UL Environment to be formaldehyde free.

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- b. Flexible Glass Wool Equipment Insulation (R-6): UL/ULC Classified; meeting ASTM C 553 Types I, II and III; ASTM C 1136 Type II and ASTM C 1290. UL GREENGUARD Gold Certified; Verified to be formaldehyde free by UL Environment; does not contain polybrominated diphenyl ethers (PBDE) such as Penta-BDE, Octa-BDE or Deca-BDE; Certified to meet all requirements of EUCEB. Flexible, limited combustible.
- c. Flexible Unicellular Equipment Insulation: ASTM C 534, Type as required.
TYPE I - TUBULAR.
TYPE II - SHEET.
- d. Jacketing material for Equipment Insulation: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard, Laminated Self-Adhesive Water and Weather Seal jacketing or metal jacket at Installer's option, except as otherwise indicated.
- e. Equipment Insulation Compounds; Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.
- f. Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape, corner angles, anchors and stud pins as recommended by insulation manufacturer for applications indicated.

2.7 HYDRONIC PIPING AND ACCESSORIES

- A. Manufacturer: Subject to compliance with requirements, provide piping system products from one of the following:
 - 1. Grooved Mechanical Joint Pipe, Fittings and Couplings:
 - a. Victaulic Company of America.
 - b. Anvil Gruvlok
 - c. Grinnell
 - d. Or equal
 - 2. Pump Discharge Valves (Triple-Duty Valve):
 - a. Bell & Gossett ITT; Fluid Handling Div.
 - b. Amtrol, Inc.
 - c. Armstrong Pumps, Inc.
 - d. Taco, Inc.
 - e. Victaulic (Tri-Service Assembly)
 - f. Or equal
 - 3. Safety Relief Valves:
 - a. Bell & Gossett ITT; Fluid Handling Div.
 - b. Amtrol, Inc.
 - c. Spirax Sarco.
 - d. Watts Regulator Co.
 - e. Or equal

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4. Pressure Reducing Valves:
 - a. Bell & Gossett ITT; Fluid Handling Div.
 - b. Amtrol, Inc.
 - c. Armstrong Pumps, Inc.
 - d. Taco, Inc.
 - e. Or equal
5. Air Vents (Automatic):
 - a. Bell & Gossett ITT; Fluid Handling Div.
 - b. Armstrong Machine Works.
 - c. Hoffman Specialty ITT; Fluid Handling Div.
 - d. Spirax Sarco.
 - e. Or equal
6. Air Separators:
 - a. Bell & Gossett ITT; Fluid Handling Div.
 - b. Amtrol, Inc.
 - c. Armstrong Pumps, Inc.
 - d. Taco, Inc.
 - e. Or equal
7. Diaphragm-Type Compression Tanks:
 - a. Bell & Gossett ITT; Fluid Handling Div.
 - b. Amtrol, Inc.
 - c. Armstrong Pumps, Inc.
 - d. Or equal
8. Pump Suction Diffusers:
 - a. Bell & Gossett ITT; Fluid Handling Div.
 - b. Amtrol, Inc.
 - c. Armstrong Pumps, Inc.
 - d. Taco, Inc.
 - e. Victaulic (style 731-D / W731-D)
 - f. Or equal
9. Chemical Feeder:
 - a. Dearborn USA.
 - b. Vulcan Laboratories, Subsidiary of Clow Corp.
 - c. York-Shipley, Inc.
 - d. Or equal
10. Basket Strainers:
 - a. Crane Co.
 - b. Metraflex Co.

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- c. Spirax Sarco.
- d. Victaulic Company of America. (732/W732/730/W730)
- e. Or equal

B. PIPE AND TUBING MATERIALS

- 1. Copper Tubing: ASTM grade B 88, Type L hard drawn temper copper tubing.
- 2. Copper Tubing: ASMT grade B 88, Type K, annealed copper tubing.
- 3. Steel Pipe: ASTM A-53 grade B, Schedule 40, seamless, black steel pipe, beveled ends.
- 4. CPVC Plastic Pipe: ASTM D 2846, Chlorinated Poly (Vinyl Chloride) (CPVC) pipe.

C. FITTINGS

- 1. Cast-Iron Threaded Fittings: ANSI B16.4, Class 125, standard pattern, for threaded joints. Threads shall conform to ANSI B2.1.
- 2. Malleable-Iron Threaded Fittings: ANSI B16.3, Class 150, standard pattern, for threaded joints. Threads shall conform to ANSI B2.1.
- 3. Steel Fittings: ASTM A 234, seamless or welded, for welded joints.
- 4. Grooved Mechanical Fittings: ASTM A 106, or ASTM A 53/A53M, Type F, E or S, Grade B fabricated steel, or ASTM A 234, Grade WPB forged steel fittings with grooves or shoulders designed to accept grooved end couplings.
- 5. Grooved Rigid Mechanical Couplings: Consist of a two- piece ductile iron housing per ASTM A536, a synthetic rubber gasket of a central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 - a. Rigid Couplings:
 - 1) Housings 12” and smaller cast with offsetting angled-pattern bolt pads to provide visual confirmation upon metal-to-metal pad contact with no torque requirement. Victaulic Style 107H and Style 07 or equal. Designs that permit spaces at bolt pads or require a torque per manufacturer’s written installation instructions not permitted
 - 2) Housings 14” and larger cast with wedge-shaped groove profile, lead-in chamfer and flat pad design for metal-to-metal pad contact. Victaulic Style W07 or equal.
 - b. Flexible Couplings:
 - 1) Use in locations where vibration attenuation and stress relief are required. Victaulic Style 177, 77 or W77 or equal. Three flexible couplings may be used in lieu of each flexible connector for vibration attenuation. Couplings shall be placed in close proximity to the vibrating source in accordance with published guidelines.
 - c. Flange Adapters: Ductile iron housing, flat face, for use with grooved end pipe and fittings, for mating directly with ANSI Class 125, 150, and 300 flanges. Victaulic Style 741, 743 or W741 or equal.
- 6. Wrought-Copper Fittings: ANSI B16.22, streamlined pattern.
- 7. CPVC Plastic Fittings: ASTM D 2846, Chlorinated Poly Vinyl Chloride (CPVC) socket-type fittings and solvent for solvent cemented joints.

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8. Cast-Iron Threaded Flanges: ANSI B16.1, Class 125; raised ground face, bolt holes spot faced.
9. Cast Bronze Flanges: ANSI B16.24, Class 150; raised ground face, bolt holes spot faced.
10. Steel Flanges and Flanged Fittings: ANSI B16.5, including bolts, nuts, and gaskets of the following material group, end connection and facing:
 - a. Material Group: 1.1.
 - b. End Connections: Butt Welding.
 - c. Facings: Raised face.
11. Solder Filler Metals: ASTM B 32, 50-50, Tin-Lead, for condenser water, chilled water, and make-up water and drain piping.
12. Solder Filler Metals: ASTM B 32, 95-5 Tin-Antimony, for heating hot water and low pressure steam piping.
13. Brazing Filler Metals: AWS A5.8.
14. Gasket Material: EPDM Thickness, material, and type suitable for fluid to be handled, and design temperatures and pressures.
15. Flexible Connectors: Stainless steel bellows with woven flexible bronze wire reinforcing protective jacket; minimum 150 psig working pressure, maximum 250° F. operating temperature. Connectors shall have flanged, grooved or threaded end connections to match equipment connected; and shall be capable of 3/4" misalignment.
 - a. Three (3) flexible couplings may be used in lieu of each flexible connector for vibration attenuation. Couplings shall be placed in close proximity to the vibrating source in accordance with published guidelines.

D. PIPE SLEEVES AND ESCUTCHEONS

1. General: Provide schedule 40 black steel or 18 gage galvanized pipe sleeve large enough to accept pipe along with specified pipe insulation at each point where pipe penetrates a wall or floor. Sleeve shall be large enough to allow for free movement of pipe however minimized to prevent leakage of smoke and fire during a fire emergency. For all piping exposed to view provide a chrome plated escutcheon that will surround insulation where applicable on pipe for a neat finished appearance. Where piping is concealed above ceilings no escutcheons are required.

E. SPECIAL DUTY VALVES

1. General: General duty valves (i.e., gate, check, ball, and butterfly valves) are specified in Division 23 Section "Valves" Special duty valves are specified in this Article by their generic name; refer to the drawings for specific applications of these valves.

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2. Pump Discharge Valves (Triple-Duty Valve): 175 PSIG working pressure, 300° F. maximum operating temperature, cast-iron body, bronze disc and seat, stainless steel stem and spring, and "Teflon" packing. Valves shall have flanged connections and straight or angle pattern as indicated. Features shall include non-slam check valve with spring-loaded weighted disc, and calibrated adjustment feature to permit regulation of pump discharge flow and shutoff.
 - a. In grooved installations, Tri-Service Assemblies may be used in lieu of Triple-Duty Valves. Straight pattern, (300-psi) pressure rating, combination shut-off, throttling, and non-slam check service in one unit. Victaulic Vic®-300 MasterSeal™ or equal, butterfly valve assembled with Series 779 Venturi Check valve or equal, with flow measurement capabilities and Victaulic or equal couplings (style to be determined by system requirements) for 2" through 12". Straight pattern, 230-psig pressure rating combination shut-off, throttling, and non-slam check service in one unit. Victaulic AGS-300 or equal butterfly valve assembled with Series W715 or equal check valve and Victaulic or equal couplings for 14" and larger.
3. Pressure Reducing Valves: Diaphragm operated, cast-iron or brass body valve, with low inlet pressure check valve, inlet strainer removable without system shut-down, and non-corrosive valve seat and stem. Select valve size, capacity, and operating pressure to suit system. Valve shall be factory-set at operating pressure and have the capability for field adjustment.
4. Safety Relief Valves: 125 psig working pressure and 250° F. maximum operating temperature: designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code. Valve body shall be cast-iron, with all wetted internal working parts made of brass and rubber. Select valve to suit actual system pressure and BTU capacity.
5. Combined Pressure/Temperature Relief Valves: Diaphragm operated, cast-iron or brass body valve, with low inlet pressure check valve, inlet strainer removable without system shut-down, and non-corrosive valve seat and stem. Select valve size, capacity, and operating pressure to suit system. Valve shall be factory-set at operating pressure and have the capability for field adjustment. Safety relief valve designed, manufactured, tested, and labeled in accordance with the requirements of Section IV of the ASME Boiler and Pressure Vessel Code. Valve body shall be cast-iron, with all wetted internal working parts made of brass and rubber; 125 psig working pressure and 250° F. maximum operating temperature. Select valve to suit actual system pressure and BTU capacity. Provide with fast fill feature for filling hydronic system.

F. HYDRONIC SPECIALTIES:

1. Automatic Air Vent: Designed to vent automatically with float principle; bronze body and nonferrous internal parts; 150 psig working pressure, 240° F. operating temperature; and having 1/4" discharge connection and 1/2" inlet connection.
2. Diaphragm-Type Compression Tanks: Size and number as indicated; construct of welded carbon steel for 125 psig working pressure, 375° F. maximum operating temperature. Separate air charge from flexible diaphragm securely sealed into tank. Provide taps for pressure gage and air charging fitting, and drain fitting. Support vertical tanks with steel legs or base; support horizontal tanks with steel saddles. Tank, with taps and supports, shall be constructed, tested, and labeled in accordance with ASME Pressure Vessel Code, Section VIII, Division 01.

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3. Pump Suction Diffusers: Cast-iron or ductile iron body, with threaded connections for 2" and smaller, flanged or grooved connections for 2-1/2" and larger; 175 psig working pressure, 300° F. maximum operating temperature for flanged and 300 psig working pressure, 230F for grooved; and complete with the following features:
 - a. Inlet vanes with length 2-1/2 times pump suction diameter or greater.
 - b. Cylinder strainer with 3/16" diameter openings with total free area equal to or greater than 5 times cross-sectional area of pump suction, designed to withstand pressure differential equal to pump shutoff head.
 - c. Disposable fine mesh strainer to fit over cylinder strainer.
 - d. Permanent magnet, located in flow stream, removable for cleaning.
 - e. Adjustable foot support, designed to carry weight of suction piping.
 - f. Blowdown tapping in bottom; gage tapping in side.
4. Chemical Feeder: (Provide one (1) for each piping system). Bypass type chemical feeders of 5 gallon capacity, welded steel construction; 125 psig working pressure; complete with fill funnel and inlet, outlet, and drain valves.
5. Chemical Treatment
 - a. Furnish the necessary apparatus to provide water treatment to the hot water piping systems as well as the boilers as furnished by New England Systems and Supply, Inc., GE Betz Water Technologies, or other fully capable water treatment organization approved by the Engineer.
 - b. A contract agreement satisfactory in form and substance shall be executed between this HVAC subcontractor and water treatment company to furnish supervisory service to assure the use of the proper chemical treatment thereof. The water treatment company shall perform the following specified services through its agent:
 - 1) Supervise the cleaning and flushing of all systems and the initial introduction of water treatment chemicals.
 - 2) Furnish all required chemicals for the cleaning and proper initial treatment of all systems hereinafter described, together with all necessary testing equipment and reagents for field analysis of the water.
 - 3) Submit a written report of test results of the field analyses to the Engineer when the systems are cleaned and treated with corrosion inhibitors. Submit certificate of completion for all systems indicating that all treatment systems are properly functioning and that the associated systems are properly treated.
 - c. The hot water piping systems shall be cleaned with sufficient chemicals to ensure the removal of all cutting oil, compound, etc. These chemicals shall not be harmful to the various materials of the systems. The treatment company representative shall supervise this operation including the flushing of the system and shall test the final rinsed system to ensure that the remnants of the cleaning solution do not impart alkalinity to the water in excess of 300 PPM.
 - d. Hot water systems shall be treated with sufficient amounts of the proper chemicals to conform to the Dianodic method for corrosion protection. Take various samples of water to assure proper level of chemical treatment.
 - e. Each boiler shall be treated with sufficient amounts of the proper chemicals to provide positive protection against corrosion, scale formation and carry over.

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- f. At the end of the first year of the contract agreement, the chemical treatment company shall provide to the owner and copy to Architect, a log of type, quantity and dosage of treatment and test results of treatment performed through the first year.
 - g. Following the first year of service, chemical treatment company shall provide recommended maintenance and treatment schedule to owner and a copy to architect for testing and treating the water. This schedule shall be posted in the boiler room along with the testing and treatment log.
 - h. Upon completion of first year of service, the chemical treatment company shall instruct the owner to the owner's responsibility to test and treat water or to contract with chemical treatment company to perform testing and treatment services.
6. Y-Pattern Strainers: Cast-iron body (ASTM A 126, Class B), flanged ends for 2-1/2" and larger, threaded connections for 2" and smaller, bolted cover, perforated Type 304 stainless steel basket, bottom drain connections; 125 psig working pressure.
7. Basket Strainers: High tensile cast-iron body (ASTM A 126, Class B), flanged end connections, bolted cover, perforated Type 304 stainless steel basket, bottom drain connections; 125 psig working pressure.
8. Grooved-End Strainers:
- a. Y-Pattern: Ductile iron body ASTM A536, grooved ends for 2" and larger, coupled cover, perforated Type 304 stainless steel basket, bottom drain, 300 psig working pressure.
 - b. T-Pattern: Ductile iron body ASTM A536, grooved ends for 2" and larger, coupled or T-bolt hinged cover, perforated 304 stainless steel basket, bottom drain, up to 750 psig working pressure.
9. Grooved-End Expansion for Steel Piping 2" and larger (Water Service):
- a. 2" Through 6": Packless, gasketed, slip-type expansion joint with grooved end telescoping body for installation with Victaulic Style 107 or 07 rigid couplings. Provides axial end movement to 3", designed for water services up to 230°F and working pressure to 350 psi. Victaulic Style 150 Mover®.
 - b. 2" Through 24": Combination of short nipples and Victaulic Style 177 or 77 flexible couplings joined in tandem for increased expansion. Joint movement and expansion capabilities dependent on number of couplings/nipples used in the joint. Pressure rating dependent on size and style of flexible couplings used. Victaulic Style 155.
 - c. Expansion Loops: Pipe bends and loops in grooved piping systems shall consist of (8) Victaulic Style 177, 77 or W77 flexible couplings, (4) Victaulic 90° elbows, and (3) grooved end pipe spools provided in water systems to +250°F in accordance with the latest Victaulic recommendations for expansion compensation. Rigid couplings shall not be used on loop corners.
 - d. Expansion Joints: Provide pipe expansion joints at all building expansion joints. Utilize a seismic expansion fitting similar to Metra-Flex, Metra Loop Grooved ends or equal. The expansion fitting shall provide absorption in the lateral offset and angular movement.

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10. Glycol/Make-up Pump - Provide a packaged automatic glycol solution make up unit consisting of a base, polyethylene reservoir with removable lid and visible solution level scale in gallons, y-stainers, isolation valves, fill pump with a minimum capacity of 5 gpm @ 100 psi discharge, open drip proof motor, pump isolation, check and balancing valves, discharge pressure gauge, motor contactor, pressure control and necessary interconnecting piping. Pump shall be a bronze gear driven design and shall have a standard 120 volt power electrical cord and all necessary controllers and safeties. The unit shall provide alarm outputs for BMS connection.
11. AIR and DIRT SEPARATORS - Air and dirt removal device shall be constructed of steel. It shall be designed, fabricated and stamped per ASME Section VIII Division 1 with a maximum working pressure of 125 psi at 270°F. Manufacturer shall be holder of ASME U stamp. Manufacturer to have optional 250 psi and 150 psi ASME units available. Units up to three 3-inch in size shall be provided with threaded connections as standard. Units four 4-inch and larger shall be provided with flanged system connections as standard. Inlet and outlet connections to be in line with piping system. Both inlet and outlet to be in the same horizontal and vertical planes. Each air and dirt removal device shall be equipped with a brass conical shaped air venting chamber designed to minimize system fluid from fouling the venting assembly. The air vent shall be able to be closed to allow flushing and purging of dirt via side port without dirt passing through vent on initial system fill. A brass flushing cock shall be located on the side of each separator to facilitate system fast-fill and removal of the floating impurities from the air system interface within the separator. A blow down valve shall be provided by the unit manufacturer on the bottom of each unit to allow blow down and cleaning. On units 2 ½” and smaller the valve and all of its fittings shall be 1”. On units three 3” and larger the valve and all openings shall be 2”.

2.8 TERMINAL HEATING UNITS (HYDRONIC)

A. Unit Heaters: (Horizontal Type)

1. General: Provide horizontal unit heaters in locations as indicated, and of capacities, style, and having accessories as scheduled.
2. Construction:
 - a. Casings: Construct of steel, phosphatized inside and out, and painted finish with baked enamel. Color by architect. Provide adjustable face air diffuser.
 - b. Fans: Construct of aluminum and factory-balance. Design so motor and fan assembly is removable through fan outlet panel.
 - c. Coils: Construct of plate-type aluminum fins, mechanically bonded to copper tubes. Design coil for use in steam or hot water applications.
 - d. Motors: Provide totally enclosed motors, with built-in overload protection, having electrical characteristics as scheduled.
3. Manufacturer: Subject to compliance with requirements, provide horizontal unit heaters of one of the following:
 - a. Airtherm Mfg. Co.
 - b. Rittling
 - c. Modine Mfg. Co.
 - d. Trane (The) Co.
 - e. Or equal

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B. Unit Heaters: (Cabinet Type)

1. General: Provide cabinet unit heaters having cabinet sizes and in locations as indicated, and of capacities, style, and having accessories as scheduled. Include in basic unit chassis, coil, fanboard, fan wheels, housings, motor, and insulation.
2. Construction:
 - a. Chassis: Galvanized steel wrap-ground structural frame with edges flanged.
 - b. Insulation: Faced, heavy density glass fiber.
 - c. Cabinet: 14-ga removable front panel, 16-ga top and side panels. Insulate front panel over entire coil section. Provide access door on coil connection side. Clean cabinet parts, bonderize, phosphatize, and factory finished with baked enamel. Color by architect.
 - d. Water Coils: Construct of 5/8" seamless copper tubes mechanically bonded to configured aluminum fins. Design for 300 psi and leak test at 300 psi under water. Provide same end connections for supply and return.
 - e. Fans: Provide centrifugal, forward curved double width fan wheels constructed of non-corrosive, molded, fiberglass reinforced thermo-plastic material. Construct fan scrolls of galvanized steel.
 - f. Motors: Provide shaded pole motors with integral thermal over-load protection, and motor cords for plug-in to junction box in unit. Provide three speed switch on fan motor.
 - g. Filters: Provide 1" thick throwaway type filters in fiberboard frames.
3. Manufacturer: Subject to compliance with requirements, provide cabinet heaters of one of the following:
 - a. McQuay Inc.
 - b. Rittling
 - c. Trane (The) Co.
 - d. Young Radiator Co.
 - e. Or equal

C. Hydronic Radiant Heating Ceiling Panels

1. Radiant ceiling panels to include aluminum activation, copper meander, steel cassette and supported steel cross channels. Panels to weigh no more than 2.5 lb/ft² when operating.
2. Panel Surface: All panels to have solid smooth panel face.
3. Heating capacity shall be tested and certified by manufacturer in accordance with DIN 14037 or ASHRAE 138-2013.
4. Radiant ceiling panel surface to be coated with highly emissive powder coat paint for optimal radiative properties. Color to be selected by architect.
5. Panel connections shall be ½".
6. Factory installed 1" insulation. Ship loose insulation is not acceptable.
7. Copper piping shall be single tube with no solder connections.
8. Copper meander to be supplied with same end, opposite end or 2X meander connections based on drawings.
9. Radiant panels shall be 2-pipe.
10. Radiant ceiling panels to be supplied for grid installation. Mounting brackets and installation hardware to be supplied by manufacturer.
11. Panel lengths and widths per drawings.

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12. Flexible hoses to be supplied with panels for connections to surrounding panels and distribution system. Panel connection by means by brazing or press is not acceptable.
13. Radiant ceiling panels shall be shipped with an adhesive film protective coating on each individual element on the visual side.
14. Radiant ceiling manufacturer to supply 5 year warranty from date of shipment.
15. Panels shall be crated for shipment.
16. Connections
 - a. Piping installation requirements are specified in other Division 23 Sections. Drawings indicated general arrangement of piping, fittings, and specialties.
 - b. Install piping adjacent to radiant panels to allow for service and maintenance.
 - c. In addition to Division 23 Section "Hydronic Piping", connect copper tubing to supply with shut-off valve, strainer, control valve, and union or flange, and to return with balancing valve and union or flange.
17. Manufacturers: subject to compliance with requirements, provide products by one of the following:
 - a. Zehnder
 - b. TWA
 - c. Messana
 - d. Or equal

2.9 DUCTLESS COOLING UNITS

A. Evaporator:

1. General: The unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board, and fan motor. The unit in conjunction with the wired, wall mounted controller shall have a self-diagnostic function, three-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry nitrogen before shipment from factory. Each unit shall be provided with low ambient control down to 0 deg. F outside.
2. Cabinet: The casing shall be ABS plastic factory finish. Cabinet shall be designed for suspension mounting and horizontal operation. The rear cabinet panel shall have provisions for a field installed filtered outside air intake connection.
3. Fan: The evaporator fan shall have three high performance, double inlet, forward curve sirocco fans driven by a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of four speeds: Low, M1, M2 and Hi.
4. Vane: There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall provide a choice of five vertical airflow patterns selected by remote control. There shall also be a set of vertical vanes to provide horizontal swing airflow movement selected by remote control.
5. Filter: Return and outside air shall be filtered by means of an easily removable washable filter.

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6. Coil: The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil.
7. Control: The control system shall consist of two microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. Field wiring shall run directly from the indoor unit to the wall mounted controller with no splices. For A-Control, a three conductor 14 ga. AWG wire with ground shall provide power feed and bi-directional control transmission between the outdoor and indoor units. Where separate power is supplied to the indoor and outdoor units, a two 20 ga. AWG wire shall be run between the units to provide forbid-directional control communication. The system shall be capable of automatic restart when power is restored after power interruption. The system shall have self-diagnostics ability, including total hours of compressor run time. Diagnostics codes for indoor and outdoor units shall be displayed on the wired controller panel. Unit manufacturer shall provide BACnet communication gateway.

B. Condensing:

1. General: The outdoor unit shall be equipped with a control board that interfaces with the indoor unit to perform all necessary operation functions. The outdoor unit shall be capable of operating at 0 deg. F, (-18 deg. C) ambient temperature without additional low ambient controls. The outdoor unit shall be able to operate with a maximum height difference of 100 ft. and have maximum refrigerant tubing length of 165 ft. between indoor and outdoor units without the need for line size changes, traps or additional oil. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.
2. Cabinet: The casing shall be constructed from galvanized steel plate, coated with a finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection and have a factory finish. The fan grille shall be of ABS plastic.
3. Fan: The fan motor shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent contact with moving parts.
4. Coil: The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up. The coil shall be protected with an integral metal guard. Refrigerant flow from the condenser shall be controlled by means of linear expansion valve (LEV) metering orifice. The LEV shall be control by a microprocessor controlled step motor.
5. Compressor: The compressor shall be a scroll compressor with variable speed inverter technology. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which results in vast energy savings. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be intermittently applied to the compressor motor to maintain enough heat. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted on rubber snubbers to avoid the transmission of vibration.

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6. Electrical: The electrical power of the unit shall be as indicated on the drawings. The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC. The unit shall have Pulse Amplitude Modulation circuit to utilize 98 percent of input power supply.
- C. Manufacturer: Subject to compliance with requirements, provide ductless split systems of one of the following:
1. Mitsubishi
 2. Hitachi
 3. Toshiba
 4. Or equal

2.10 POWER AND GRAVITY VENTILATORS

- A. General: Except as otherwise indicated, provide standard prefabricated power and gravity ventilator units of type and size indicated, modified to comply with requirements, and for complete installation.
- B. Refer to Section 23 09 23 - Automatic Temperature Controls for control sequence.
- C. Roof Fans (EF)
1. Type: Centrifugal fan, direct or belt driven as scheduled. Provide aluminum, or galvanized steel, weatherproof housings as scheduled. Provide square base to suit roof curb. Provide permanent split-capacitor type motor for direct driven fans; capacitor-start, induction-run type motor for belt driven fans.
 2. Electrical: Provide factory-wired non-fusible type disconnect switch at motor in fan housing. Provide thermal overload protection in fan motor. Provide conduit chase within unit for electrical connection. Provide shaft grounding ring similar to AEGIS.
 3. Bird Screens: Provide removable bird screens, 1/2 in. mesh, 16-ga. aluminum or brass wire.
 4. Motor Operated Dampers: Provide louvered dampers with linkage below curb base (maximum of 6 in.).
 5. For garage exhaust fans units bear AMCA label for sound and airflow performance, and shall be UL listed for smoke exhaust application.
 6. Manufacturer: Subject to compliance with requirements, provide centrifugal roof ventilators of one of the following:
 - a. Carnes Co., Div. of Wehr Corp.
 - b. Cook Co., Loren.
 - c. Greenheck Fan Corp.
 - d. Penn Ventilator Co., Inc.
 - e. Power Line Fans; Div. of Torin Corp.
 - f. Swartwout Industries Inc.
 - g. Or Equal.

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D. Centrifugal In-Line Fans (EF)

1. General: Fans shall be of the centrifugal belt or direct driven in-line type. Units shall bear AMCA label.
2. Fan Housing: Shall be of the square design constructed of heavy gauge galvanized steel and shall include square duct mounting collars. Unit shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.
3. Fan Wheel: Shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.
4. Motors: Shall be heavy duty ball bearing type, carefully matched to the fan load and furnished at the specified voltage, phase, and enclosure. Motors and drives shall be mounted out of the airstream. Motors shall be readily accessible for maintenance.
5. Shafts and Drives: Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum (L50) life in excess of 200,000 hours at maximum cataloged operating speed. Drives shall be sized for a minimum of 150 percent of driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. Motor pulleys shall be adjustable for final system balancing. A NEMA 1 disconnect switch shall be provided, factory wired.
6. Manufacturer: Subject to compliance with requirements, provide centrifugal in-line fans of one of the following:
 - a. Greenheck Fan Corp.
 - b. Carnes CO., Div. of Wehr Corp.
 - c. Cook Co., Loren.
 - d. Penn Ventilator Co., Inc.
 - e. Power Line Fans; Div. of Torin Corp.
 - f. Or Equal.

2.11 EXTRUDED ALUMINUM RAIN RESISTANT WALL LOUVERS

A. Air Construction Requirements

1. Louvers shall be model EHH as manufactured by Greenheck, or an approved equal. Louver frame shall be channel style with 0.081 inch extruded aluminum wall thickness. Louver blades shall be horizontal stationary style located on approximate 2 inch centers with 0.081 inch extruded aluminum wall thickness. Bird screen shall be internally mounted 0.75 inch x 0.051 inch flattened expanded aluminum. Finish of all materials shall be mill only. The Louvers shall be AMCA certified louvers

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B. Performance Requirements

1. Louvers shall be AMCA Licensed when tested in accordance with AMCA 500-L Air Performance and Water Penetration test procedures. Free area for size 48 inch x 48 inch louver shall not be less than 6.72 square feet (42%). Airflow resistance at 1000 feet per minute free area intake velocity shall not be greater than 0.19 inch water gauge pressure drop. Airflow resistance at 1000 feet per minute free area exhaust velocity shall not be greater than 0.2 inch water gauge pressure drop. Beginning point of water penetration is above 1250 feet per minute free area intake velocity.
2. Louvers shall be designed and manufactured to withstand a minimum 25 pound per square foot wind load.

C. Provide the following Manufacturer's Options:

1. Clear Anodize (204-R1 Class II, or 215-R1 Class I)
2. Clip angles
3. 0.5 inch x 0.047 inch square stainless steel wire cloth bird screen

D. Manufacturer: Subject to compliance with requirements, provide louvers of one of the following:

1. Greenheck
2. Ruskin
3. Carnes
4. Or equal

2.12 DUCT MOUNTED HOT WATER COIL

A. Design Pressures and Temperatures

1. Coil shall be designed to withstand the following maximum operating pressures and temperatures:
 - a. Water Coils - 250 psig / 300° F

B. Fins

1. Coils shall be plate fin type construction providing uniform support for all coil tubes. Coils are to be manufactured with die-formed aluminum or copper fins with self spacing collars which completely cover the entire tube surface.
 - a. Thickness - 0.0060" +/- 5% unless specified otherwise Tube Holes:
 - b. 0.625 diameter spaced 1.5 inch equilaterally
 - c. 0.500 diameter spaced 1.25 inch equilaterally
 - d. 0.375 diameter spaced 1.0 inch equilaterally fins/inch 0.625 diameter coils 6 through 14 fins / inch
 - e. 0.500 diameter coils 6 through 16 fins / inch
 - f. 0.375 diameter coils 10 through 20 fins / inch All fins have a tolerance of +/- 4%

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C. Tubing

1. Tubing and Return Bends - Standard pressure - constructed from UNS12200 seamless copper conforming to ASTM B75, ASTM B251, and ASTM B743.
2. Copper Tube Temper - Light annealed with a maximum grain size of 0.040 mm and a maximum hardness of Rockwell 65 on the 15T scale.
3. Tube Expansion - Mechanically expanded to form an interference fit with the fin collars without decreasing tube wall thickness.
4. Minimum Thickness:
 - a. 0.016 inch for 0.500 and 0.375 inch tubing
 - b. 0.020 inch for 0.625 inch tubing unless specified otherwise

D. Casing (Endplates and Side Plates)

1. Shall be made from one of the following materials:
 - a. Copper 0.093 inch thick meeting ASTM B152
 - b. 16 or 14 Gauge, stainless steel meeting ASTM A240
 - c. 16 or 14 Gauge, G90 Galvanized steel meeting ASTM A653
2. Sheet metal breaks - Bent to $90^{\circ} \pm 2^{\circ}$ unless specified otherwise Formed tube collars are designed so that the expansion surface is 0.100" and the ends are re-flared to prevent raw metal edge from contacting copper tubes.

E. Testing Requirements

1. Coils shall be submerged in water and tested with dry nitrogen.
 - a. Water Coils are tested to 450 psig

F. Headers

1. Headers shall be constructed from UNS 12200 seamless copper conforming to ASTM B75, ASTM B88 and ASTM B251.
2. Water Coil Headers - Equipped with optional factory installed manual air vents and drains placed at the highest and lowest points.
3. End caps (1.625" and larger) - Die formed and installed on the inside diameter of the header such that the landed surface area is three times the header wall thickness.
4. End caps (Less than 1.625) - Flat copper sheet stock circle sheared, stamped or punched to header diameter and installed on the header ends.

G. Connections

1. Male Pipe Thread (MPT) and constructed from red brass conforming to ASTM B43 or schedule 40 steel.
2. Male Pipe thread (MPT) or Female pipe thread (FPT) and constructed from copper
3. Sweat Connection constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251

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H. Brazing

1. High temperature filler metals shall be used for all brazed joints. Filler metal will contain at least 5% silver.

I. Certification

1. Acceptable coils are to have AHRI Standard 410 certification and bear the AHRI symbol. Non-certified coils or coils outside AHRI's rating range will be considered if the manufacturer is a current member of the AHRI air-cooling and air-heating coils certification program and the coils have been rated in accordance with AHRI Standard 410.
2. Acceptable coils are to be Intertek Recognized Components, and are eligible to bear the ETL Listed Mark.

J. Manufacturer: Subject to compliance with requirements, provide heating coils of one of the following:

1. Greenheck
2. Multitherm
3. Rothmann
4. Or equal

2.13 VARIABLE AIR VOLUME BOX (VAV)

A. General: Provide factory-fabricated and tested air terminals as shown on drawings, selected with performance characteristics which match or exceed those indicated on schedule.

B. Casings: Construct of die-cast aluminum or sheet metal of the following minimum thicknesses:

- | | Steel | Aluminum |
|---|--------|-----------|
| 1. Upstream Pressure Side: | 22-ga. | 0.032 in. |
| 2. Downstream Pressure Side; | 22-ga. | 0.025 in. |
| 3. Provide hanger brackets for attachment of supports. | | |
| 4. Linings: Line inside surfaces of casings with lining material meeting ASTM Standard C1071 to provide acoustic performance, thermal insulation, and to prevent condensation on outside surfaces of casing. Provide minimum thickness of 1 in. Secure lining to prevent delamination, sagging or settling. Seal edges of lining to prevent fraying.
a. Cover liner surfaces and edges with perforated metal. | | |
| 5. Leakage: Construct casings such that when subjected to 0.5-in w.g. pressure for low pressure units, and 3.0-in w.g. pressure for high pressure units, total leakage does not exceed 4 percent of specified air flow capacity with outlets sealed and inlets wide open. Construct air dampers such that when subjected to 6.0-in w.g. inlet pressure with damper closed, total leakage does not exceed 10 percent of specified air flow capacity. | | |

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- C. Air Dampers: Construct of materials that cannot corrode, do not require lubrication, nor require periodic servicing. Provide maximum volume dampers, pressure independent that are calibrated in cfm, factory-adjusted, and marked for specified air capacities. Provide mechanism to vary air volume thru damper from minimum to maximum, in response to signal from thermostat.
- D. Controls: Provide controls accurate to 1.5 deg. F(0.8 deg. C) and adjustable from 65 deg. F (22 deg. C) to 85 deg. F (29 deg. C).
 - 1. ATC Contractor to provide and field install DDC controls, compatible with automatic temperature control system specified in other Division-23 sections. All testing and commissioning shall be completed in field.
- E. Identification: Provide label on each unit indicating Unit Number, cfm range, cfm factory-setting, and calibration curve (if required).
- F. Silencer:
 - 1. Silencer section shall consist of a three foot 22ga solid metal casing, 22ga perforated liners, and absorptive acoustic fiberglass liner.
 - 2. Acceptable methods of silencer construction shall be button lock, Pittsburgh lock, and welds. In situations where these methods are not feasible, rivets can be used. Screws or other mechanical fasteners on the silencer will not be acceptable.
 - 3. The silencer noses and perforated liners shall be rigidly fastened to the casing of the silencer on both the top and bottom.
 - 4. The silencer section acoustic media shall be shot free inorganic glass fiber with long, resilient fibers, bonded with thermosetting resin, and contain 50 percent recycled media. Glass fiber shall be packed with a minimum 10 percent compression to eliminate voids and settling; density shall consistent with that used to generate catalog test data. Combustion ratings for acoustical media shall be equal to or less than the combustion ratings noted below when tested in accordance with ASTM E84, UL713, and NFPA 255:
 - a. Flame Spread Classification: 25
 - b. Smoke Development Rating: 50
 - 5. Silencer shall be Price model SUDQ.
- G. Manufacturer: Subject to compliance with requirements, provide variable air volume boxes of one of the following:
 - 1. Trane
 - 2. Price
 - 3. Titus Products Div.
 - 4. Or equal

2.14 COMMERCIAL GAS-OIL BOILER

- A. General: Boiler shall be furnished complete with an insulated metal jacket; Cast iron smoke hood with integral 14 gauge aluminized steel damper; Pressure tight front and rear flame

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observation ports with covers; Steel angle floor rails; Cast iron burner mounting plate with insulation and additional controls and devices as hereafter specified. The existing Dual Fuel Burner, Powerflame model C3-GO-25, shall be re-installed on the new boiler assembly.

- B. Construction: Boiler shall be a cast iron sectional unit of the wet base type designed for pressure firing and it shall be constructed and tested for 15 PSI maximum steam working pressure (determined by application) in accordance with the A.S.M.E. Section IV Rules for the Construction of Heating Boilers. Individual sections will have been subjected to a hydrostatic pressure test of 200 PSIG at the factory before shipment and they shall be marked, stamped or cast with the A.S.M.E. Code symbol. Boiler sections shall be of one piece design incorporating the furnace space and flue gas collector space with perimeter joints between the sections arranged for permanent pressure sealing with high temperature ceramic fiber rope. Upper and lower ports for connecting the water space of adjacent sections shall be sealed by means of port seals. Sections shall be assembled with short draw rods, tightened to final torque after the section assembly is complete. Boiler sections and Trim shall be shipped separate for field assembly.
- C. Jacket: Insulating metal jacket shall consist of 20 gauge steel panels fitted with 1 ½ Lb./Cu. Ft. density fiber glass insulation glued to the inside of the panels. Jacket panels shall be finished with paint baked on and shall be arranged with slots and knockouts to accommodate the boiler piping and to allow jacket installation after the piping is in place. Left hand side panels shall be furnished with chrome plated knobs for easy removal and to provide easier access to the boiler cleanout covers. Cleanout covers shall be sized and located to allow full access to the extended pin type heating surface areas for cleaning with a wire brush. Cleanout covers shall have grooves to contain high temperature ceramic fiber rope seals for gas tight fit to the sections.
- D. Manufacturer's Warranty
1. Units that do not carry a standard published warranty of ten or more years are not acceptable to this project. Job specific warranties are not acceptable unless executed by an authorized officer of the manufacturer under seal and submitted five (5) working days prior to the bid date of this project.
- E. Boiler trim:
1. All electrical components to be of high quality and bear the U.L. label.
 - a. Water boiler(s) controls furnished:
 - 1) Combination low temperature limit (operating) and manual reset high temperature limit control.
 - 2) Low temperature limit set according to system design. High temperature limit set at least 20°F higher than the low limit (240°F is the maximum allowable water temperature).
 - 3) Combination pressure-temperature gauge with dial clearly marked and easy to read.
 - 4) ASME certified pressure relief valve, set to relieve at 30 PSIG. Optional relief valves available up to and including maximum allowable pressure. Side outlet discharge type; contractor to pipe outlet to floor drain or near floor, avoiding any area where freezing could occur.
 - b. Low water cut-off:
 - 1) Boiler(s) to be furnished with U.L. labeled low water cut-off with ASME working pressure rating equal to the ASME rating of the relief valve.

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- 2) Do not use quick-connect fittings on boiler(s).
- 3) Install cut-off according to manufacturer's instructions.
- 4) Locate so burner shuts down if boiler water level falls below allowable safe waterline

F. Manufacturer: Subject to compliance with requirement, provide forced draft boilers of one of the following:

1. Smith (The H.B.) Co., Inc.
2. Weil-McLain, A Marley Co.
3. Peerless

2.15 PUMPS

A. General: Provide factory-tested pumps, thoroughly cleaned, and painted with one coat of machinery enamel prior to shipment. Type, size, and capacity of each pump is listed in pump schedule. Provide pumps of same type by same manufacturer.

B. In-Line Circulator Pumps:

1. General: Provide in-line circulator pumps where indicated, and of capacities as scheduled.
2. Type: Horizontal mount, vertical split case, oil-lubricated, designed for 125 psi working pressure, and 225° F. (107° C) continuous water temperature.
3. Body: Cast-iron, with suction and discharge gauge tappings.
4. Shaft: Hardened alloy steel.
5. Bearings: Oil-lubricated bronze journal bearings.
6. Seal: Mechanical, with carbon seal ring and ceramic seat.
7. Motor: Non-overloading at any point on pump curve, open, drip-proof, oil-lubricated journal bearings, resilient mounted construction, built-in thermal overload protection on single phase motors.
8. Couplings: Self-aligning, flexible coupling.
9. Impeller: Enclosed type hydraulically and dynamically balanced, and keyed to shaft.
10. Install pumps on channel steel support stands with vibration isolators. Refer to pump piping drawing details for valve and accessory requirements.
11. Manufacturer: Subject to compliance with requirements, provide in-line circulator pumps of one of the following:
 - a. Bell & Gosset ITT; Fluid Handling Div.
 - b. Armstrong Pumps, Inc.
 - c. Taco, Inc.
 - d. Or equal

C. Frame-Mounted End Suction Pumps:

1. General: Provide frame-mounted end suction pumps where indicated, and of capacities and having characteristics as scheduled.

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2. Type: Horizontal mount, single stage, vertical split case, flexible coupling, base mounted, designed for 175 psi working pressure.
3. Casing: Cast iron, 125 psi ANSI flanges, tappings for gage and drain connections.
4. Shaft: Steel with replaceable shaft sleeve. Provide shaft grounding rings similar to Aegis or equal.
5. Bearing: Regreasable ball bearings.
6. Seal: Mechanical, with carbon seal ring and ceramic seat.
7. Motor: Open, dripproof, regreasable ball bearings under motor, motor shall be premium efficiency inverted duty type. Provide AEGIS magnetic bearing protection ring for inverter rated motors that are controlled by variable speed drives. The bearing protection ring shall channel harmful shaft voltages to ground to protect bearing races from pitting.
8. Impeller: Enclosed type, hydraulically and dynamically balanced keyed to shaft and secured with locking screw.
9. Baseplate: Structural steel with welded cross members, and open grouting area.
10. Coupling: Flexible, capable of absorbing torsional vibration, equipped with coupling guard.
11. Manufacturer: Subject to compliance with requirements, provide frame-mounted end suction pumps of one of the following:
 - a. Bell & Gosset ITT; Fluid Handling Div.
 - b. Armstrong Pumps, Inc.
 - c. TACO
 - d. Or Equal.

2.16 PACKAGED ROOFTOP UNITS

A. SECTION INCLUDES

1. Packaged rooftop unit.
2. Heat exchanger.
3. Refrigeration components.
4. Unit operating controls.
5. Roof curb.
6. Electrical power connections.
7. Operation and maintenance service.

B. PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

1. Section 15952 - Controls and Instrumentation: Installation and wiring of thermostats and other control components.
2. Section 16180 - Equipment Wiring Systems: Electrical connection of equipment.

C. RELATED SECTIONS

1. Section - General Provisions
2. Section - Mechanical Identification
3. Section - Testing and Balancing

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4. Section - Vibration Isolation
5. Section - Ductwork Insulation.
6. Section - Controls and Instrumentation.
7. Section - Equipment Wiring Systems.

D. REFERENCES

1. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
2. AHRI 340 / 360 - Unitary Air-Conditioning Equipment.
3. ANSI/ASHRAE/IESNA 90.1 - Energy Standard for New Buildings Except Low-Rise Residential Buildings.
4. California Administrative Code - Title 24

E. SUBMITTALS

1. Submit drawings indicating components, dimensions, weights and loadings, required clearances, and location and size of field connections.
2. Submit product data indicating rated capacities, weights, accessories, service clearances and electrical requirements.
3. Submit manufacturer's installation instructions.

F. OPERATION AND MAINTENANCE DATA

1. Submit operation and maintenance data.
2. Include manufacturer's descriptive literature, start-up and operating instructions, installation instructions, and maintenance procedures.

G. HANDLING

1. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.
2. Protect units from physical damage. Leave factory shipping covers in place until installation.

H. WARRANTY

1. Provide a full parts, labor and refrigerant warranty for one year from start-up or 18 months from shipment, whichever occurs first
2. 5 Year Compressor Parts Warranty Option

I. REGULATORY REQUIREMENTS

1. When cULus is selected, unit shall conform to cULus for construction of packaged air conditioner and shall have cULus label affixed to rooftop package.
 - a. In the event the unit is not cULus approved, the manufacturer shall, at his expense, provide for a field inspection by a cULus representative to verify conformance to cULus standards. If necessary, contractor shall perform required modifications to the unit to comply with cULus, as directed by the cULus representative, at no additional expense to the Owner.
2. Gas-fired heating rooftop units shall conform to ANSI Z21.47/Canadian Standards Association (CAN/CSA-2.3) for construction of packaged air conditioner.

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- a. In the event the unit is not CSA approved, the manufacturer must, at his expense, provide for a field inspection by a CSA representative to verify conformance to CSA standards. If necessary, contractor shall perform modifications to the unit to comply with CSA, as directed by the CSA representative, at no additional expense to the Owner.
3. Gas-fired heating rooftop units shall conform to UL 795/Canadian Standards Association (CAN/CSA-3.2) for construction of packaged air conditioner.
 - a. In the event the unit is not CSA approved, the manufacturer must, at his expense, provide for a field inspection by a CSA representative to verify conformance to CSA standards. If necessary, contractor shall perform modifications to the unit to comply with CSA, as directed by the CSA representative, at no additional expense to the Owner.

J. SUMMARY

1. The contractor shall furnish and install packaged rooftop air conditioning unit(s) as shown and as scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the conditions specified, scheduled or as shown on the contract drawings.

K. MANUFACTURERS

1. GENERAL

- a. Manufacturer of packaged unitary rooftop products shall have had a minimum of five years successful experience in the manufacture and service support of the rooftop packages specified herein. Manufacturers with less than five years' experience in the production of rooftop units of the sizes and types specified shall not be acceptable.

2. APPROVED MANUFACTURERS

- a. Base bid shall be Trane packaged rooftop air conditioning units with approved alternate being Daikin or JCI. Alternates must still comply with the performance and features as specified herein and as indicated on the design documents. Job will be awarded on basis of specified product. Substitutions must be selected and approved within 14 calendar days after award of contract.
3. Units shall be specifically designed for outdoor rooftop installation on a roof curb and be completely factory assembled and tested, piped, internally wired, fully charged with R-454B compressor oil, factory run tested and shipped in one piece. Units shall be available for direct expansion cooling only, or direct expansion cooling with natural gas, electric, hot water or steam heating. Filters, outside air system, exhaust air system, optional non-fused disconnect switches and all operating and safety controls shall be furnished factory installed.
4. All units shall be UL listed to US and Canadian Safety Standards. Cooling capacity shall be rated in accordance with AHRI Standard 360. All units shall have decals and tags to aid in service and indicate caution areas. Electrical diagrams shall be printed on long life water resistant material and shall ship attached to control panel doors.

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L. Casing

1. Exterior panels shall be zinc-coated, galvanized steel painted with a slate gray air-dry finish durable enough to withstand a minimum of 672 hours consecutive salt spray application in accordance with standard ASTM B117. Screws shall be zinc-plus-zinc chromate coated.
2. Heavy gauge steel hinged access panels with tiebacks to secure door in open position shall provide access to filters and heating sections. Refrigeration components, supply air fan and compressor shall be accessible through removable panels as standard. Unit control panel, filter section, and gas heating section shall be accessible through hinged access panels as standard. Optional double wall construction hinged access doors shall provide access to filters, return/ exhaust air, heating and supply fan section. All access doors and panels shall have neoprene gaskets. Interior surfaces or exterior casing members shall have 1/2 inch fiberglass insulation.
3. Unit base shall be watertight with heavy gauge formed load-bearing members, formed recess and curb overhang. Unit lifting lugs shall accept chains or cables for rigging. Lifting lugs shall also serve as unit tie down points.

M. Refrigeration System

1. The scroll compressor shall be industrial grade, direct drive 3600 RPM maximum speed scroll type. The motor shall be suction gas-cooled hermetic design. Compressor shall have centrifugal oil pump with dirt separator, oil sight glass, and oil charging valve. Compressor shall also be provided with thermostatic motor winding temperature control to protect against excessive motor temperatures resulting from over-/under-voltage or loss of charge, high and low pressure cutouts, and reset relay.

N. Power Supplies

O. Ambient Control

1. Variable speed condenser motors shall be provided to allow the unit to operate down to 0°F.

P. Corrosion Protected Condenser Coil

1. Protection on the all aluminum, microchannel condenser coil shall consist of a corrosion resistant coating that shall withstand ASTM B117 Salt Spray test for 6,000 hours and ASTM G85 A2 Cyclic Acidified Salt Fog test for 2,400 hours. This coating shall be added after coil construction covering all tubes, headers and fin edges, therefore providing optimum protection in more corrosive environments.

Q. Hot Gas Bypass

1. Electronic Hot Gas Bypass valve piping and controls shall all be included on circuit 1 to allow operation at low airflow, avoiding coil frosting and damage to compressor. When suction pressure falls below valve adjustable setpoint, the valve shall modulate hot gas to the inlet of the evaporator. Valves sized to meet ASHRAE 90.1.

R. Evaporator Coil Drain Pan

1. Drain pan shall be double sloping galvanized steel and promote runoff of standing water from condensation inside the unit.

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2. Two drain pipes shall be installed through the base channel on each side of the unit. Drain pipe connection shall be installed through the side of the unit and connector size is 1.25 NPTI.

S. Air-Cooled Condenser Coil

1. Condenser coils shall have all aluminum microchannel coils. All coils shall be leak tested at the factory to ensure pressure integrity. The condenser coil shall be pressure tested to 650 psig. Subcooling circuit(s) shall be provided as standard.

T. Air-Cooled Condenser Fans and Motors

1. All condenser fans shall be vertical discharge, direct drive fans, statically balanced, with aluminum blades and zinc plated steel hubs. Condenser fan motors shall be three-phase motors with permanently lubricated ball bearings, built-in current and thermal overload protection and weather-tight slingers over motor bearings. Modulating condenser fans shall be provided on all variable speed units.

U. Supply Fan

1. Supply fan motors shall be open drip-proof. All supply fans shall be dynamically balanced in factory. Supply fan shall be test run in unit and shall reach rated rpm. All 60 Hz supply fan motors shall meet the Energy Independence Security Act of 2007 (EISA).
2. Supply fans shall have two double-inlet, forward-curved fans mounted on a common shaft with fixed sheave drive. Fans shall be factory-tested to reach rated rpm before the fan shaft passes through first critical speed. Fan shaft shall be mounted on two grease lubricated ball bearings designed for 200,000 hours average life. Optional extended grease lines shall allow greasing of bearings from unit filter section. Fan motor and fan assembly shall be mounted on common base to allow consistent belt tension with no relative motion between fan and motor shafts. Entire assembly shall be completely isolated from unit and fan board by double deflection rubber-in-shear isolators, or by optional 2" deflection spring isolation.
3. Optional extended grease lines shall allow greasing of bearings from unit filter section. Fan motor and fan assembly shall be mounted on common base to allow consistent belt tension with no relative motion between fan and motor shafts. Entire assemblies shall be completely isolated from unit and fan board by two-inch deflection spring isolators.

V. Variable Air Volume Discharge Temperature Control with Variable Frequency Drives

1. Option shall provide all necessary controls to operate a VAV rooftop from the discharge air temperature, including discharge air microprocessor controller and discharge air sensor.
2. The microprocessor controller shall coordinate the economizer control and the stages of cooling with discharge air temperature reset capabilities. Option shall include factory installed and tested VFDs to provide supply fan motor speed modulation.
3. VFD shall receive 0-10 VDC from the unit microprocessor based upon supply static pressure and causes the drive to accelerate or decelerate as required to maintain the supply static pressure setpoint. Optional bypass control shall provide full nominal airflow in the event of drive failure.

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W. Electrical

1. Unit shall be completely factory wired with necessary control and contactor pressure lugs or terminal block for power wiring. Units shall provide an option for a non-fused disconnect with external handle for safety.
2. A standard SCCR of 5,000 amps shall be applied to the unit enclosure.
3. Motors shall have internal bearing protection for use with VFDs to provide a conductive discharge path away from the motor bearings to ground. Bearing Protection Rings shall be circumferential rings with conductive micro fibers which provide the path of least resistance and dramatically extend motor life.
4. Phase monitor shall protect 3-phase equipment from phase loss, phase reversal and phase imbalance. Any fault condition shall produce a Failure Indicator LED and send the unit into an auto stop condition. cULus approved.
5. An external handle mounted on the control box door shall be provided to disconnect unit power with the control box door closed for safety.

X. Electronic Unit Controller

1. The electronic unit controller shall be an application-specific, programmable controller that is factory installed and designed to control packaged HVAC equipment. A 7" user interface features a touch-sensitive color screen that provides facility managers with at-a-glance operating status, performance monitoring, scheduling changes and operating adjustments. Other advanced features include automated controller backup and optional features such as secure remote connectivity, wireless building communications, mobile device connectivity and custom programming with expandable I/O.
2. The electronic unit controller shall support standard BACnet communication protocol through a RS485, two-wire communication link or BACnet/IP.

Y. Filters

1. Filter options shall mount integral within unit and be accessible by hinged access panels.
2. Shall provide a complete set of two-inch thick filter racks, without the filter media to accommodate applications which require field supplied filters.
3. High Efficiency Throwaway Option, MERV 8 pre-filter, shall be two-inch high efficiency media filters with average dust spot efficiency of 25-35 percent and an average arrestance in excess of 90 percent when tested in accordance with ASHRAE 52-76.

Z. Relief Air

1. Relief air options shall include no relief, barometric relief, 100 percent modulating exhaust fan with direct space building pressurization control. Exhaust motors shall be open drip-proof fan cooled. All 60 Hz motors meet the Energy Independence and Security Act of 2007 (EISA). All 50 Hz exhaust motors meet the U.S. Energy Policy Act of 1992 (EPACT).
2. Gravity dampers shall open to relieve positive pressure in the return air section of the rooftop. Barometric relief dampers shall relieve building over pressurization, when that over pressurization is great enough to overcome the return duct pressure drops.

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3. Two, double-inlet, forward-curved fans shall be mounted on a common shaft with fixed sheave drive. All fans shall be dynamically balanced and tested in factory before being installed in unit. Exhaust fan shall be test run as part of unit final run test. Unit shall reach rated rpm before fan shaft passes through first critical speed. Fan shaft shall be mounted on two grease lubricated ball bearings designed for 200,000-hour average life.
4. Extended grease lines shall be provided to allow greasing of bearings from unit filter section. Fan motor and assembly shall be mounted on common base to allow consistent belt tension with no relative motion between fan and motor shafts. Entire assembly shall be completely isolated from unit and fan board by spring isolation on motor sizes larger than 5 hp.
5. A differential pressure control system, (Statitrac™), shall use a differential pressure transducer to compare indoor building pressure to outdoor ambient atmospheric pressure. The FC exhaust fan shall be turned on when required to lower building static pressure setpoint.
6. Relief dampers at unit outlet shall modulate relief airflow in response to OA damper position.

AA. Outside Air

1. Outside air options: 0-100 percent fully modulating economizer.
2. Economizer option shall be operated through the primary temperature controls to automatically utilize outside air for “free” cooling. Automatically modulated return and outside air dampers shall maintain proper temperature in the conditioned space. Economizer shall be equipped with an automatic lockout when the outdoor high ambient temperature is too high for proper cooling.
3. Minimum position control shall be standard and adjustable at the user interface or through the building management system. A spring return motor shall ensure closure of OA dampers during unit shutdown or power interruption. Mechanical cooling shall be available to aid the economizer mode at any ambient. Standard economizer dampers leakage rate shall be 2.5 percent of nominal airflow (400 cfm/ton) at 1 inch wg. static pressure.
4. Low leak dampers shall be provided with gasketing added to the damper blades and rolled stainless steel jamb seals to the sides of the damper assembly. Low leak economizer dampers shall have a leakage rate of 1 percent based on testing data completed in accordance with AMCA Standard 500 at AMCA Laboratories.
5. Economizer return and outside air dampers shall be provided with horizontal airfoil blades and spring-return actuators. The economizer shall have a functional life of 60,000 opening and closing cycles. Dampers shall be AMCA 511 Class 1A certified with a maximum leakage rate of 3 CFM/sq-ft at 1.0 in WC pressure differential thus exceeding requirements of ASHRAE 90.1-2013, California Title 24-2013, and IECC-2012.
6. Two enthalpy sensors shall be provided to compare total heat content of the indoor air and outdoor air to determine the most efficient air source when economizing.
7. An outdoor enthalpy sensor shall be provided to compare the total heat content of outdoor air to a locally adjustable setpoint. The setpoint shall be programmed at the user interface to determine if the outdoor enthalpy condition is suitable for economizer operation.

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8. An outdoor temperature sensor shall be included for comparing the outdoor dry bulb temperature to a locally adjustable temperature setpoint. The setpoint shall be programmed at the user interface to determine if outdoor air temperature is suitable for economizer operation.
9. An outdoor and return air temperature sensor is used to compare the dry bulb temperature of the outside air to the return air temperature to determine if it is suitable to economize.

BB. Hot Water Heating Option

1. Hot water coils shall be Type 5W and factory mounted in the rooftop unit to provide complete drainage of coil. Hot water modulating valve with actuator shall be provided.

CC. Isolators

1. Supply and relief/return fan (if applicable) assemblies shall be isolated with two-inch nominal deflection to reduce transmission of vibrations.

DD. Service

1. Hinged access doors shall provide easy access to supply fan, filters, exhaust/return fan, and the heating section. Double wall construction with dual density insulation sandwiched between heavy gauge galvanized steel panels for strength and durability can be selected.
2. A 15A, 115V Ground Fault Interrupter convenience outlet shall be factory installed. It shall be wired and powered from a factory mounted transformer. Unit-mounted, non-fused disconnect with external handle shall be furnished with factory powered outlet.
3. Lines shall allow greasing of supply and relief fan bearings through the filter access door.

EE. Roof curb.

1. Unit shall fit on existing roof curb without a curb adapter

2.17 AIR-TO-AIR ENERGY RECOVERY VENTILATOR

A. SUMMARY

1. This section includes Air-to-Air Energy Recovery Ventilators for indoor installation.
2. Within this document, these units may be referred to as Energy Recovery Ventilator (ERV) for brevity.

B. RELATED

1. Drawing and general provisions of the contract, including General Requirements Division 01, Division 23, Division 23 Specifications Sections, and common work requirements for HVAC apply to work specified in this section.
 - a. Section 23 09 00: Controls and Instrumentation

C. SUBMITTALS

1. Product data: For each type or model of Energy Recovery Ventilator, include the following:
 - a. Unit performance data for both Supply Air and Exhaust Air, with system operating conditions indicated.
 - b. Enthalpy plate performance data for both summer and winter operation.
 - c. Motor ratings and unit electrical characteristics.

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- d. Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
- e. Estimated gross weight of each installed unit.
- f. Filter types, quantities, and sizes
- g. Installation, Operating and Maintenance manual (IOM) for each model.
2. LEED Submittals:
 - a. Provide data for prerequisite E01: Documentation indicating that units comply with ASHRAE 62.1-2010, Section 5 - "Systems and Equipment".
3. Shop Drawings: For air-to-air energy recovery ventilators, include plans, elevations, sections, details, and attachments to other work.
 - a. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - b. Wiring Diagrams: For power, signal, and control wiring.
4. Operation and maintenance data for air-to-air energy recovery ventilator

D. QUALITY ASSURANCE

1. Source Limitations: Obtain Air-to-Air Energy Recovery Ventilator with all appurtenant components or accessories from a single manufacturer.
2. For the actual fabrication, installation, and testing of work under this section, use only thoroughly trained and experienced workers completely familiar with the items required and with the manufacturer's current recommended methods of installation.
3. The ERV core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of ten (10) years from the date of purchase. The balance-of-unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of two (2) years from the date of installation.
4. Manufacturer shall be able to provide evidence of independent testing of the core by Underwriters Laboratory (UL), verifying a maximum flame spread index (FSI) of 25 and a maximum smoke developed index (SDI) of 50 thereby meeting NFPA90A and NFPA 90B requirements for materials in a compartment handling air intended for circulation through a duct system. The method of test shall be UL Standard 723.
5. Certifications:
 - a. The energy recovery cores used in these products shall be third party Certified by AHRI under its Standard 1060 for Energy Recovery Ventilators. AHRI published certifications shall confirm manufacturer's published performance for airflow, static pressure, temperature and total effectiveness, purge air (OACF) and exhaust air leakage (EATR). Products that are not currently AHRI certified will not be accepted. OACF shall be no more than 1.02 and EATR shall be zero when application design criteria reduce static pressure differential to zero or less.
 - b. Entire unit shall be listed under UL 1812 Standard for Ducted Air to Air Heat Exchangers and comply with CSA Standard 22.2.
6. Every unit to be factory tested prior to shipping: Motor Dielectric Voltage-Withstand Bench Test, Unit Dielectric Voltage-Withstand Test, Continuity of Internal Control Circuits Test, Unit Amperage Test

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E. COORDINATION

1. Coordinate size and location of all building penetrations required for installation of each Energy Recovery Ventilator and associated electrical systems.
2. Coordinate sequencing of construction for associated plumbing, HVAC, electrical supply.

F. MANUFACTURERS

1. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to:
 - a. RenewAire
2. Manufacturer should be in business for minimum 10 years manufacturing energy recovery ventilators.

G. MANUFACTURED UNITS

1. Air-to-Air Energy Recovery Ventilators shall be fully assembled at the factory and consist of a fixed-plate cross-flow heat exchanger with no moving parts, an insulated single wall G90 galvanized 20-gauge steel cabinet, motorized supply air damper, filter assemblies for both intake and exhaust air, enthalpy core, supply air blower assembly, motorized exhaust air damper, exhaust air blower assembly and electrical control box with all specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection. Entire unit with the exception of field-installed components shall be assembled and test operated at the factory.

H. CABINET

1. Materials: Formed single wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.
2. Outside casing: 20 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish.
3. Access doors shall be hinged with airtight closed cell foam gaskets. Door pressure taps, with captive plugs, shall be provided for cross-core pressure measurement allowing for accurate airflow measurement.
4. Cabinet Insulation: Case walls and doors shall be fully insulated with 1 inch, expanded polystyrene foam insulation faced with a cleanable foil face on all exposed surfaces.
5. Enthalpy core: Energy recovery core shall be of the total enthalpy type, capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air. No condensate drains shall be allowed. The energy recovery core shall be designed and constructed to permit cleaning and removal for servicing. The energy recovery core shall have a ten year warranty. Performance criteria are to be as specified in AHRI Standard 1060.
6. Control center / connections: Energy Recovery Ventilator shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections to the non-fused disconnect.

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7. Passive Frost Control: The ERV core shall perform without condensing or frosting under normal operating conditions (defined as outside temperatures above -10°F and inside relative humidity below 40%). Occasional more extreme conditions shall not affect the usual function, performance or durability of the core. No condensate drains will be allowed.
 8. Motorized Isolation Damper(s): Exhaust Air motorized and Supply Air motorized damper(s) of an AMCA Class I low leakage type shall be factory installed.
- I. BLOWER SECTION
1. Blower section construction, Supply Air and Exhaust Air: Blower assemblies consist of 208-230V 1 Phase 60 HZ, ECM motor, and a direct driven backward-curved blower.
 2. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
- J. MOTORS
1. Blower motors shall be Premium Efficiency, EISA compliant for energy efficiency. The blower motors shall be totally enclosed (TEFC) and shall be supplied with factory installed motor starters.
- K. UNIT CONTROLS
1. Fan control: Terminal strip for EC motors.
 2. Sensors: Dirty filter monitor for both airstreams.
 3. Factory-installed microprocessor controller and sensors, Premium ERV controls that:
 - a. Comply with requirements in Division 23 Section "Sequence of Operations for HVAC Controls"
 - b. Has factory-installed hardware and software to enable the building automation interface via BACnet to monitor, control, and display status and alarms
 - c. The microprocessor controller shall be capable of operating at temperatures between -20F to 160F
 - d. The microprocessor controller shall be a DIN rail mounting type
 - e. Factory-installed microprocessor controller shall come with backlit display that allows menu-driven display for navigation and control of unit
 - f. The microprocessor controller shall have the ability to communicate with the BMS via Modbus RTU/TCP and BACnet MSTP/IP
 - g. The microprocessor controller shall have integrated ethernet interface and a web server for displaying unit parameters
 - h. The microprocessor shall have near field communication (NFC) capability for android devices
 - i. The microprocessor controller shall have an internal programmable time clock that will allow the user to add up to different occupancy schedules and add holidays
 - j. The microprocessor control shall be capable of integral diagnostics
 - k. The microprocessor control shall be capable of IP or SI unit display
 - l. The microprocessor controller shall have a battery powered clock
 - m. The microprocessor controller shall at a minimum offer the ability for three modes of determining occupancy: a dry contact, the internal time clock or the BMS

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- n. A remote user terminal to allow for remote monitoring and adjustment of parameters, allowing ease of control access without going outdoors or into the mechanical room if desired by the user
- o. The microprocessor controller shall have at a minimum (10) universal inputs/outputs (AI, DI, AO) and have (6) six relay outputs (DO)
- p. The microprocessor controller shall have an integrated fieldbus port
- q. The microprocessor controller shall have the capability for I/O expansion
- r. The microprocessor controller shall have a micro USB port to load the application program, the unit parameters, saving logs, etc.
- s. The sensors that will be required for control are:
 - 1) (2) Temperature sensor for fresh air and exhaust air
 - 2) (2) Temperature and humidity sensor for outside air, return air
 - 3) (2) Differential pressure sensors for filter alarms
 - 4) [(2) Differential pressure sensors for measuring pressure drop across energy recovery core and for determining airflow in both airstreams]
 - 5) (2) Adjustable current switches
 - 6) [Field-installed duct or room IAQ sensor]
 - 7) [Field-installed duct or room CO2 sensor]
 - 8) [Field-installed duct static sensor]
 - 9) [Field-installed room pressurization sensor]
- t. The microprocessor controller shall have the capability to monitor the unit conditions for alarm conditions. Upon detecting an alarm, the microprocessor controller shall have the capability to record the alarm description, time, date, available temperatures, and unit status for user review. A digital output shall be reserved for remote alarm indication. Alarms to be also communicated via BMS as applicable. Provide the following alarm functions:
 - 1) Outside air temperature sensor alarm
 - 2) Outside air humidity sensor alarm
 - 3) Return air temperature sensor alarm
 - 4) Return air humidity sensor alarm
 - 5) Fresh air sensor alarm
 - 6) Exhaust air sensor alarm
 - 7) Dirty filter alarm
 - 8) Supply and exhaust air proving alarm
- u. Display the following on the face of microprocessor controller:
 - 1) Unit on
 - 2) [Heating status]
 - 3) Outdoor air temperature
 - 4) Outdoor air humidity
 - 5) Return air temperature

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- 6) Return air humidity
 - 7) Supply air temperature
 - 8) Unit on/off
 - 9) Fan on/off
 - 10) Damper status
 - 11) Alarm digital display
- v. The microprocessor controller shall have factory pre-programmed multiple operating sequences for control of the ERV. Factory default settings shall be fully adjustable in the field. Available factory pre-programmed sequences on operations are:
4. SEQUENCE OF OPERATIONS
- a. DDC CONTROLLER:
 - 1) Controller with integral LCD readout for changing set points and monitoring unit operation.
 - 2) Provided with required sensors and programming.
 - 3) Factory programmed, mounted, and tested.
 - 4) Integral USB and Ethernet ports for updating programs and retrieving log files.
 - b. BMS INTERFACE:
 - 1) [BACnet MS/TP]
 - 2) [GENERAL OPERATION]
 - c. POWER UP:
 - 1) When the unit main disconnect is closed a delay of 10 seconds (adjustable) occurs for the controller to come online.
 - d. ERV UNIT START COMMAND:
 - 1) An input signal is required to enable the unit operation. The unit will be commanded on by:
 - a) [Digital input]
 - b) [BMS command]
 - 2) All types of input that are enabled must be true before the unit will start.
 - a) The exhaust fan starts after a 3 second delay (adjustable). The exhaust fan will not start until the damper actuator end switch closes.
 - b) The supply fan starts after a 6 second delay (adjustable). The supply fan will not start until the damper actuator end switch closes.
 - c) The supply fan, exhaust fan, [economizer], [heating] are controlled based on the chosen unit operating modes and air conditions.
 - e. ERV UNIT STOP COMMAND (OR DE-ENERGIZED):
 - 1) The unit can then be commanded off by:
 - a) [Digital input]
 - b) [BMS command]
 - 2) Supply fan and exhaust fan are de-energized.

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- 3) All dampers are unpowered and spring return to their default position after a 10 second delay (adjustable).
- f. SUPPLY FAN OPERATION:
- 1) [The supply fan will operate at a constant speed.]
 - 2) The unit will attempt to start the supply fan when the supply fan delay timer expires. When the supply fan starts the supply fan adjustable current switch should close and remain closed until the fan is turned off.
- g. SUPPLY FAN STATUS:
- 1) Once the supply fan current switch closes [heating] operation is allowed. After a delay of 90 seconds (adjustable) from supply fan start signal, if the supply fan current switch is still open the supply fan alarm should be set to true and [heating] operation shall be prohibited. The supply fan status shall be set to true only when the supply fan output is on and supply fan current switch is closed. The supply fan status shall be false in all other circumstances.
- h. FIXED FAN SPEED OPTION:
- 1) The analog voltage command to the supply fan ECM can be set from the unit controller display [or by the BMS]. The adjustable range of 0% to 100% correspond to the minimum and maximum fan operating speed. This supply fan operation mode can be used to field balance the supply air flow rate.
- i. EXHAUST FAN OPERATION:
- 1) [The exhaust fan will operate at a constant speed.]
 - 2) The unit will attempt to start the exhaust fan when the exhaust fan delay timer expires. When the exhaust fan starts the exhaust fan adjustable current switch should close and remain closed until the fan is turned off.
- j. EXHAUST FAN STATUS:
- 1) After a delay of 90 seconds (adjustable) from exhaust fan start signal, if exhaust fan current switch is still open the exhaust fan alarm should be set to true. The exhaust fan status shall be set to true only when the exhaust fan output is on and exhaust fan current switch is closed. The exhaust fan status shall be false in all other circumstances.
- k. FIXED FAN SPEED OPTION:
- 1) The analog voltage command to the exhaust fan ECM can be set from the unit controller display [or provided by the BMS]. The adjustable range of 0% to 100% correspond to the minimum and maximum fan operating speed (0 VDC minimum to 10 VDC maximum, adjustable). This exhaust fan operation mode can be used to field balance the exhaust air flow rate.
- l. HEATING OPERATION:
- 1) Heating will be locked out if the outdoor air temperature is above 70 degrees (adjustable). The temperature set point can be configured as constant (adjustable) or can be reset by the outside air temperature. Heating will be controlled using the supply air temperature or return air temperature.

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m. **CONSTANT TEMPERATURE OPTION:**

- 1) The controller will stage the heaters or adjust the 0 to 10 VDC analog output to the heating device to maintain the air temperature at a set point. The air temperature set point is entered and adjusted from the unit controller display [or provided by the BMS]. The minimum and maximum values for the air temperature set point are unit dependent and are adjustable. An adjustable PI (proportional & integral) loop will compare the measured air temperature to the air temperature set point and adjust the analog output. A digital output that indicates a call for heating will also be provided. The analog and digital output can be used to control a hot water valve, electric heater, gas heater, or heat pump.

n. **RESET AIR TEMPERATURE OPTION:**

- 1) The controller will adjust the 0 to 10 VDC analog output to the heating device to maintain the air temperature at a set point. The air temperature set point is calculated based on the outdoor air temperature. The air set point is adjusted between the 100 degree F maximum (adjustable) and the 70 degree F minimum (adjustable) as the measured temperature varies from the 20 degree F minimum (adjustable) to the 70 degree F maximum (adjustable). These values are entered and adjusted from the unit controller display [or provided by the BMS]. An adjustable PI (proportional & integral) loop will compare the measured supply air temperature to the supply air temperature set point and adjust the 0 to 10 VDC analog output. A digital output that indicates a call for heating will also be provided. The analog and digital output can be used to control a hot water valve, electric heater, gas heater, or heat pump. Coil freeze protection must be provided by others in the field.

L. **FILTER SECTION**

1. ERV shall have 2" thick [MERV 8] disposable pleated filters located in the outdoor air and exhaust airstreams. All filters shall be accessible from the exterior of the unit.

2.18 METAL DUCTWORK

- A. Reference Standards: Material, construction and installation shall meet requirements of most recent editions of the following standards and references, except for more stringent requirements specified or shown on Drawings:

Standard	As Applicable To:
SMACNA HVAC Duct Construction Standards Metal and Flexible	Sheet Metal Ductwork; Duct Liners; Adhesives; Fasteners; Flexible Ductwork.
SMACNA HVAC Air Duct Leakage Test Manual	Duct Leakage Testing
SMACNA Fibrous Glass Duct Construction Standards	Fibrous Glass Ductwork; Tapes
SMACNA Thermaoplastic Duct (PVC) Construction Manual	PVC Ductwork
ADC and TIMA Flexible Duct	Flexible Ductwork

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Performance Standards

NFPA 96	Kitchen Hood Exhaust Ductwork
NFPA 45	Laboratories using chemicals
SMACNA Guidelines for Welding	Welded Galvanized, Black Iron
Sheet Metal	and Stainless Steel Ductwork

B. General

1. Provide supporting and hanging devices necessary to attach entire HVAC system including ductwork and equipment, and to prevent vibration.
2. Provide vertical and horizontal supports as required by codes to meet minimum applicable earthquake resistance standards.
3. Ductwork shall be free from vibration under all conditions of operation. Dimensions shown on Drawings for lined ductwork are net inside dimensions. Increase ductwork to accommodate lining requirements.
4. Pipe or conduit crossing duct:
 - a. No pipe, conduit, hanger, Architectural element nor structural member shall pass through duct without Designer's written approval.
 - b. Where it is impossible to reroute pipe or conduit and when written approval has been obtained, increase duct size to maintain constant cross sectional area at point of interference. Provide streamlined enclosure for pipe or conduit, as illustrated in SMACNA.
5. When making offsets and transformations necessary to accommodate structural conditions, preserve full cross sectional area of ductwork shown on Drawings.
6. Ductwork shall have pressure velocity classifications as follow:

DUCT CONSTRUCT- ION CLASS	STATIC PRESSURE RATING	PRESSURE	SMACNA SEAL CLASS	SMACNA LEAKAGE CLASS	VELOCITY
4"	4"	Pos.*	A	3	4000 fpm or less
3"	3"	Pos. or Neg.	A	3	4000 fpm or less
2"	2"	Pos. or Neg.	A	6	2500 fpm or less
1"	1"	Pos. or Neg.	A	6	2500 fpm or less
½"	½"	Pos. or Neg.	A	6	2000 fpm or less

*for negative pressures over 3" w.g., refer to SMACNA Round and Rectangular Industrial Duct Construction Standards for joint and intermediate reinforcement requirements.

- a. Unless otherwise specified or shown on the drawings, the following pressure classifications shall be used for the types of ductwork listed below:

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- 1) 4" Class: All supply ductwork from discharge of air units to inlets of supply diffusers and/or variable air volume units.
 - 2) 3" Class: All exhaust and system return ductwork. Supply ductwork after the variable air volume units.
 - 3) 2" Class: All other ductwork.
7. Sealing Requirements for Class A, Leakage Class 3 & 6 Galvanized, Non-Welded Aluminum or Non-Welded Stainless Steel Ductwork:
- a. Transverse Joints
 - 1) During assembly seal all flanged transverse joints with sealing tape of quality equal to Hardcast Inc. 1902-FR. Corners shall be sealed as described by SMACNA and when applicable per manufacturer's published procedures. After sealant has cured, seal entire joint with Hardcast Inc. RTA-50 adhesive on to Hardcast Inc. DT tape or approved equal.
 - 2) Seal all non-flanged transverse joints with Hardcast Inc. RTA-50 adhesive on to Hardcast Inc. DT tape or approved equal.
 - b. Longitudinal Seams
 - 1) Seal all longitudinal seams during ductwork fabrication with Hardcast Inc. Cold Seal 1001 or approved equal.
 - c. Joints and Ductwall Penetrations
 - 1) Seal all duct joints at takeoffs, access doors, damper bearing penetrations, flexible duct connections etc., with Hardcast Inc. Versa Grip 102 or approved equal.
 - 2) Note, access doors and damper rod penetrations shall be equipped with proper hardware for sealing.
8. Support
- a. Space hangers as required by SMACNA (8 ft max) for horizontal duct on 8 ft. centers, unless concentrated loadings require closer spacing.
 - b. Support vertical duct on each floor or slab it penetrates.
 - c. Supports for ductwork and equipment shall be galvanized unless specified otherwise.
9. Connections
- a. Connect inlets and outlets of air handling units and fans to ductwork with flexible connections unless fan has vibration isolator mounts inside unit with flexible connections and no external vibration isolators. Exception: Do not use flex on life safety smoke exhaust fans.
 - b. Indoors, flexible connections shall be neoprene coated fibrous glass fire retardant fabric, by Ventfabrics, or Durodyne. Outdoors, flexible connections shall be Dupont hypalon coated fibrous glass fire, weather, and UV resistant by Ventfabrics or Durodyne.
 - c. Secure flexible connections tightly to air handlers with metal bands. Bands shall be same material as duct construction.
 - d. Connections from trunk to branch ducts shall be as detailed on Drawings.

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10. Construction
 - a. No sharp metal edges shall extend into air streams.
 - b. Install drive slips on air leaving side of duct with sheet metal screws on 6" centers.
 - c. Spin in collars shall NOT be used for branch connections in 3" or higher pressure class ductwork.
11. Joints
 - a. Longitudinal lock seams shall be double locked and flattened to make tight joints.
 - b. Make transverse joints, field connections, collar attachments and flexible connections to ducts and equipment with sheet metal screws or bolts and nuts. Do not use rivets and staples.
12. Prefabricated Transverse Duct Joints
 - a. Transverse joints in galvanized sheet metal ductwork may be made with galvanized gasketed frame and angle duct joint system by Ductmate, TDF, TDC or approved equal. Angles shall be at least 20 gauge. Prefabricated transverse duct joints shall not be used for duct 16 GA. and heavier, nor for duct 23 GA. or lighter.
 - b. Secure angles to duct with screws (using clutched arbor) or spot welds spaced as recommended by manufacturer for duct pressure class.
13. Elbows and Bends
 - a. Elbows and bends for rectangular ducts shall have centerline radius of 1-1/2 times duct width wherever possible. Elbows for grease exhaust and fume hood exhaust shall be full radius. Vanes or mitered duct are not allowed.
 - b. Where centerline radius is less than 1-1/2 times duct width (on supply, return and exhaust ductwork), elbows shall be radius throat (square throat allowed when turning around column or other close objects) with radius heel. For elbows whose width is greater than 48 inches and/or where shown on plans, provide splitter vanes. Install vanes in accordance with SMACNA. Where multiple elbows are separated by less than ten duct diameters use splitter (full length) vanes.
 - c. For round ductwork provide stamped elbows, with centerline radii equal to 1-1/2 times duct diameter, or gored elbows as follows:

Elbow Angle	No. of Gores
0° - 36°	2
37° - 72°	3
73° - 90°	5
 - d. Elbows for flat oval ducts shall have centerline radii equal to 1 1/2 times duct diameter in plane of bend, or gored elbows with gores as specified for round ducts.
14. Access Panels/Doors
 - a. Provide proper pressure and leakage rated, gasketed, duct mounted access panels/doors for the following items with minimum sizes, as indicated. Access doors shall be of double wall construction doors in insulated ducts shall be insulated. Gauges of door materials, no. of hinges, no. and type of door locks shall be as required by the SMACNA Duct Construction Standards. Hinged doors are not acceptable, screwed or bolted access panels are not acceptable. Doors shall be chained to frame with a minimum length of 6" to prevent loss of door. For seal Class A, access doors shall be leakage rated, neoprene gasketed UL 94 HF1 listed, DUCTMATE "sandwich" or approved equal. Door metal shall be the same as the

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attached duct material. For grease and high temperature ducts, door assembly shall be rated for 2300°F. The minimum sizes are:

- 1) Fire dampers 12" x 12", or larger.
 - 2) Combination Fire/Smoke dampers 12" x 12", or larger.
 - 3) Smoke dampers 6" x 6" minimum.
 - 4) Automatic control dampers 6" x 6" minimum.
 - 5) Manual volume dampers 2 sq. ft. and larger 6" x 6" minimum.
 - 6) Inlet side to all coils 12" x 12", or larger.
 - 7) Suction and discharge sides of inline fans 24" x 24" minimum.
 - 8) At additional locations indicated on drawings, or specified elsewhere 12" x 12" minimum.
- b. Generally access doors are not shown on the drawings, but shall be provided in accordance with the above.
15. Extractors shall have adjusting rod and locknut on outside of duct.
16. Connections to roof fans:
- a. Shall be at least 22 ga. galvanized steel soldered watertight.
 - b. Solder side seams at least 12" up from bottom.
 - c. Provide suitable dielectric gaskets to join dissimilar materials.
17. Plenums and connections to louvers:
- a. Shall be 18 ga. minimum cross broken and properly reinforced with galvanized angle irons to SMACNA requirements.
 - b. Shall have bottom and corner seams soldered watertight at least 12" up from bottom.
 - c. Shall have neoprene gaskets or other non corrosible material to make connections to louvers watertight.
 - d. Shall pitch connection back towards the louver. Provide half coupling drain connection at bottom of plenum unless noted otherwise. Pipe drain to nearest floor drain.
 - e. Shall have unused portions of louvers blocked-off with sheet metal; sealed air and water tight; insulated with 2" thick 6 lb. density rigid or board insulation.
18. Duct Pressure Tests
- a. Pressure test all duct classes after takeoffs and wall penetrations are in place and before applying exterior insulation. Correct any leaks.
 - b. Pressure and leak test 100% of all duct work with a pressure class of 3" or higher as specified in paragraph 2.20.B.6.a. Duct shall be constructed so there is no joint or structural failure at the test pressure.

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19. Duct Leakage Tests

- a. Leak testing method shall be performed as outlined in the SMACNA HVAC Air Duct Leakage Test Manual. As specified in paragraph 2.20.B.6 & a, utilize Sealing Requirements for Class A and Leakage Class 6 for all ductwork. Provide orifice assembly including straightening vanes, orifice plate mounted in straight tube with properly located pressure taps, and U tube manometer or other device as specified by SMACNA. Orifice assembly shall be calibrated accurately and shall come with calibration curve. Leakage classes shall be as previously specified. Submit leak test report (per SMACNA format) for Designer review. Drawings of ductwork tested shall also be submitted with report, indicating presence of takeoffs, wall penetrations, joints, etc.

20. Materials

- a. Sheet metal ducts shall be constructed of hot dipped galvanized sheet metal with G90 Commercial coating according to ASTM 527 unless specified otherwise.
- b. Stainless steel (SS) ductwork shall be 18 gauge for kitchen hoods; and as required by SMACNA for other ducts. Materials shall be 316/No. 4 finish for exposed duct, 304/No. 1 finish for concealed ducts. Joints and seams shall be welded as required by SMACNA Guidelines for Welding Sheetmetal.
- c. Aluminum ductwork shall be Alclad 3003 1414 or alloy 5052 H32, for exhaust fan No. 2 duct system. Thickness as required by the SMACNA duct construction standards with Alloy 6061 bracing angles, and Pittsburgh lock longitudinal corner and double side seaming.
- d. Flexible Ductwork
 - 1) Flexible ductwork, connecting to uninsulated or unlined duct, shall be polyester core with corrosion resistant helical wire reinforcing. The polyester core shall be minimum two ply and shall have a minimum thickness of 0.0017". Flex duct shall be U.L. rated for 6" W.C. positive pressure, 2" W.C. negative pressure with a maximum velocity of 4000 FPM. Flexduct must be listed as a Class 1 Connector according to UL 181 and shall meet the requirements of NFPA 90A maximum ASTM E 84 fire hazard rating shall be 25 flame spread, 50 fuel contributed and 50 smoke developed. Uninsulated flexible duct shall be equivalent to Wiremold, Type WB, or Flexmaster Types 2 and 4 (not type 9).
 - 2) Flexible duct connected to insulated or lined duct shall also be insulated and shall be equivalent to Wiremold Type WK or Flexmaster Types 2 or 4 (not type 9), with 1 1/2", 3/4 lb. density fiberglass insulation and an aluminized reinforced vapor barrier.
 - 3) Submittals shall include data on no. of polyester plies and minimum thickness of polyester core, in addition to other data listed above required to ensure that submitted product meets the requirements of these specifications.
 - 4) If flexduct other than the model numbers of the vendors listed above is submitted, a sample of the flex shall be submitted to the Designer. The Designer shall have sole discretion in determining whether the submitted flex is equivalent to that of the named vendors above.
 - 5) Unless otherwise indicated, flexible duct shall not exceed 5'-0" long.

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- C. 2" and Lower Pressure Class Ductwork, Rectangular:
1. Ducts wider than 19" with more than 10 square feet of unbraced panel shall be beaded or cross broken.
 2. Internal stiffening struts shall only be used upon prior written approval of the Designer.
 3. Make changes in duct size with tapered connections as required by SMACNA. Changes shall NOT exceed 30° from line of air flow. Take off to the diffusers shall be 45° leading edge type or Bellmouth type.
 4. Transverse joints shall be TDF/TDC or slip joints; use flat or standing seam according to SMACNA. Where duct size requires standing seam but space restrictions dictate flat seam, notify Designer prior to fabrication.
- D. 2" and Lower Pressure Class Ductwork, Round:
1. Joints
 - a. Longitudinal joints shall be spiral seam, butt welded, lap and seam welded, or ACME lock grooved seam. Snap lock seams shall be used on ½" w.g. pressure class duct only.
 - b. Transverse joints shall be beaded sleeve joint or other approved joints listed in SMACNA. Use three or more sheet metal screws at 15" uniform intervals along circumference of joints.
 2. Branch fittings shall be conical tee (Buckley or equal) or combination tee as shown in SMACNA.
- E. 3" and 4" Pressure Class Ductwork Rectangular
1. Joints
 - a. Joints shall be prefabricated type by TDC, TDF or Ductmate. See Prefabricated Joints paragraph for specific requirements.
 2. Duct reinforcement spacing and type shall comply with SMACNA.
 3. Ductwork on both sides of transitions shall be run in same horizontal axis.
 4. Diverging section slope shall be 1 1/2" per foot or less if possible.
 5. Contraction section slope shall not exceed 7" per foot.
 6. Takeoffs shall be 45° leading edge type except that Bellmouths (Buckley or equal) may be used for takeoffs to terminal boxes if the distance between the box and point of takeoff is less than 8 ft.
 7. Ducts with an aspect ratio greater than 3:1 shall be minimum of 18 gauge unless a thicker gauge is required by SMACNA.
- F. 3" and 4" Pressure Class Ductwork, Flat Oval, Single Wall
1. Joints
 - a. Ducts shall have spiral lock seams or longitudinal seams. Seams and joints in fittings shall be continuously welded. If coating is damaged during welding, repair joints to prevent corrosion.
 - b. Transverse joints shall be slip or flanged.
- G. 3" and 4" Pressure Class Ductwork, Round, Single Wall

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1. Joints
 - a. Longitudinal seams shall be lock spiral, lock longitudinal or butt welded longitudinal.
 - b. Transverse joints shall be slip joints. Draw band joints shall be used on longitudinal seam duct only. Loose flange Vanstone joints may be used on ducts over 36" in diameter.
 - c. Seams and joints in fittings shall be continuously welded. If coating is damaged during welding, repair joints to prevent corrosion.
2. Branch fittings shall be conical tee or combination tee as detailed in SMACNA.

H. Flexible Rigid Duct

1. Flexible ductwork shall be Flexmaster Triple Lock Buck Duct Flexible Air Duct (insulated) as manufactured by Buckley Associates or equal (617 878 5000). Flexible duct, non insulated, shall be Underwriters Laboratory Listed UL 181 Class 0 air duct and constructed in accordance with NFPA Standards 90A and 90B. It shall have a smoke/flame spread rating of 50/25.
2. Duct shall be made from a tape of dead soft aluminum sheet, spiral wound into a tube and spiral corrugated to provide strength and stability. The joint shall consist of a triple lock mechanically performed without the use of adhesives to make a durable airtight seam. A double lock is not acceptable.
3. Flexible duct connected to insulated or lined duct shall also be insulated. Flexmaster insulated flex shall have a gray Fire Retardant Polyethylene outer jacket with a ½ lb. density, 1 1/2" thick fiberglass insulation blanket, factory wrapped. Flexible Duct, insulated, shall be Underwriters Laboratory Listed and constructed in accordance with NFPA standards 90A and 90B. It shall have a smoke/flame spread rating of 50/25.
4. The flexible duct shall be supported as required.
5. Flexible duct work shall be rated at 12" positive pressure. Duct from 3 to 16" shall have a negative pressure of 12", 8" for duct work 18 and 20.
6. All flexible duct shall be individually cartoned and labeled for delivery to the job site for maximum protection.
7. Submittals shall include data on minimum thickness of aluminum core, in addition to other data listed above, required to ensure that submitted product meets the requirements of these specifications.
8. Provide sealing compound for installation. See further paragraphs in this specification and details for other installation requirements.

I. Volume Dampers

1. Provide Young Regulator manual adjustable rectangular opposed blade dampers for duct heights less than 12" with factory installed locking hand quadrants extended 2" for all dampers installed in externally insulated duct:
 - a. On each supply, return and general exhaust duct take off.
 - b. At each take off to register, grille or diffuser (not all are shown on Drawing).
2. Dampers are manufactured approximately 5/16" smaller in width and 1/8" smaller in height than size of duct in which they are installed; e.g., nominal damper size is 24" x 10"; actual size is approximately 23 11/16" x 9 7/8".

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3. Damper frame shall be constructed of #6063 extruded aluminum reinforced channel with minimum thickness of .050". Opposed damper blades shall be #6063 extruded aluminum with minimum thickness of .050" and shall include reinforcing ribs. Each blade shall be supported in the damper frame by individual Teflon axle bearings, and shall be driven by stainless steel connecting slide linkage controlled by 3/8" square steel control shaft.
 4. Note: All required volume dampers may not be indicated on drawings but dampers shall be provided as necessary for systems balancing.
 5. Dampers 12" and larger in height shall be opposed multi blade equal to Greenheck, Nailor, or Vent Products.
 6. Where dampers are inaccessible, use Young Regulator locking type ceiling regulators and miter gear or worm gear for all horizontal dampers. Bearing coupling for bottom duct control may be used for shaft on vertical blade dampers. The 3/8" rod between ceiling regulator and damper shall be provided by contractor.
 7. Damper blades shall be two gauges heavier than adjoining ductwork, and shall be riveted to supporting rods. Hem over edges parallel to rods.
 8. Brackets shall be galvanized metal, secured to ductwork with sheet metal screw with locking quadrant arms (see seal class section for additional requirements). Provide 2" handle extension for all dampers on externally insulated ductwork.
 9. Note: All required volume dampers may not be indicated on Drawings but dampers shall be provided as necessary for system balancing.
- J. Automatic Dampers: Install automatic dampers furnished under Automatic Temperature Control Paragraph of this Section, as shown on Drawings, and as specified. Provide sealed wall penetrations for Seal Class A ductwork.
- K. Locker Room Exhaust or Return Ductwork
1. Ductwork shall be aluminum, of types as detailed in this specification above and constructed in accordance with SMACNA except that Seal Class shall be "A" regardless of duct pressure rating.
- L. Branch Duct Take off Fittings
1. Contractor shall provide Buckley Bellmouth Take offs at all branch duct locations.
 2. Bellmouth Fitting shall be Model BMD with damper. In areas where sufficient duct height is not available, the contractor shall provide the Buckley Mini mouth fitting, Model M BMD with damper or the flat oval Bellmouth, Model FOBMD with damper.
 3. Bellmouths shall be constructed of heavy duty galvanized steel. Bellmouths shall include an air tight Neoprene gasket to ensure a tight fitting with minimal leakage. Pre drilled holes shall be provided for quick mounting. Bellmouth shall be as manufactured by Buckley Associates or equal (617 878 5000).
 4. Standard damper hardware to be constructed of 26 gauge galvanized material with a quadrant damper and tight fitting gasketing to ensure minimal leakage at damper pivot points.
 5. Optional heavy duty hardware shall be provided at locations of higher static pressure where shown on the drawings.
 6. Ninety degree take offs are not permitted on this project..

2.19 DUCTWORK ACCESSORIES

A. Dampers:

1. Low Pressure Manual Dampers: Provide dampers of single blade type or multiblade type, constructed in accordance with SMACNA "HVAC Duct construction Standards".
2. Automatic Control Dampers: Refer to Division-23 section "Automatic Temperature Control" for control dampers; not work of this section.
3. Backdraft Relief Dampers: Provide dampers with parallel blades, counterbalanced and factory-set to relieve at .05" static pressure. Construct blades of 16-ga. aluminum, provide 1/2" diameter ball bearings, 1/2" diameter steel axles spaced on 9" centers. Construct from 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under: 4" x 1-1/4" x 16 ga. channel for face areas over 25 sq. ft. Provide galvanized steel finish on frame with aluminum touch-up. Provide felted or rubber trim to assure tight, leak-proof seal when closed.
4. Manufacturer: Subject to compliance with requirements, provide dampers of one of the following:
 - a. Air Balance, Inc.
 - b. Airgarde Corp.
 - c. American Warming & Ventilating, Inc.
 - d. Arrow Louver and Damper; Div. of Arrow United Industries, Inc.
 - e. Louvers & Dampers, Inc.
 - f. Penn Ventilator Co.
 - g. Ruskin Mfg. Co.
 - h. Or equal

B. Fire Dampers:

1. Fire Dampers: Provide fire dampers, of types and sizes indicated. Construct casings of 11-ga. galvanized steel. Provide fusible link rated at 160 to 165 degrees F (71 to 74 degrees C) unless otherwise indicated. Provide owner with a spare fusible link for each damper. Provide out of air stream type damper in open position and with positive lock in closed position, and with the following additional features:
 - a. Damper Blade Assembly: Curtain type.
 - b. Blade Material: Steel, match casing.
 - c. Blade Material: Stainless steel.
2. Motor-Driven Fire/Smoke Dampers: Provide line voltage motor-driven fire/smoke dampers in types and sizes indicated on drawings, with casing constructed of 11-ga. galvanized steel with bonded red acrylic enamel finish, fusible link 160 to 165 degrees F (71 to 74 degrees C), unless otherwise indicated, and curtain type stainless steel interlocking blades, with electric motor equipped with instant closure clutch, stainless steel cable damper blade linkage, motor mounting bracket, and 32" long wire leads for connecting to smoke detector, and with the following construction features:
 - a. Unit Assembly: Motor mounted outside air stream.
3. Manufacturer: Subject to compliance with requirements, provide fire dampers of one of the following:

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- a. Air Balance, Inc.
 - b. American Warming & Ventilating, Inc.
 - c. Arrow Louver and Damper; Div. of Arrow United industries, Inc.
 - d. Louvers & Dampers, Inc.
 - e. Penn Ventilator Co.
 - f. Phillips-Aires
 - g. Ruskin Mfg. Co.
 - h. Or equal
- C. Turning Vanes:
1. Manufactured Turning Vanes: Provide double thickness airfoil turning vanes constructed of 1-1/2" wide curved blades set at 3/4" o.c., supported with bars perpendicular to blades set at 2" o.c, and set into side strips suitable for mounting in ductwork.
 2. Manufacturer: Subject to compliance with requirements, provide turning banes of one of the following:
 - a. Aero Dyne Co.
 - b. Airsan Corp.
 - c. Anemostat Products Div.; Dynamics Corp. of America.
 - d. Barber-Colman Co.
 - e. Duro Dyne Corp.
 - f. Environmental Elements Corp.; Subs, Koppers Co., Inc.
 - g. Hart & Cooley Mfg. Co.
 - h. Register & Grille Mfg. Co., Inc.
 - i. Souther, Inc.
 - j. Or equal
- D. Duct Hardware:
1. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:
 - a. Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.
 - b. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12". Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.
 2. Manufacturer: Subject to compliance with requirements. Provide duct hardware of one of the following:
 - a. Ventbamics, Inc.
 - b. Young Regulator Co.
 - c. Or equal

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E. Duct Access Doors:

1. General: Provide duct access doors of a size as required to service and maintain device in duct. Provide on (1) access door at each control damper, humidifier, coil, fire damper, and any device that requires attention.
2. Construction: Construct of same or greater gauge as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with one handle-type latch for doors 12" high and smaller, 2 handle-type latches for larger doors.
3. Manufacturer: Subject to compliance with requirements, provide duct access doors of one of the following:
 - a. Air Balance, Inc.
 - b. Duro Dyne Corp.
 - c. Register & Grille Mfg. Co., Inc.
 - d. Ruskin Mfg. Co.
 - e. Ventfabrics, Inc.
 - f. Zurn Industries, Inc.; Air Systems Div.
 - g. Or equal

F. Flexible Connectors:

1. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibration of connected equipment.
2. Manufacturer: Subject to compliance with requirements, provide flexible connections of one of the following:
 - a. American/Elgen Co.; Energy Div.
 - b. Duro Dyne Corp.
 - c. Flexaust (The) Co.
 - d. Ventfabrics, Inc.
 - e. Or equal

2.20 ACCESS DOORS

- A. Furnish Access Doors for access to all concealed control valves, motor operated dampers, fire doors, and to all other concealed parts of the HVAC System that require accessibility for the proper operation and maintenance of the system. These doors shall be installed under the appropriate SECTION of the Specifications as determined by the surface upon which the panels are mounted.
- B. All Access Doors shall be located in a workmanlike manner in closets, storage rooms, and/or other non-public areas, positioned so that the valve or part can be easily reached, and the size shall be sufficient for this purpose (minimum size 12" x 16"). Furnish Access Doors for each pipe space to permit thorough inspection of same. When access doors are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the Architect.

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- C. Access doors shall be prime painted and completed with cylinder lock and two (2) keys as manufactured by Acudor, Inland Steel Products Company "Milcor", or Walsh-Hannon-Gladwin, Inc., "Way Lector". Type shall be as follows:
1. Acoustical Tile Ceiling Acudor AT-5020
 2. G.W.B. Surfaces Acudor DW-5040
 3. Masonry Construction Acudor UF-5000
 4. Fire Rated Construction Acudor FB-5060
- D. Access Door Shop Drawings shall be submitted to the Architect for approval.

2.21 FIRESTOPPING AND SEALANTS

A. General

1. All firestop products and systems shall be designed and installed so that the basic sealing system will allow the full restoration of the thermal and fire resistance properties of the barrier being penetrated with minimal repair if penetrants are subsequently removed. For applications where combustible penetrants are involved, i.e. insulated and plastic pipe, a suitable intumescent material must be used.
2. This section specifically addresses pipe, duct, cable, and wiring penetrations of fire wall firestops and smoke stops for all bearing and non-bearing walls and floors assemblies.

B. References

1. American Society For Testing and Materials Standards (ASTM):
 - a. ASTM E 814: Standard Test method For Fire Tests of Through-Penetration Firestops
 - b. ASTM E84: Standard Test Method For Surface Burning Characteristics of Building Materials
2. Underwriters Laboratories Inc.:
3. UL 1479 Fire Tests of Through-Penetration Firestops
 - 1) UL 723 Surface Burning Characteristics of Building Materials
- b. UL Fire Resistance Directory:
 - 1) Through Penetration Firestop Device (XHJI)
 - 2) Fire Resistive Ratings (BXUV)
 - 3) Through Penetration Firestop Systems (XHEZ)
 - 4) Fill, Void, or Cavity Material (XHHW)

C. Definitions

1. Firestopping: The use of a material or combination of materials in a fire-rated structure (wall or floor) where it has been breached, so as to restore the integrity of the fire rating on that wall or floor.
2. System: The use of a specific firestop material or combination of materials in conjunction with a specific wall or floor construction type and a specific penetrant(s), constitutes a "System".
3. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.

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4. Through-Penetration: Any penetration of a fire-rated wall or floor that completely breaches the barrier.
5. Membrane-Penetration: Any penetration in a fire-rated wall that breaches only one side of the barrier.
6. Construction Gaps: Any gap, joint, or opening, whether static or dynamic, where the top of a wall may meet a floor; wall to wall applications, edge to edge floor configurations; floor to exterior wall; or any linear breach in a rated barrier. Where movement is required, the firestopping system must comply with UL2079 for dynamic joints.

D. Quality Assurance

1. Firestopping systems (materials and design):
 - a. Shall conform to both Flame (F) and Temperature (T) ratings as required by local building codes and as tested by nationally accepted test agencies per ASTM E814 or UL 1479 fire tests in a configuration that is representative of field conditions.
 - b. The F rating must be a minimum of one (10 hour but not less than the fire resistance rating of the assembly being penetrated. T rating when required by code authority shall be based on measurement of the temperature rise on penetrating item(s). the fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.
 - c. For joints, must be tested to UL2079 with movement capabilities equal to those of the anticipated conditions.
2. Firestopping materials and systems must be capable of closing or filling through openings created by 1) the burning or melting of combustible pipes, cable jacketing, or pipe insulation materials, or 2) deflection of sheet metal due to thermal expansion (electrical & mechanical duct work).
3. Firestopping material shall be asbestos and lead free and shall not incorporate nor require the use of hazardous solvents.
4. Firestopping sealants must be flexible, allowing for normal pipe movement.
5. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces.
6. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.
7. All firestopping materials shall be manufactured by one manufacturer (to the maximum extent possible).
8. Installation of firestopping systems shall be performed by a contractor (or contractors) trained or approved by the firestop manufacturer.
9. Material used shall be in accordance with the manufacturer's written installation instructions.

E. Materials

1. Intumescent Firestop Sealants and Caulks:
 - a. STI SpecSeal S100 and S500 Sealant
 - b. 3M Fire Barrier Caulk CP25WB+
2. Latex Firestop Sealant:

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- a. STI SpecSeal LC150 Sealant
3. Silicone Firestop Sealants and Caulks:
 - a. STI SpecSeal Pensil 100 and 300
 - b. 3M Fire Barrier Silicone Sealants
4. Firestop Putty:
 - a. STI SpecSeal Firestop Putty Bars and Pads
 - b. 3M Fire Barrier Moldable Putty
5. Firestop Collars:
 - a. STI SpecSeal Firestop Collars
 - b. 3M Fire Barrier PPD's
6. Wrap Strips:
 - a. SpecSeal Wrap Strip
 - b. 3M Fire Barrier FS195 Wrap Strip
7. 2-Part Silicone Firestop Foam:
 - a. STI SpecSeal Pensil 200
 - b. 3M Fire Barrier 2001 Silicone Foam
8. Firestop Mortar:
 - a. STI SpecSeal Mortar
9. Composite Board:
 - a. 3M Barrier Sheet Material
10. Accessories:
 - a. Forming/Damming Materials: Mineral Fiberboard or other type as per manufacturer recommendation.

2.22 AUTOMATIC TEMPERATURE CONTROLS:

- A. Basic Components and Systems:
 1. General: Provide control products in sizes and capacities indicated, consisting of dampers, thermostats, clocks, sensors, controllers, and other components as required for completed installation. Except as otherwise indicated, provide manufacturer's standard materials and components as published in their product information, designed and constructed as recommended by manufacturer and as required for application indicated. All equipment and systems shall be installed by factory trained contractors with the following functional and construction features.

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2. The building automation system shall be based on a Niagara open protocol BacNet system infrastructure that integrates diverse systems and devices (regardless of manufacturer, communication standard ie Lon, Modbus or software) into a unified platform that can be read and written to and easily managed in real time using a standard Web browser. Systems not developed on a Niagara BacNet protocol are unacceptable. The building automation system shall not require licensing fees and shall be licensed indefinitely to the Owner for use at the project site. ATC manufacturer shall provide written confirmation that installing ATC Contractor is an authorized dealer and service provider. The ATC system provided must be capable of being serviced by three or more local authorized vendors/contractors.
3. Provide all required control wiring including CAT6 Ethernet wiring for any controllers requiring Ethernet connectivity. Terminate Ethernet cable in MDF and IDF closets on patch panels proceed under Technology Section 270000.
4. Install an open-protocol (BACNet) energy management system (EMS) to monitor and trend the energy consumed by the following systems throughout the school:
 - a. HVAC systems
5. The ATC control and building EMS system shall have the following attributes with characteristics and performance as specified within this Specification section, related Electrical and Plumbing section specifications and the Control Diagram drawings:
 - a. Sensors as follows:
 - 1) Indication and trending of damper and valve commanded positions.
 - b. Points matrix – including all hardwired input and output devices connected to the automation system, all set points, upper and lower control limits.
 - c. Trend capabilities – including a trend point list and preprogrammed sample of point (performed by controls contractor), sample rate, storage interval, upload interval, custom trend abilities, alarms, and automated trend data review and notification (automated diagnostics).
 - d. System architecture – capable of allowing sampling of these points to facilitate building commissioning and diagnostics without significantly affecting system performance.
 - e. Data storage system – with adequate capacity to record trend data for use by building operators. Data export requirements must facilitate user-friendly data access and manipulation.
 - f. Operator interface – designed for remote/web access, monitoring requirements, trend-log reporting and diagnosing building problems through a user-friendly interface. This includes providing a visual (non text based) operations and reporting interface to facilitate rapid system assessment that utilizes color-coding, diagrams of floor plans and graphing capabilities.
 - g. The remote access shall use a web browser only and not require a VPN with remote desktop application.
6. Electric Wiring: All electric wiring and wiring connections, either line voltage or low voltage, from the emergency electric panels to the ATC panels, and from the ATC related panels to the individual control devices i.e. rooftop units, exhaust fans, boilers, chillers, valves, and dampers required for the installation of the control system, as herein specified shall be provided by the control contractor unless specifically shown on the electrical drawings or called for in the electrical specifications.

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- a. The wiring installation shall be in accordance with National and Local Codes and with the Electrical portion of these specifications. All wiring shall be run concealed wherever possible. Exposed wiring in occupied areas shall be run in raceways. Raceways shall be Wiremold 200 series with all elbows, raceways, covers, mounting stops, box extensions and wiring for a complete and neat installation. All wiring located in mechanical spaces, boiler rooms, and fan rooms shall be installed in metal conduit
 - b. All wiring above ceilings, in boiler rooms, and all mechanical spaces shall follow routing of piping and where not possible shall be in conduit. All exposed wire shall be bundled and wire tied and shall be supported to adjacent piping. Draped and free floating wire will not be allowed.
 - c. All terminations of wire at control devices shall be looped and supported adequately.
 - d. All wiring shall comply with the requirements of the electrical section of the specification.
7. All appliances, controllers, and servers provided shall include the licenses for full, bidirectional (import & export) support for BACnet/IP and BACnet/MS/TP. These drivers shall be installed, tested, and commissioned to permit BACnet communications at the IP and MS/TP levels.
 8. BACnet MS/TP shall be used as the communications protocol between the network controllers and the field controllers. All objects in the field controllers shall be exposed as BACnet objects and accessible through network controllers.
 9. The controls contractor shall provide, install and configure fully licensed copies of all necessary EMS manufacturers' software and tools to engineer, develop, configure, program, and test control sequences in the network controllers and in the field controllers, and user interface screens and graphics in the network controllers and system server as provided on this project. The controls contractor shall provide full documentation and backup file copies of all system, controller, and user interface configuration, programming, screens, user interface screens and graphics. With the software tools and backup files, it will be possible for the owner or any trained person or company contracted by the owner to make any changes they deem necessary to the system, to the controllers, and/or to the user interface, without having to use the original controls contractor.
- B. Controls Systems Wiring
1. All conduit raceways, wiring, accessories and wiring connections required for the installation of the Controls Systems shall be provided by the Controls Contractor except as shown on the Electrical Drawings. All wiring shall comply with the requirements of applicable portions of the Electrical Section 26 00 00 and all local and national electric codes and the requirements of the AHJ.
 2. All Controls Systems wiring materials and installation methods shall comply with the original equipment manufacturer recommendations and standards.
 3. The sizing type and provision of cable, conduit, cable trays and raceways shall be the design responsibility of the Controls Contractor.
 4. Class 2 Wiring
 - a. All Class 2 (24VAC or less) wiring shall be installed in conduit unless otherwise specified.

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- b. Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5ft. from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines.
 5. Class 2 signal wiring and 24VAC power may be run in the same conduit. Power wiring 120VAC and greater shall not share the same conduit with Class 2 signal wiring.
 6. Perform circuit tests using qualified personnel only. Provide necessary instruments and equipment to demonstrate that:
 - a. All circuits are continuous and free from short circuits and grounds.
 - b. All circuits are free from unspecified grounds; that resistance to ground of all circuits is no less than 50 megaohms.
 - c. All circuits are free from induced voltages.
 7. Provide complete testing for all cables and wiring. Provide all equipment, tools, and personnel as necessary to conduct these tests.
 8. Provide for complete grounding of all signal and communication cables, panels and equipment so as to ensure integrity of Controls Systems operation. Ground cabling and conduit at panel terminations. Do not create ground loops.
- C. Line Voltage Power Sources
 1. 120-volt AC circuits for the Controls Systems shall be taken by the Controls Contractor from electrical emergency panelboards and circuit breakers as designated on the electrical drawings.
 2. Circuits used for the Controls Systems shall be dedicated to these Controls Systems and shall not be used for any other services.
 3. Controls DDC terminal unit controllers may use 120-volt AC power from motor power circuits.
- D. Controls Systems Raceways
 1. All wiring shall be installed in conduit or raceway except as noted elsewhere in the Specification. Minimum conduit size 3/4 in.
 2. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.
 3. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the supporting surface.
 4. UL/ULC Listed Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 ft. in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls and for final connection to equipment.
- E. Penetrations
 1. Firestopping for all penetrations used by dedicated Controls Systems conduits and raceways shall be by other trades.
 2. All openings in fire proofed or fire stopped components shall be closed by other trades using approved fire resistive sealant.
 3. All wiring passing through penetrations, including walls, shall be in sleeves, conduit or enclosed raceway.

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4. No penetrations through building structural elements, slabs, ceilings and walls shall be made before receipt of written approval from the Architect.

F. Controls Systems Identification Standards

1. Node Identification: All nodes shall be identified by a permanent label fastened to the outside of the enclosure. Labels shall be suitable for the node environmental location.
2. Cable shall be labeled at every termination with cross-referencing to record documentation.
3. Raceway Identification: Exposed covers to junction and pull boxes of the FMS raceways shall be identified at primary points.
4. Wire Identification: All low and line voltage wiring shall be identified by a number, as referenced to the associated shop and record drawing, at each termination.
5. Wires and cabling shall not be spliced between terminations. Cable shields shall be single end grounded – typically at the panel end outside the panel.
6. Suggested color coding, for use at the Contractors option, are:
 - a. Analog Input Cable Yellow
 - b. Analog Output Cable Tan
 - c. Binary Input Cable Orange
 - d. Binary Output Cable Violet
 - e. 24 VAC Cable Gray
 - f. General Purpose Cable Natural
 - g. Tier 1 Comm Cable Purple
 - h. Other Tier Comm Cable Blue
 - i. Ethernet cable Blue
7. Provide permanent identification labels at all valve and damper actuators to indicate open and closed positions.

G. Field Panel And Device Installations And Locations

1. The Controls Systems panels, enclosures and cabinets shall be located as coordinated with the Architect at an elevation of not less than 2 ft. from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.
2. All field devices shall be installed per the manufacturer recommendation and in accessible locations as coordinated with the Architect.
3. Panels to be located in damp areas or areas subject to condensation shall be mounted with wall standoffs.
4. Conduit configurations entering or leaving panels and devices shall be such as to preclude condensation traps.

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H. Networking Communications

1. The design of the EMS shall network operator workstations and stand-alone DDC Controllers. The network architecture shall consist of multiple levels for communication efficiency, a building-wide (Management Level Network) Ethernet network based on TCP/IP protocol, high performance peer-to-peer building level network(s) and DDC Controller floor level local area networks with access being totally transparent to the user when accessing data or developing control programs.
2. System shall communicate with a BACnet network over Ethernet or BACnet/IP (according to Annex J). The intent is to use the system provided under this contract to communicate with control systems and/or devices provided by other vendors. A PICS must be provided describing the BACnet, ANSI/ASHRAE 135-95, implementation. The product shall be Network Application Engine level 1 controllers with field equipment controller for level 2 controllers no substitutions. Minimum system functionality must include monitoring, commanding, and alarming for daily operator functions from a common workstation.
 - a. System shall have the capability to be an OPC Client and Server for dynamic communication with OPC Clients or Servers over an Ethernet network. At a minimum, the following must be supported:
 - 1) Data Access 1.0 (96), 1.0A (97) and 2.0 (11/98)
 - 2) Alarms & Events 1.0 (1/99)
3. Network Switches
 - a. Provide HP ProCurve 2910 al series 2910-48G al 48 ports network switch Brocade, Cisco or equal in MDF/IDF rooms as required.
4. Ethernet Wiring
 - a. Ethernet wiring shall be CAT6 UTP cable plenum rated. CAT6 UTP cables shall conform to ANSI/TIA/EIA-568-B1, B2, B3 Commercial Building Telecommunications Cabling Standard (latest amendment and including all applicable addenda) and ISO/IEC 11801 (International) Generic Cabling for Customer Premises standard (latest amendment and including all applicable addenda).
5. Building Data Network:
 - a. All operator devices either network resident shall have the ability to access all point status and application report data or execute control functions for any and all other devices via the network. No hardware or software limits shall be imposed on the number of devices with global access to the network data at any time.
 - b. The network shall support a minimum of 100 DDC controllers and PC workstations
 - c. The system shall support integration of third party systems (fire alarm, security, lighting, PLC, chiller, boiler) via panel mounted open protocol processor. This processor shall exchange data between the two systems for interprocess control. All exchange points shall have full system functionality as specified herein for hardwired points.
 - d. Field panels must be capable of integration with open standards including Modbus, BACnet, and Lonworks as well as with third party devices via existing vendor protocols.

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- e. The Building Network shall use the TCP/IP over Ethernet. All devices must:
 - 1) Auto-sense 10/100/1000 Mbps networks.
 - 2) IP Address will be assigned by Owner's IT staff.
 - 3) DNS and Gateway IP address will be provided by Owner's IT staff. A VLAN will be setup by Owner's IT staff.
 - 4) Allow access using Telnet.
- 6. Internet access
 - a. Web Based Operator Interface
 - 1) The BAS shall provide a web based graphical interface that allows users to access the BAS data via the Internet. The interface shall use HTML based ASP pages to send and receive data from the BAS to a web browser.
 - 2) All information exchanged over Internet shall be encrypted and secure via SSL.
 - 3) Access to the web interface will be password protected. A users rights and privileges to points and graphics will be the same as those assigned at the BAS workstation. An option will exist to only allow users "read" access via the web browser, while maintaining "command" privileges via the BAS workstation.
 - 4) Commissioning of the Web interface shall not require modification or creation of HTML or ASP pages. All graphics available at the BAS graphical workstation shall be available to users via a web browser.
 - 5) The web-based interface shall provide the following functionality to users, based on their access and privilege rights:
 - a) Logon Screen – allows the user to enter their user name, password and Domain name for logging into the web server.
 - b) Alarm Display – a display of current BAS alarms to which the user has access will be displayed. Users will be able to acknowledge and erase active alarms, and link to additional alarm information including alarm messages, and informational and memo text. Any alarm acknowledgements initiated through the web interface will be written to the BAS central workstation activity log.
 - c) Graphic Display – Display of system graphics, including animated motion, available in the BAS workstation will be available for viewing over the web browser. Software that requires creation of dedicated "web" graphics in order to display them via the browser interface will not be acceptable. A graphic selector list will allow users to select any graphics to which they have access. Graphic displays will automatically refresh with the latest change of values. Users will have the ability to command and override points from the graphic display as determined by their user accounts rights.
 - d) Point details – users will have access to point detail information including operational status, operational priority, physical address, and alarm limits, for point objects to which they have access rights.

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- e) Point Commanding – users will be able to override and command points they have access to via the web browser interface. Any commands or overrides initiated via the web browser interface will be written to the BAS central workstation activity log.
- 7. The web server licensing options will allow concurrent access by 10 browser connections.
- 8. Internet connections, ISP services, as well as necessary firewalls or proxy servers shall be provided by the Owner as required to support the web access feature.
- I. DDC Controller Floor Level 2 Network
 - 1. This level communication shall support a family of application specific controllers and shall communicate with the network through DDC Controllers for transmission of global data.
- J. DDC & HVAC Mechanical Equipment Controllers
 - 1. The DDC and HVAC Mechanical Equipment Controllers shall reside on the Building Level Network.
 - 2. DDC and HVAC Mechanical Equipment Controllers shall use the same programming language and tools. DDC and HVAC Mechanical Equipment Controllers which require different programming language or tools on a network are not acceptable.
 - 3. DDC and HVAC Mechanical Equipment Controllers which do not meet the functions specified are not acceptable.
- K. DDC Controller
 - 1. DDC Controllers shall be a 16-bit stand-alone, multi-tasking, multi-user, real-time digital control processors consisting of modular hardware with plug-in enclosed processors, communication controllers, power supplies and input/output point modules. Controller size shall be sufficient to fully meet the requirements of this specification and the attached point I/O schedule. Each controller shall support a minimum of three Floor Level Application Specific Controller Device Networks.
 - 2. Each DDC Controller shall have 72 Megabytes of memory to support its own operating system and databases, including:
 - a. Control processes
 - b. Energy management applications
 - c. Alarm management applications including custom alarm messages for each level alarm for each point in the system.
 - d. Historical/trend data for points specified
 - e. Maintenance support applications
 - f. Custom processes
 - g. Operator I/O
 - h. Dial-up communications
 - i. Manual override monitoring
 - 3. Each DDC Controller shall support firmware upgrades without the need to replace hardware.

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4. Provide all processors, power supplies and communication controllers so that the implementation of a point only requires the addition of the appropriate point input/output termination module and wiring.
5. DDC Controllers shall provide a RS-232C serial data communication ports for operation of operator I/O devices such as industry standard printers, operator terminals, modems and portable laptop operator's terminals. DDC Controllers shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers or terminals.
6. As indicated in the point I/O schedule, the operator shall have the ability to manually override automatic or centrally executed commands at the DDC Controller via local, point discrete, on-board hand/off/auto operator override switches for digital control type points and gradual switches for analog control type points.
 - a. Switches shall be mounted either within the DDC Controllers key-accessed enclosure, or externally mounted with each switch keyed to prevent unauthorized overrides.
 - b. DDC Controllers shall monitor the status of all overrides and inform the operator that automatic control has been inhibited. DDC Controllers shall also collect override activity information for reports.
7. DDC Controllers shall provide local LED status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device. Graduated intensity LEDs or analog indication of value shall also be provided for each analog output. Status indication shall be visible without opening the panel door.
8. Each DDC Controller shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all panel components. The DDC Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication.
9. Isolation shall be provided at all peer-to-peer network terminations, as well as all field point terminations to suppress induced voltage transients consistent with:
 - a. RF-Conducted Immunity (RFCI) per ENV 50141 (IEC 1000-4-6) at 3 V
 - b. Electro Static Discharge (ESD) Immunity per EN 61000-4-2 (IEC 1000-4-2) at 8 kV air discharge, 4 kV contact
 - c. Electrical Fast Transient (EFT) per EN 61000-4-4 (IEC 1000-4-4) at 500 V signal, 1 kV power
 - d. Output Circuit Transients per UL 864 (2,400V, 10A, 1.2 Joule max)
 - e. Isolation shall be provided at all peer-to-peer panel's AC input terminals to suppress induced voltage transients consistent with:
 - 1) IEEE Standard 587-1980
 - 2) UL 864 Supply Line Transients
 - 3) Voltage Sags, Surge, and Dropout per EN 61000-4-11 (EN 1000-4-11)
10. In the event of the loss of normal power, there shall be an orderly shutdown of all DDC Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 60 days.

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- a. Upon restoration of normal power, the DDC Controller shall automatically resume full operation without manual intervention.
 - b. Should DDC Controller memory be lost for any reason, the user shall have the capability of reloading the DDC Controller via the local RS-232C port, via telephone line dial-in or from a network workstation PC.
11. Provide a separate DDC Controller for each AHU or other HVAC system as indicated in Section 3.02. It is intended that each unique system be provided with its own point resident DDC Controller.

L. HVAC Mechanical Equipment Controllers

1. HVAC Mechanical Equipment Controllers shall be a 12-bit stand-alone, multi-tasking, multi-user, real-time digital control processors consisting of modular hardware with plug-in enclosed processors.
2. Each HVAC Mechanical Controller shall have 72 Megabytes of memory to support its own operating system and databases, including:
 - a. Control processes
 - b. Energy management applications
 - c. Alarm management applications including custom alarm messages for each level alarm for each point in the system.
 - d. Historical/trend data for points specified
 - e. Maintenance support applications
 - f. Custom processes
 - g. Operator I/O
 - h. Remote communications
3. HVAC Mechanical Equipment Controllers shall provide a RS-232C serial data communication port for operation of operator I/O devices such as industry standard printers, operator terminals, modems and portable laptop operator's terminals.
4. HVAC Mechanical Equipment Controllers shall provide local LED status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device.
5. Each HVAC Mechanical Equipment Controller shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all components. The HVAC Mechanical Equipment Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication.
6. In the event of the loss of normal power, there shall be an orderly shutdown of all HVAC Mechanical Equipment Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.
 - a. Upon restoration of normal power, the HVAC Mechanical Equipment Controller shall automatically resume full operation without manual intervention.

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- b. Should HVAC Mechanical Equipment Controller memory be lost for any reason, the user shall have the capability of reloading the HVAC Mechanical Equipment Controller via the local RS-232C port, via telephone line dial-in or from a network workstation PC.
- M. DDC and HVAC Mechanical Equipment Controller Resident Software Features
- 1. General:
 - a. The software programs specified in this Section shall be provided as an integral part of DDC and HVAC Mechanical Equipment Controllers and shall not be dependent upon any higher level computer for execution.
 - b. All points shall be identified by up to 30 character point name and 16 character point descriptor. The same names shall be used at the PC workstation.
 - c. All digital points shall have user defined two-state status indication (descriptors with minimum of eight characters allowed per state (i.e. summer/winter).
 - 2. Control Software Description:
 - a. The DDC and HVAC Mechanical Equipment Controllers shall have the ability to perform the following pre-tested control algorithms:
 - 1) Two-position control
 - 2) Proportional control
 - 3) Proportional plus integral control
 - 4) Proportional, integral, plus derivative control
 - 5) Automatic tuning of control loops
 - 3. DDC and HVAC Mechanical Equipment Controllers shall provide the following energy management routines for the purpose of optimizing energy consumption while maintaining occupant comfort.
 - a. Start-Stop Time Optimization (SSTO) shall automatically be coordinated with event scheduling. The SSTO program shall start HVAC equipment at the latest possible time that will allow the equipment to achieve the desired zone condition by time of occupancy. The SSTO program shall also shut down HVAC equipment at the earliest possible time before the end of the occupancy period, and still maintain desired comfort conditions.
 - 1) The SSTO program shall operate in both the heating and cooling seasons.
 - a) It shall be possible to apply the SSTO program to individual fan systems.
 - b) The SSTO program shall operate on both outside weather conditions as well as inside zone conditions and empirical factors.
 - 2) The SSTO program shall meet the local code requirements for minimum outside air while the building is occupied.
 - b. Event Scheduling: Provide a comprehensive menu driven program to automatically start and stop designated points or groups of points according to a stored time.
 - 1) It shall be possible to individually command a point or group of points.
 - 2) For points assigned to one common load group, it shall be possible to assign variable time delays between each successive start or stop within that group.

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- 3) The operator shall be able to define the following information:
 - a) Time, day
 - b) Commands such as on, off, auto, and so forth.
 - c) Time delays between successive commands.
 - d) There shall be provisions for manual overriding of each schedule by an appropriate operator.
- 4) It shall be possible to schedule events up to one year in advance.
 - a) Scheduling shall be calendar based.
 - b) Holidays shall allow for different schedules.
 - c) Automatic Daylight Savings Time Switchover: The system shall provide automatic time adjustment for switching to/from Daylight Savings Time.
 - d) Night setback control: The system shall provide the ability to automatically adjust setpoints for night control.
4. DDC and HVAC Mechanical Equipment Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.
 - a. A single process shall be able to incorporate measured or calculated data from any and all other DDC and HVAC Mechanical Equipment Controllers on the network. In addition, a single process shall be able to issue commands to points in any and all other DDC and HVAC Mechanical Equipment Controllers on the network. Database shall support 30 character, English language point names, structured for searching and logs.
 - b. Processes shall be able to generate operator messages and advisories to operator I/O devices. A process shall be able to directly send a message to a specified device or cause the execution of a dial-up connection to a remote device such as a printer or pager.
 - c. DDC and HVAC Mechanical Equipment Controller shall provide a HELP function key, providing enhanced context sensitive on-line help with task orientated information from the user manual.
 - d. DDC and HVAC Mechanical Equipment Controller shall be capable of comment lines for sequence of operation explanation.
5. Alarm management shall be provided to monitor and direct alarm information to operator devices. Each DDC and HVAC Mechanical Equipment Controller shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost. At no time shall the DDC and HVAC Mechanical Equipment Controllers ability to report alarms be affected by either operator or activity at a PC workstation, local I/O device or communications with other panels on the network.
 - a. All alarm or point change reports shall include the point's English language description and the time and date of occurrence.

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- b. The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of six priority levels shall be provided for each point. Point priority levels shall be combined with user definable destination categories (PC, printer, DDC Controller) to provide full flexibility in defining the handling of system alarms. Each DDC and HVAC Mechanical Equipment Controller shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point.
 - c. Alarm reports and messages will be directed to a user-defined list of operator devices or PCs based on time (after hours destinations) or based on priority.
 - d. In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 200 character alarm message to more fully describe the alarm condition or direct operator response.
 - e. In dial-up applications, operator-selected alarms shall initiate a call to a remote operator device.
6. A variety of historical data collection utilities shall be provided to manually or automatically sample, store and display system data for points as specified in the I/O summary.
- a. Any point, physical or calculated may be designated for trending. Any point, regardless of physical location in the network, may be collected and stored in each DDC and HVAC Mechanical Equipment Controllers point group. Two methods of collection shall be allowed: either by a pre-defined time interval or upon a pre-defined change of value. Sample intervals of 1 minute to seven days shall be provided. Each DDC and HVAC Mechanical Equipment Controller shall have a dedicated RAM-based buffer for trend data and shall be capable of storing a sufficient number of data samples. All trend data shall be available for transfer to a Workstation without manual intervention.
 - b. DDC and HVAC Mechanical Equipment Controllers shall also provide high resolution sampling capability for verification of control loop performance. Operator-initiated automatic and manual loop tuning algorithms shall be provided for operator-selected PID control loops as identified in the point I/O summary.
 - 1) Loop tuning shall be capable of being initiated either locally at the DDC and HVAC Mechanical Equipment Controller, from a network workstation or remotely using dial-in modems. For all loop tuning functions, access shall be limited to authorized personnel through password protection.
7. DDC and HVAC Mechanical Equipment Controllers shall be capable of automatically accumulating and storing run-time hours for digital input and output points and automatically sample, calculate and store consumption totals for analog and digital pulse input type points, as specified in the point I/O schedule.

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8. The peer to peer network shall allow the DDC and HVAC Mechanical Equipment Controllers to access any data from or send control commands and alarm reports directly to any other DDC and HVAC Mechanical Equipment Controller or combination of controllers on the network without dependence upon a central or intermediate processing device. DDC and HVAC Mechanical Equipment Controllers shall send alarm reports to multiple workstations without dependence upon a central or intermediate processing device. The peer to peer network shall also allow any DDC and HVAC Mechanical Equipment Controller to access, edit, modify, add, delete, back up, and restore all system point database and all programs.
 9. The network shall allow the DDC and HVAC Mechanical Equipment Controllers to assign a minimum of 50 passwords access and control priorities to each point individually. The logon password (at any PC workstation or portable operator terminal) shall enable the operator to monitor, adjust and control the points that the operator is authorized for. All other points shall not be displayed on the PC workstation or portable terminal (e.g. all base building and all tenant points shall be accessible to any base building operators, but only tenant points shall be accessible to tenant building operators). Passwords and priorities for every point shall be fully programmable and adjustable.
- N. Floor Level Network Application Specific Controllers (FEC)
1. Each DDC Controller shall be able to extend its performance and capacity through the use of remote application specific controllers (FECs) through Floor Level LAN Device Networks.
 2. Each FEC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each FEC shall be a microprocessor-based, multi-tasking, real-time digital control processor. Each FEC shall be capable of control of the terminal device independent of the manufacturer of the terminal device.
- O. Local User Display
1. Where specified in the sequence of operation or points list, the controllers on the peer to peer building level network shall have a display and keypad for local interface. A keypad shall be provided for interrogating and commanding points in the controller.
 2. The display shall use the same security password and access rights for points in the display as is used in the associated controller.
 3. The LCD display shall be a minimum of a 2 line 40 character display.
 4. The LCD display shall include the full point name, value (numeric, digital or state text),
 5. point priority and alarm status on one screen.
 6. The LCD shall dynamically update the value, priority, and alarm status for the point being displayed.
 7. The display shall be mounted either on the door of the enclosure or remote from the controller.

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P. Personal Computer Operator Workstation Hardware

1. Personal computer operator workstations shall be provided for command entry, information management, system monitor, alarm management and database management functions. All real-time control functions shall be resident in the DDC Controllers to facilitate greater distribution, fault tolerance and reliability of the building automation control.
 - a. Provide workstation(s): Manufactured by Dell, HP, Toshiba or equal.
 - b. Workstation shall consist of a personal computer with minimum 8.0GB RAM, hard drive with 1 TB available space, video card capable of supporting 1024 × 768 resolution with a minimum of 32 Bit color (Windows 10), DVD-ROM Drive, mouse and 101-key enhanced keyboard. Personal computer shall be a Windows 10 or 11 Professional PC and shall include a minimum latest generation Intel Core i7 3.40 GHz processor.
 - c. The PC monitor shall support a minimum display resolution of no less than 1900 X 1280 pixels and shall be minimum 19 in. LCD display. Separate controls shall be provided for color, contrasts and brightness. The screen shall be non-reflective.
 - d. Also provide separate file server with available storage capacity to accommodate trending 15 min. interval of each control point for a period of one year for data archives, minimum 1 TB capacity.
2. Provide an HP LaserJet Pro 400 Color M451dn, Cannon, Brother or equal printer at each workstation location or on the network (Ethernet) for recording alarms, operator transactions and systems reports.
3. Alarm Display shall list the alarms with highest priority at the top of the display. The alarm display shall provide selector buttons for display of the associated point graphic and message. The alarm display shall provide a mechanism for the operator to sort alarms.
4. Intranet/Internet access
 - a. Web Based Operator Interface
 - 1) The BAS shall provide a web based graphical interface that allows users to access the BAS data via the Internet, extranet, or Intranet. The interface shall use HTML based ASP pages to send and receive data from the BAS to a web browser.
 - 2) A web server computer will be supplied. The web server shall support browser access via Microsoft Internet Explorer 9.0 (or higher), or Navigator Netscape 6.0 (or higher).
 - 3) All information exchanged over Internet shall be optionally encrypted and secure via SSL (provided by Owner).
 - 4) Access to the web interface may be password protected. A users rights and privileges to points and graphics will be the same as those assigned at the BAS workstation. An option will exist to only allow users “read” access via the web browser, while maintaining “command” privileges via the BAS workstation.
 - 5) Commissioning of the Web interface shall not require modification or creation of HTML or ASP pages. All graphics available at the BAS graphical workstation shall be available to users via a web browser.

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- 6) The web-based interface shall provide the following functionality to users, based on their access and privilege rights:
 - a) Logon Screen – allows the user to enter their user name, password and Domain name for logging into the web server.
 - b) Alarm Display – a display of current BAS alarms to which the user has access will be displayed. Users will be able to acknowledge and erase active alarms, and link to additional alarm information including alarm messages, and informational and memo text. Any alarm acknowledgements initiated through the web interface will be written to the BAS central workstation activity log.
 - c) Graphic Display – Display of system graphics, including animated motion, available in the BAS workstation will be available for viewing over the web browser. Software that requires creation of dedicated “web” graphics in order to display them via the browser interface will not be acceptable. A graphic selector list will allow users to select any graphics to which they have access. Graphic displays will automatically refresh with the latest change of values. Users will have the ability to command and override points from the graphic display as determined by their user accounts rights.
 - d) Point details – users will have access to point detail information including operational status, operational priority, physical address, and alarm limits, for point objects to which they have access rights.
 - e) Point Commanding – users will be able to override and command points they have access to via the web browser interface. Any commands or overrides initiated via the web browser interface will be written to the BAS central workstation activity log.
- 7) The web server licensing options will allow concurrent access by a minimum of 10 browser connections.
- 8) Internet connections, ISP services, as well as necessary firewalls or proxy servers shall be provided by the Owner as required to support the web access feature.

Q. Workstation Operator Interface

1. Basic Interface Description

- a. Operator workstation interface software shall minimize operator training through the use of user-friendly and interactive graphical applications, 30-character English language point identification, on-line help, and industry standard Windows application software. Interface software shall simultaneously communicate with existing system and share data between the dedicated, modem autodial, and Ethernet-connected building level networks. The software shall provide, as a minimum, the following functionality:
 - 1) Real-time graphical viewing and control of the BAS environment
 - 2) Reporting
 - 3) Scheduling and override of building operations
 - 4) Collection and analysis of historical data
 - 5) Point database editing, storage and downloading of controller databases.

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- 6) Utility for combining points into logical Point Groups. The Point Groups shall then be manipulated in Graphics, trend graphs and reports in order to streamline the navigation and usability of the system.
 - 7) Alarm reporting, routing, messaging, and acknowledgment
 - 8) “Collapsible tree,” dynamic system architecture diagram application:
 - a) Showing the real-time status and definition details of all workstations and devices on a management level network
 - b) Showing the real-time status and definition details of all DDC and HVAC Mechanical Controllers at the building level
 - c) Showing the status and definition details of all field-level application controllers
 - 9) Definition and construction of dynamic color graphic displays.
 - 10) Online, context-sensitive help, including an index, glossary of terms, and the capability to search help via keyword or phrase.
 - 11) On-screen access to User Documentation, via online help or PDF-format electronic file.
 - 12) Automatic database backup at the workstation for database changes initiated at DDC Controller operator interface terminals.
- b. Provide a graphical user interface that shall minimize the use of keyboard through the use of a mouse or similar pointing device, with a "point and click" approach to menu selection and a “drag and drop” approach to inter-application navigation. Selection of applications within the workstation software shall be via a graphical toolbar menu – the application toolbar menu shall have the option to be located in a docked position on any of the four sides of the visible desktop space on the workstation display monitor, and the option to automatically hide itself from the visible monitor workspace when not being actively manipulated by the user.
- c. The software shall provide a multi-tasking type environment that allows the user to run several applications simultaneously. BAS software shall run on a Windows 7 Professional bit operating system. System database parameters shall be stored within an object-oriented database, which is compliant with the Open Database Connectivity (ODBC) or Structured Query Language (SQL) standards. Standard Windows applications shall run simultaneously with the BAS software. The mouse or Alt-Tab keys shall be used to quickly select and switch between multiple applications. The operator shall be able to work in Microsoft Word, Excel, and other Windows based software packages, while concurrently annunciating on-line BAS alarms and monitoring information
- 1) Provide functionality such that any of the following may be performed simultaneously on-line, and in any combination, via adjustable user-sized windows. Operator shall be able to drag and drop information between the following applications, reducing the number of steps to perform a desired function (e.g., Click on a point on the alarm screen and drag it to the dynamic trend graph application to initiate a dynamic trend on the desired point):
 - a) Dynamic color graphics application
 - b) Alarm management application

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- c) Scheduling application
 - d) Dynamic trend graph data plotter application
 - e) Dynamic system architecture diagram application
 - f) Control Program and Point database editing applications
 - g) Reporting applications
- 2) Report and alarm printing shall be accomplished via Windows Print Manager, allowing use of network printers.
- d. Operator-specific password access protection shall be provided to allow the administrator/manager to limit users' workstation control, display and data base manipulation capabilities as deemed appropriate for each user, based upon an assigned password. Operator privileges shall "follow" the operator to any workstation logged onto (up to 999 user accounts shall be supported). The administrator/manager shall be able to grant discrete levels of access and privileges, per user, for each point, graphic, report, schedule, and BAS workstation application. And each BAS workstation user account shall use a Windows 10 user account as a foundation.
- e. Dynamic Color Graphics application shall include the following:
- 1) Must include graphic editing and modifying capabilities
 - 2) A library of standard control application graphics and symbols must be included
 - 3) Must be able to command points directly off graphics application
 - 4) Graphic display shall include the ability to depict real-time point values dynamically with animation, picture/frame control, symbol association, or dynamic informational text-blocks.
 - 5) Navigation through various graphic screens shall be optionally achieved through a hierarchical "tree" structure
 - 6) Graphics viewing shall include zoom capabilities
 - 7) Graphics shall automatically display the HAND status of points that have been overridden by a field HAND switch, for points that have been designed to provide a field HAND override capability.
 - 8) Advanced linking within the Graphics application shall provide the ability to navigate to outside documents (e.g., .doc, .pdf, .xls), internet web addresses, e-mail, external programs, and other workstation applications, directly from the Graphics application window with a mouse-click on a customizable link symbol.
- f. Reports shall be generated on demand or via pre-defined schedule, and directed to CRT displays, printers or file. As a minimum, the system shall allow the user to easily obtain the following types of reports:
- 1) A general listing of all or selected points in the network
 - 2) List of all points currently in alarm
 - 3) List of all points currently in override status
 - 4) List of all disabled points
 - 5) List of all points currently locked out

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- 6) List of user accounts and access levels
 - 7) List all weekly schedules and events
 - 8) List of holiday programming
 - 9) List of control limits and deadbands
 - 10) Custom reports from 3rd party software
 - 11) System diagnostic reports including, list of DDC panels on line and communicating, status of all DDC terminal unit device points
 - 12) List of programs
 - 13) List of point definitions
 - 14) List of logical point groups
 - 15) List of alarm strategy definitions
 - 16) List of DDC Control panels
 - 17) Point totalization report
 - 18) Point Trend data listings
 - 19) Initial Values report
 - 20) User activity report
- g. Scheduling and override
- h. Provide a calendar type format for simplification of time and date scheduling and overrides of building operations. Schedule definitions reside in the PC workstation, DDC Controller, and HVAC Mechanical Equipment Controller to ensure time equipment scheduling when PC is off-line -- PC is not required to execute time scheduling. Provide override access through menu selection, graphical mouse action or function key. Provide the following capabilities as a minimum:
- 1) Weekly schedules
 - 2) Zone schedules
 - 3) Event schedules – an event consists of logical combinations of equipment and/or zones
 - 4) Report schedules
 - 5) Ability to schedule for a minimum of up to 365 days in advance
 - 6) Additionally, the scheduling application shall:
 - a) Provide filtering capabilities of schedules, based on name, time, frequency, and schedule type (event, zone, report)
 - b) Provide sorting capabilities of schedules, based on name, time and type of schedule (zone, event, report)
 - c) Provide searching capabilities of schedules based on name – with wildcarding options

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- i. Collection and Analysis of Historical Data
 - 1) Provide trending capabilities that allow the user to easily monitor and preserve records of system activity over an extended period of time. Any system point may be trended automatically at time-based intervals (up to four time-based definitions per point) or change of value, both of which shall be user-definable. Trend data shall be collected stored on hard disk for future diagnostics and reporting. Automatic Trend collection may be scheduled at regular intervals through the same scheduling interface as used for scheduling of zones, events, and reports. Additionally, trend data may be archived to network drives or removable disk media for future retrieval.
 - 2) Trend data reports shall be provided to allow the user to view all trended point data. Reports may be customized to include individual points or predefined groups of selected points. Provide additional functionality to allow predefined groups of up to 250 trended points to be easily transferred on-line to Microsoft Excel. DDC contractor shall provide custom designed spreadsheet reports for use by the owner to track energy usage and cost, equipment run times, equipment efficiency, and/or building environmental conditions. DDC contractor shall provide setup of custom reports including creation of data format templates for monthly or weekly reports.
 - j. The ATC contractor shall provide an additional 40 hours of ATC/BMS system programming time to assist the owner/engineer with customized programming of the ATC/BMS system due to any changes and/or modifications.
2. Dynamic Color Graphic Displays
 - a. Create color graphic floor plan displays and system schematics for each piece of mechanical equipment, including air handling units and hot water boiler systems, and room level terminal units, shall be provided by the BAS contractor as indicated in the point I/O schedule of this specification to optimize system performance, analysis and speed alarm recognition.
 - b. The operator interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection, point alarm association, or text-based commands. Graphics software shall permit the importing of Autocad or scanned pictures for use in the system.
 - c. Dynamic temperature values, humidity values, flow values and status indication shall be shown in their actual respective locations within the system schematics or graphic floor plan displays, and shall automatically update to represent current conditions without operator intervention and without pre-defined screen refresh rates.
 - 1) Provide the user the ability to display real-time point values by animated motion or custom picture control visual representation. Animation shall depict movement of mechanical equipment, or air or fluid flow. Picture Control shall depict various positions in relation to assigned point values or ranges. A library (set) of animation and picture control symbols shall be included within the workstation software's graphics application. Animation shall reflect, ON or OFF conditions, and shall also be optionally configurable for up to five rates of animation speed.

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- 2) Sizable analog bars shall be available for monitor and control of analog values; high and low alarm limit settings shall be displayed on the analog scale. The user shall be able to "click and drag" the pointer to change the setpoint.
 - 3) Provide the user the ability to display blocks of point data by defined point groups; alarm conditions shall be displayed by flashing point blocks.
 - 4) Equipment state or values can be changed by clicking on the associated point block or graphic symbol and selecting the new state (on/off) or setpoint.
 - 5) State text for digital points can be user-defined up to eight characters.
- d. Colors shall be used to indicate status and change as the status of the equipment changes. The state colors shall be user definable.
 - e. Advanced linking within the Graphics application shall provide the ability to navigate to outside documents (e.g., .doc, .pdf, .xls), internet web addresses, e-mail, external programs, and other workstation applications, directly from the Graphics application window with a mouse-click on a customizable link symbol.
 - f. The windowing environment of the PC operator workstation shall allow the user to simultaneously view several applications at a time to analyze total building operation or to allow the display of a graphic associated with an alarm to be viewed without interrupting work in progress.
 - g. Off the shelf graphic software, html web-based graphic software shall be provided to allow the user to add, modify or delete system graphic background displays.
 - h. A clipart library of HVAC application and automation symbols shall be provided including fans, valves, motors, chillers, AHU systems, standard ductwork diagrams. The user shall have the ability to add custom symbols to the clipart library. The clipart library shall include a minimum of 400 application symbols. In addition, a library consisting of a minimum of 700 graphic background templates shall be provided.
 - i. The Graphics application shall include a set of standard Terminal Equipment controller application-specific background graphic templates. Templates shall provide the automatic display of a selected Terminal Equipment controller's control values and parameters, without the need to create separate and individual graphic files for each controller.
3. System Configuration & Definition
 - a. A "Collapsible tree," dynamic system architecture diagram/display application of the site-specific BAS architecture showing status of controllers, PC workstations and networks shall be provided. This application shall include the ability to add and configure workstations, DDC Controllers or HVAC Mechanical Equipment controllers, as well as 3rd-party integrated components. Symbols/Icons representing the system architecture components shall be user-configurable and customizable, and a library of customized icons representing 3rd-party integration solutions shall be included. This application shall also include the functionality for real-time display, configuration and diagnostics of dial-up modems to DDC Controllers.

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- b. Network wide control strategies shall not be restricted to a single DDC Controller or HVAC Mechanical Equipment controller, but shall be able to include data from any and all other network panels to allow the development of Global control strategies.
 - c. Provide automatic backup and restore of all DDC controller and HVAC Mechanical Equipment controller databases on the workstation hard disk. In addition, all database changes shall be performed while the workstation is on-line without disrupting other system operations. Changes shall be automatically recorded and downloaded to the appropriate DDC Controller or HVAC Mechanical Equipment Controller. Changes made at the user-interface of DDC Controllers or HVAC Mechanical Equipment Controllers shall be automatically uploaded to the workstation, ensuring system continuity.
 - d. System configuration, programming, editing, graphics generation shall be performed on-line. If programming and system back-up must be done with the PC workstation off-line, the BAS contractor shall provide at least 2 operator workstations.
 - e. Point database configuration shall be available to the user within a dedicated point database editor application included in the workstation software. The editor shall allow the user to create, view existing, modify, copy, and delete points from the database. The point editor shall also allow the user to configure the alarm management strategy for each point. The editor shall provide the option for editing the point database in an online or offline mode with the DDC Controllers.
 - 1) The workstation software shall also provide the capability to perform bulk modification of point definition attributes to a single or multiple user-selected points. This function shall allow the user to choose the properties to copy from a selected point to another point or set of points. The selectable attributes shall include, but are not limited to, Alarm management definitions and Trend definitions.
4. Alarm Management
- a. Alarm Routing shall allow the user to send alarm notification to selected printers or workstation location(s) based on time of day, alarm severity, or point type.
 - b. Alarm Notification shall be presented to each workstation in a tabular format application, and shall include the following information for each alarm point: name, value, alarm time and date, alarm status, priority, acknowledgement information, and alarm count. Each alarm point or priority shall have the ability to sound a discrete audible notification.
 - c. Alarm Display shall have the ability to list and sort the alarms based on alarm status, point name, ascending or descending alarm time.
 - d. Directly from the Alarm Display, the user shall have the ability to acknowledge, silence the alarm sound, print, or erase each alarm. The interface shall also have the option to inhibit the erasing of active acknowledged alarms, until they have returned to normal status. The user shall also have the ability to command, launch an associated graphic or trended graphical plot, or run a report on a selected alarm point directly on the Alarm Display.

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- e. Each alarm point shall have a direct link from the Alarm Display to further user-defined point informational data. The user shall have the ability to also associate real-time electronic annotations or notes to each alarm.
- f. Alarm messages shall be customizable for each point, or each alarm priority level, to display detailed instructions to the user regarding actions to take in the event of an alarm. Alarm messages shall also have the optional ability to individually enunciate on the workstation display via a separate pop-up window, automatically being generated as the associated alarm condition occurs.
- g. Alarm Display application shall allow workstation operators to send and receive real-time messages to each other, for purposes of coordinating Alarm and BAS system management.
- h. Remote notification of messages
 - 1) Workstation shall be configured to send out messages to numeric pagers, alphanumeric pagers, phones (via text to speech technology), SMS (Simple Messaging Service, text messaging) Devices, and email accounts based on a point's alarm condition.
 - 2) There shall be no limit to the number of points that can be configured for remote notification of alarm conditions and no limit on the number of remote devices which can receive messages from the system.
 - 3) On a per point basis, system shall be configurable to send messages to an individual or group and shall be configurable to send different messages to different remote devices based on alarm message priority level.
 - 4) Remote devices may be scheduled as to when they receive messages from the system to account for operators' work schedules.
 - 5) System must be configurable to send messages to an escalation list so that if the first device does not respond, the message is sent on to the next device after a configurable time has elapsed.
 - 6) Message detail shall be configurable on a per user basis.
 - 7) During a "flood" of alarms, remote notification messages shall have the ability to optimize several alarms into an individual remote notification message.
 - 8) Workstation shall have the ability to send manual messages allowing an operator to type in a message to be sent immediately.
 - 9) Workstation shall have a feature to send a heartbeat message to periodically notify users that they have communication with the system.

R. Field Devices

- 1. Provide instrumentation as required for monitoring, control or optimization functions.

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2. Room Temperature Sensors

- a. Areas shall be provided with digital room sensors for temperature and shall have LCD display, day / night override button, and setpoint slide adjustment. The setpoint slide adjustment can be software limited by the automation system to limit the amount of room adjustment. Public areas such as corridors, entry areas, vestibules, restrooms shall have chrome cover plate temperature sensors without adjustment or occupied/unoccupied capability. All temperature sensors shall be BACnet compatible network type.

Temperature monitoring range +20/120 deg. F -13 deg. to 49 deg. C)

Output signal

Changing resistance

Accuracy at Calibration point +0.5 deg. F (+/- 0.3 deg. C)

Set Point and Display Range 55 deg. to 95 deg. F (13 deg. to 35 deg. C)

3. Liquid immersion temperature:

- a. Temperature monitoring range +30/250 deg. F (-1 deg. /121 deg. C)
b. Output signal Changing resistance
c. Accuracy at Calibration point +0.5 deg. F (+/-0.3 deg. C)

4. Duct (single point) temperature:

- a. Temperature monitoring range +20/120 deg. F (-7 deg. /49 deg. C)
b. Output signal Changing resistance
c. Accuracy at Calibration point +0.5 deg. F (+/-0.3 deg. C)

5. Duct Average temperature:

- a. Temperature monitoring range +20 deg.+120 deg.F(-7 deg./+49 deg. C)
b. Output signal 4 – 20 mA DC
c. Accuracy at Calibration point +0.5 deg. F (+03 deg. C)
d. Sensor Probe Length 25 ft. L (7.3m)

6. Outside air temperature:

- a. Temperature monitoring range -58deg.+122deg.F(-50deg.Cto 50deg.C)
b. Output signal 4 – 20 mA DC
c. Accuracy at Calibration point +0.5 deg. F (+/-0.3 deg. C)

7. Liquid Differential Pressure Transmitter

- a. Ranges 0-5/30 in. H20
0-25/150 in. H20
0-125/750 in. H20
b. Output 4 – 20 mA DC
c. Calibration Adjustments Zero and span
d. Accuracy +-0.2 percent of span
e. Linearity +-0.1 percent of span
f. Hysteresis +-0.05 percent of span

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8. Differential pressure:
 - a. Unit for fluid flow proof shall be Penn P74.
 - b. Range 8 to 70 psi
 - c. Differential 3 psi
 - d. Maximum differential pressure 200 psi
 - e. Maximum pressure 325 psi
 - f. Unit for air flow settings.
 - g. Set point ranges:
 - 0.5 in. WG to 1.0 in. W (124.4 to 248.8 Pa)
 - 1.0 in. WG to 12.0 in. WG (248.8 to 497.6 Pa)

9. Static pressure sensor:
 - a. Range
 - 0 to .5 in.WG (0 to 124.4 Pa)
 - 0 to 1 in. WG (0 to 248.8 Pa)
 - 0 to 2 in. WG (0 to 497.7 Pa)
 - 0 to 5" in.WG (0 to 1.2 kPa)
 - 0 to 10" WG (0 to 2.5 kPa)
 - b. Output Signal 4 – 20 mA VDC
 - c. Combined static error 0.5 percent full range
 - d. Operating Temperature -40 deg. to 175 deg. F (-40 deg. C to 79.5 deg. C)

10. Air Pressure Sensor:
 - a. Range:
 - 0 to 0.1 in. water (0 to 24.9 Pa)
 - 0 to 0.25 in. water (0 to 63.2 Pa)
 - 0 to 0.5 in. water (0 to 124.5 Pa)
 - 0 to 1.0 in. water (o to 249 Pa)
 - 0 to 2.0 in water 90 to 498 Pa)
 - 0 to 5.0 in. water (0 to 1.25 kPa)
 - 0 to 10.0 in. water (0 to 2.49 kPa)
 - b. Output signal 4 to 20 mA
Accuracy +1.0 percent of full scale

11. Humidity Sensors: All room/zone humidity sensors shall be BACnet compatible network type.
 - a. Range 0 to 100 percent RH
 - b. Sensing Element Bulk Polymer
 - c. Output Signal 4 – 20 mA DC
 - d. Accuracy At 77 deg. F (25 deg. C) + 2 percent RH

12. Humidistat:
 - a. Range 0 to 100 percent RH

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- b. Sensing Element Bulk Polymer
- c. Output Signal 4 – 20 mA DC
- d. Accuracy At 77 deg. F(25 deg. C) + 2 percent RH
- 13. Insertion Flow Meters (Equal to Onicon F-5300)
 - a. Sensing Method Impedance Sensing
 - b. Accuracy + 2 percent of Actual Reading
 - c. Maximum Operating Pressure 400 PSI
 - d. Output Signal 4 – 20 mA
 - e. Bi-directional where required.
- 14. Pressure to Current Transducer
 - a. Range 3 to 15 psig (21 to 103 kPa) or
3 to 30 psig (21 to 207 kPa)
 - b. Output signal 4 – 20 mA
 - c. Accuracy + 1 percent of full scale (+ 0.3 psig)
- 15. Carbon Dioxide Sensor : All room/zone CO2 & duct mounted sensors shall be BACnet compatible network type and shall have a minimum 5 year calibration period.
 - a. Range 0 to 1500 ppm
 - b. Accuracy 20+ ppm
- 16. Control Valves (all control valves shall have electric actuators with position feedback to provide confirmation of valve position).
 - a. Electric Control
 - 1) Rangeability 40:1
 - 2) Flow Characteristics Modified. Equal percentage
 - 3) Control Action Normal open for hot water and normal closed for cooling
 - 4) Medium Steam, water, glycol
 - 5) Body Type Screwed ends 2 in. and smaller, flanged
Valves 2½ in. and larger
 - 6) Body Material Bronze
 - 7) Body Trim Bronze
 - 8) Stem Stainless Steel
 - 9) Actuator 0-10 VDC, 4-20 MA or 2 position
24 VAC/120VAC – Modulating for all hot water and chilled water valves with a GPM value of 1 or above, 2 position valves for all GPM's under 1.
 - b. All automatic temperature control valves in water lines shall be provided with Characterized throttling plugs and shall be sized for minimum 25 percent of the system pressure drop or three psi, whichever is less.

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- 1) Positive positioning relays shall be provided on pneumatic control when required to provide sufficient power for sequencing.
- 2) Two position valves shall be line size.

17. Damper Actuators

- a. Electric control shall be direct coupled actuators with position feedback to BMS.
- b. Damper actuators shall be Brushless DC Motor Technology with stall protection, bi-directional, fail safe spring return, all metal housing, manual override, independently adjustable dual auxiliary switch.
 - 1) The actuator assembly shall include the necessary hardware and proper mounting and connection to a standard ½ in. diameter shaft or damper blade.
- c. Actuators shall be designed for mounting directly to the damper shaft without the need for connecting linkages.
- d. All actuators having more than 100 lb-in torque output shall have a self-centering damper shaft clamp that guarantees concentric alignment of the actuator's output coupling with the damper shaft. The self-centering clamp shall have a pair of opposed "v" shaped toothed cradles; each having two rows of teeth to maximize holding strength. A single clamping bolt shall simultaneously drive both cradles into contact with the damper shaft.
- e. All actuators having more than a 100 lb-in torque output shall accept a 1 in. diameter shaft directly, without the need for auxiliary adapters.
- f. All actuators shall be designed and manufactured by Belimo or approved equal using ISO900 registered procedures, and shall be Listed under Standards UL873 and CSA22.2 No. 24-93 1.

S. Miscellaneous Devices

1. Thermostats (Stand-alone electric type - only where specified or indicated on drawings)
 - a. Room thermostats shall be of the gradual acting type with adjustable sensitivity.
 - b. They shall have a bi-metal sensing element capable of responding to a temperature change of one-tenth of one degree. (Provide all thermostats with limit stops to limit adjustments as required.)
 - c. Thermostats shall be arranged for either horizontal or vertical mounting.
 - d. In the vertical position thermostat shall fit on a mullion of movable partitions without overlap.
 - e. Mount the thermostat covers with tamper-proof socket head screws.
2. Freezestats:
 - a. Install freezestats on each coil that mixes outside and return air (air handling units, fan coils, unit ventilators) and provide protection for every square foot of coil surface area with one linear foot of element per square foot of coil.
 - 1) Upon detection of low temperature, the freezestats shall stop the associated supply fans and return the automatic dampers to their normal position close outside air dampers and open coil valve for full flow. Provide manual reset.
3. Firestats:
 - a. Provide manual reset, fixed temperature line voltage type with a bi-metal actuated switch.

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- 1) Switch shall have adequate rating for required load.
4. Current Sensing Relay:
 - a. Provide solid-state, adjustable, current operated relay. Provide a relay which changes switch contact state in response to an adjustable set point value of current in the monitored A/C circuit.
 - b. Adjust the relay switch point so that the relay responds to motor operation under load as an “on” state and so that the relay responds to an unloaded running motor as an “off” state. A motor with a broken belt is considered an unloaded motor.
 - c. Provide for status device for all fans and pumps.
 - T. Manufacturers: Subject to compliance with requirements, provide an automatic temperature control and building management system of one of the following:
 1. Johnson Controls
 2. Honeywell
 3. Sneider Electric
 4. Delta Controls
 5. Or equal
 - U. SEQUENCE OF OPERATIONS: Refer to Control drawings for sequence of operations.

PART 3 - EXECUTION

3.1 ATTIC STOCK

- A. Rooftop Units
 1. Four additional complete extra sets of pre and final filters for each RTU/ ERV/ HV/ AHU for attic stock. All these filters indicated above including the four sets of attic stock are additional to those provided for flush out and indoor air quality requirements per LEED requirements.
 2. Provide one spare set of belts for each belt-driven air handling unit.
 3. Obtain receipt from Owner that attic stock provided.
- B. Power and Gravity Ventilators
 1. Furnish to Owner, with receipt, one spare set of belts for each belt driven power ventilator
- C. Ductwork Accessories
 1. Furnish extra fusible links to owner, one link for every 10 installed of each temperature range; obtain receipt.

3.2 INSTALLATION OF VALVES

- A. Examine valve interior through the end ports, for cleanliness, freedom from foreign matter and corrosion. Remove special packing materials, such as blocks used which prevents disc movement during shipping and handling.

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- B. Actuate valve through an open-close and close-open cycle. Examine functionally significant features, such as guides and seats made accessible by such actuation. Following examination, return the valve closure member to the position in which it was shipped.
- C. Examine threads on both the valve and the mating pipe for form (out-of-round or local indentation) and cleanliness.
- D. Examine mating flange faces for conditions which might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size and material, and for freedom from defects and damage.
- E. Prior to valve installation, examine the piping for cleanliness, freedom from foreign materials, and proper alignment.
- F. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select valves with the following ends or types of pipe/tube connections:
 - 1. Copper Tube 2" and smaller (Heating Hot Water and Low Pressure Steam): Solder ends.
 - 2. Steel Pipe Sizes 2" and smaller: Threaded or grooved-end.
 - 3. Steel Pipes Sizes 2-1/2" and larger: Grooved-end or welded.
- G. Valve Installation:
 - 1. Locate valves for easy access and provide separate support where necessary.
 - 2. Install valves and unions for each fixture and item of equipment in a manner to allow equipment removal without system shut-down. Unions are not required on flanged devices.
 - 3. Install valves in horizontal piping with the stem at or above the center of the pipe.
 - 4. Installation of Check Valves: Install for proper direction of flow as follows:
 - a. Swing Check Valves: Install in horizontal position with hinge pin level.
 - b. Wafer Check Valves: Install between 2 flanges in horizontal or vertical position.
 - c. Lift Check Valves: Install in piping line with stem upright and plumb.
- H. Threaded Connections:
 - 1. Note the internal length of threads in valve ends, and proximity of valve internal seat or wall, to determine how far pipe should be threaded into valve.
 - 2. Align threads at point of assembly.
 - 3. Apply appropriate tape or thread compound to the external pipe threads (except where dry seal threading is specified).
 - 4. Assemble joint wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.
- I. Flanged Connections:
 - 1. Align flanges surfaces parallel.
 - 2. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using a torque wrench.

- J. Grooved Connections:
 - 1. Installation shall be in accordance with the latest published instructions from the manufacturer.
- K. Field Quality Control:
 - 1. Testing: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks; replace valve if leak persists.
- L. Adjusting and Cleaning:
 - 1. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare to receive painting or insulation.

3.3 INSTALLATION OF METERS AND GAUGES

- A. Installation of Temperature Gauges:
 - 1. General: Install temperature gauges in vertical upright position, and tilted so as to be easily read by observer standing on floor.
 - 2. Temperature Gauge Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure Cap.
- B. Installation of Pressure Gauges:
 - 1. General: Install pressure gauges in piping tee with pressure gauge located on pipe at most readable position.
 - 2. Pressure Gauge Cocks: Install in piping tee with snubber. Install siphon for steam pressure gauges.
- C. Installation of Flow Measuring Fittings:
 - 1. General: Install flow measure fittings in piping systems located in accessible locations.
- D. Adjusting and Cleaning:
 - 1. Adjusting: Adjust faces of meters and gauges to proper angle for best visibility.
 - 2. Cleaning: Clean windows of meters and gauges and factory-finished surfaces. Replace cracked or broken windows, repair any scratched or marred surfaces with manufacturer's touch-up paint.

3.4 INSTALLATION OF HANGERS & ATTACHMENTS

- A. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- B. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors, and other building structural attachments.

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- C. Prior to installation of hangers, supports, anchors, and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, inspection and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect/Engineer for purposes of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.
- D. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through the openings at the tops of inserts.
- E. Install hangers, supports, clamps, and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.
 - 1. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
 - 2. Prevent electrolysis in support of copper tubing by the use of hangers and supports which are copper plated, or by other recognized industry methods.
 - 3. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
 - 4. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
 - 5. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.
 - 6. Insulated Piping: Comply with the following installation requirements:
 - a. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
 - b. Shields: For pipe sizes up to and including 4" provide heavy gauge shield at each hanger point.
 - c. Saddles: For all pipe sizes over 4" provide saddle at each hanger point. Completely fill void in saddle with loose insulation.
- F. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer for loading and stresses to connected equipment.
- G. Fabricate and install anchor by welding steel shapes, plates, and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.

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- H. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximums recommended by manufacturer for each unit.
- I. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.
- J. Provide concrete housekeeping bases for all floor-mounted equipment. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.
- K. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands.
- L. Adjusting and Cleaning:
 - 1. Hanger Adjustment: Adjust hangers so as to distribute loads equally on attachments.
 - 2. Support Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.
 - 3. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.5 INSTALLATION OF MECHANICAL IDENTIFICATION

- A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
- B. General: Install pipe markers of the following type on each system indicated to receive identification, and include arrows to show normal direction of flow:
 - 1. Plastic pipe markers, with application system as indicated. Install on pipe insulation segment where required for hot non-insulated pipes.
- C. Locate pipe markers and color bands as follows wherever piping is in or above occupied spaces or corridors, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
 - 1. Near each valve and control device.
 - 2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
 - 3. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
 - 4. At access doors, manholes and similar access points which permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.

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6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
7. On piping above removable acoustical ceilings.

D. Valve Identification:

1. General: Provide valve tag on every valve, cock, and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.
2. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by Architect/Engineer.

E. Mechanical Equipment Identification:

1. General: Install engraved plastic laminate sign or plastic equipment marker on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device.
2. Lettering Size: Minimum 1/4" high lettering for name of unit where viewing distance is less than 2' - 0", 1/2" high for distances up to 6' - 0", and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 of size of the principal lettering.

F. Adjusting and Cleaning:

1. Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.
2. Cleaning: Clean face of identification devices, and glass frames of valve charts.

3.6 INSTALLATION OF MECHANICAL INSULATION

A. Installation of Piping Insulation:

1. Insulation Omitted: Omit insulation on hot piping within radiation enclosures or unit cabinets; on cold piping within unit cabinets provided piping is located over drain pan; on heating piping beyond control valve, located within heated space; on condensate piping between steam trap and union; and on unions, flanges, strainers, flexible connections, and expansion joints. (Couplings in mechanical grooved systems will be insulated.)
2. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
3. Install insulation on pipe systems subsequent to installation of heat tracing, painting, testing, and acceptance tests.
4. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with a single cut piece to complete run. Do not use cut pieces or scraps abutting each other.
5. Clean and dry pipe surfaces prior to insulating. Butt installation joints firmly together to ensure a complete and tight fit over surfaces to be covered.
6. Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.

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7. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.
8. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.
9. Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.

B. Installation of Ductwork Insulation:

1. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
2. Install insulation materials with smooth and even surfaces.
3. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
4. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.
5. Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except where otherwise indicated.
6. Lined Ductwork: Except as otherwise indicated, omit insulation on ductwork where internal insulation or sound absorbing linings have been installed.

C. Protection and Replacement:

1. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
2. Protection; Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

3.7 INSTALLATION OF HYDRONIC PIPING AND ACCESSORIES

A. Piping Installations:

1. Locations and Arrangements: Drawings indicate the general location and arrangement of piping systems. Locations and arrangements of piping take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design consideration. So far as practical, install piping as indicated.
2. Install piping at a uniform grade of 1 in. in 40 ft. upward in the direction of flow.
3. Make reductions in pipe sizes using eccentric reducer fitting installed with the level side up.
4. Install branch connections to mains using Tee fittings in main with take-off out the bottom, except for up-freed risers which shall have take-off out the top of the main line.
5. Install unions in pipes 2 in. and smaller, adjacent to each valve, at final connections of each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

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6. Install flanges on valves, apparatus, and equipment having 2-1/2 in. and larger connections.
7. Install strainers on the supply side of each control valve, pressure reducing valve, pressure regulating valve, solenoid valve, inline pump, and elsewhere as indicated. Install nipple and ball valve in blow down connection of strainers 2 in. and larger.
8. Anchor piping to ensure proper direction of expansion and contraction. Expansion loops and joints are indicated on the Drawings.
9. Install pipe sleeves at all wall and floor penetrations.
10. Install escutcheons at all exposed pipe wall penetrations.
11. Provide Dielectric couplings at all dissimilar piping/valve connections.

B. Pipe Applications:

1. **Copper Tubing:** Use Type L, drawn copper tubing with wrought copper fittings and solder joints for 2 in. and smaller, above ground, within building. Use Type K, annealed temper copper tubing for 2 in. and smaller without joints, below ground or within slabs. Mechanical fittings (crimp or flair) are not permitted.
2. **Steel Pipe:** Use steel pipe with threaded joints and fittings for 2 in. and smaller, and with welded joints for 2-1/2 in. and larger.
3. **Steel Pipe:** Use mechanical grooved end steel pipe and mechanical couplings and fittings.

C. Grooved Pipe Ends and Fittings:

1. Roll Groove pipe ends in accordance with the latest published instructions from manufacturer of grooved couplings.
2. Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. All grooved system components shall be of same manufacturer. Use grooved-end fittings and rigid or flexible, where required, grooved-end-pipe couplings. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.
3. **Training**
 - a. The grooved coupling manufacturer's (the "manufacturer") factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and installation of groove joints products.
 - b. **IACET/Training:** A factory trained manufacturer's representative (direct employee) shall provide on-site training of contractor's field personnel in the use of grooving tools, application of groove, and product installation in compliance with the following:
 - 1) Manufacture must be accredited by the International Association for Continuing Education and Training (IACET).
 - 2) IACET Accredited Provider status demonstrates that the manufacture complies with the ANSI/IACET standard, which is recognized internationally as a standard of excellence in instructional practices.

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4. Inspection
 - a. A manufacturer's factory trained representative shall periodically visit the job site and review the installation for best practices. The installing Contractor shall correct any identified deficiencies.
 - b. The grooved fittings manufacturer's product that has been examined and has not met the visual inspection criteria for proper installation must be corrected and re-examined by Inspection Services prior to the completion of the project. Any Victaulic product that has not been corrected or was not examined will not be considered as part of the successful completion of Inspection Services.
5. Application
 - a. Upon completion of the manufacturer's inspection of the installation and any identified corrections, the manufacturer may provide the Owner or purchaser with a limited warranty on manufacturer's products.

D. Valve Applications:

1. General Duty Valve Applications: The Drawings indicate valve types to be used. Where specific valve types are not indicated the following requirements apply:
 - a. Shut-Off Duty: Use gate, and ball, valves.
 - b. Throttling Duty: Use globe, ball, and plug valves.
2. Install drain valves at low points in mains, risers, branch lines, and elsewhere as required for system drainage.
3. Install pump discharge valves with stem in upward position; allow clearance above stem for check mechanism removal.
4. Install safety relief valve on hot water generators, and elsewhere as required by ASME Boiler and Pressure Vessel Code. Pipe discharge to floor without valves. Comply with ASME Boiler and Pressure Vessel Code Section VIII, Division 1 for installation requirements.
5. Install pressure reducing valves on hot water generators, and elsewhere as required to regulate system pressure.
6. Install isolation valves in all branch supply take-offs from piping mains which serve more than two terminal heating or cooling units. Provide balancing valve with positive shut off in all return branch take-offs which serve more than two terminal heating or cooling units. Provide isolation valves in floor supply main piping lines and balancing valves with positive shut-off in all floor return main piping take-offs.

E. Hydronic Specialties Installation:

1. Install automatic air vents at high points in the system, heat transfer coils, and elsewhere as required for system air venting. Install air vents with cocks such that vents can be removed without draining system.
2. Install combination separator/strainer in pump suction lines. Run piping to compression tank with 1/4 in. per foot (two percent) upward slope towards tank. Install blowdown piping with gate valve; extend to nearest drain.
3. Install pump suction diffusers on pump suction inlet, adjust foot support to carry weight of suction piping. Install nipple and ball valve in blowdown connection.

F. Adjusting and Cleaning:

1. Clean and flush hydronic piping systems. Remove, clean, and replace strainer screens. After cleaning and flushing hydronic piping system, but before balancing, remove disposable fine mesh strainers in pump suction diffusers.
2. Chemical Treatment: Provide a water analysis prepared by the chemical treatment supplier to determine the type and level of chemicals required for prevention of scale and corrosion. Perform initial treatment after completion of system testing.

3.8 INSTALLATION OF TERMINAL HEATING UNITS (HYDRONIC)

A. Vibration Control and Seismic Restraint: Refer to section 230548 and drawing VS-1 for the appropriate support of each piece of HVAC equipment noted as requiring such. The vibration control and seismic restraint manufacturer shall recommend the correct connection and device as outlined in section 230548 and drawing VS-1.

B. Installation of Finned Tube Radiation: (Hydronic)

1. General: Install finned tube radiation as indicated, and in accordance with manufacturer's installation instructions.
2. Locate finned tube radiation as indicated, run cover wall-to-wall unless otherwise indicated. Provide butt caps, splice joints, "Z" bends etc. for a complete installation.
3. Install access panels centered in front of each shutoff valve, balancing cock, steam trap, or temperature control valve.

C. Installation of Horizontal Unit Heaters: (Hydronic)

1. General: Install unit heaters as indicated, and in accordance with manufacturer's installation instructions.
2. Uncrate units and inspect for damage. Verify that nameplate data corresponds with unit designation.
3. Hang units from building substrate, not from piping. Mount as high as possible to maintain greatest headroom possible unless otherwise indicated.
4. Support units with rod-type hangers anchored to building substrate.
5. Install piping as indicated.
6. Protect units with protective covers during balance of construction.

D. Installation of Radiant Panels & Radiation Wall Units:

1. Install components level and plumb. Maintain sufficient clearance for normal services, maintenance, or in accordance with construction drawings.
2. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
 - a. Verify that controls and control enclosure are accessible.
 - b. Verify that control connections are complete to control valves as needed.
 - c. Verify that any identification tags are visible.
 - d. Verify that controls respond to inputs as specified.

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3. Connections
 - a. Piping installation requirements are specified in other Division 23 Sections. Drawings indicated general arrangement of piping, fittings, and specialties.
 - b. Install piping adjacent to radiant panels to allow for service and maintenance.
 - c. In addition to Division 23 Section "Hydronic Piping", connect copper tubing to supply with shut-off valve, strainer, control valve, and union or flange, and return pipe with balancing valve and union or flange.

 4. Field Quality Control
 - a. Perform the following field tests and inspections and prepare test reports:
 - 1) Leak Test: After installation, fill water tubes and test for leaks. Repair leaks and retest until no leaks exist.
 - 2) Operational Test: After electrical circuitry has been energized, start units to conform to proper unit operation.
 - 3) Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - b. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field assembled components and equipment installation, including connections, and to assist in field testing. Report any findings in writing.
 - c. Remove and replace malfunctioning units and retest as specified above.

 5. Cleaning and Protection
 - a. Clean all visible surfaces of equipment; touch up as required.
 - b. Protect all units before, during and after installation. Damaged materials due to improper protection shall be cause for rejection.

 6. Construction Phase Services
 - a. Manufacturer or factory-authorized representative shall visit the site regularly during the installation process to ensure proper means and methods are being employed. Bid shall include the cost of a minimum of two (2) such visits.
 - b. Manufacturer or factory-authorized representative shall provide start-up and training services to owners/staff to adjust, operate, and maintain radiant panels.
- E. Installation of Cabinet Unit Heaters (Hydronic):
1. General: Install cabinet heaters as indicated, and in accordance with manufacturer's installation instructions.
 2. Coordinate with other trades to assure correct recess size for recessed units.
 3. Install piping as indicated.
 4. Protect units with protective covers during balance of construction.
- F. Installation of Fan-Coil Units: (Hydronic/Vertical Upright)
1. General: Install fan-coil units as indicated, and in accordance with manufacturer's installation instructions.
 2. Coordinate with other trades to assure correct recess size for recessed units.
 3. Install piping as indicated.
 4. Protect units with protective covers during balance of construction.

G. Adjusting and Cleaning:

1. General: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean terminal coils and inside of cabinets.
2. Retouch any marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.
3. Install new filter units for terminals requiring same.

3.9 INSTALLATION OF DUCTLESS COOLING UNIT SYSTEMS

A. Vibration Control and Seismic Restraint: Refer to section 23 05 48 and drawing VS-1 for the appropriate support of each piece of HVAC equipment noted as requiring such. The vibration control and seismic restraint manufacturer shall recommend the correct connection and device as outlined in section 23 05 48 and drawing VS-1.

B. General:

1. Verify all dimensions by field measurements. Verify roof structure, mounting supports, wall structure, and membrane installations are completed to the proper point to allow installation of wall mounted and roof mounted units. Examine rough-in for refrigerant piping systems to verify actual locations of piping connections prior to installation. Do not proceed until unsatisfactory conditions have been corrected.
2. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

C. Field Quality Control:

1. Provide the services, to include a written report, of a factory authorized service representative to examine the field assembly of the components, installation, and piping and electrical connections.
2. Charge systems with refrigerant and oil, and test for leaks. Repair leaks and replace lost refrigerant and oil.

D. Demonstration:

1. Provide the services of a factory authorized service representative to provide start-up service and to demonstrate and train the Owner's maintenance personnel as specified below.
2. Start-up service: Place units into operation and adjust controls and safeties. Replace Damaged Or Malfunctioning Components And Controls.

E. Training:

1. Train the Owner's maintenance personnel on start-up and shut-down procedures, troubleshooting procedures, and servicing and preventative maintenance schedules and procedures.
2. Schedule training with Owner through the Architect/Engineer with at least seven days prior notice.

3.10 INSTALLATION OF POWER AND GRAVITY VENTILATORS

- A. Vibration Control and Seismic Restraint: Refer to section 230548 and drawing VS-1 for the appropriate support of each piece of HVAC equipment noted as requiring such. The vibration control and seismic restraint manufacturer shall recommend the correct connection and device as outlined in section 230548 and drawing VS-1.
- B. General: Except as otherwise indicated or specified, install ventilators in accordance with manufacturer's installation instructions and recognized industry practices to insure that products serve the intended function.
- C. Coordinate ventilator work with work of roofing, walls and ceilings, as necessary for proper interfacing.
- D. Ductwork: Connect ducts to ventilators in accordance with manufacturer's installation instruction, and details on drawings.
- E. Roof Curbs: Furnish roof curbs to roofing Installer for installation.
- F. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
 - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Verify proper rotation direction of fan wheels. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
- G. Remove shipping bolts and temporary supports within ventilators. Adjust dampers for free operation.
- H. Testing: After installation of ventilators has been completed, test each ventilator to demonstrate proper operation of unit at performance requirements specified. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.
- I. Cleaning: Clean factory-finished surface. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
- J. General: Furnish to Owner, with receipt, one spare set of belts for each belt driven power ventilator.

3.11 INSTALLATION OF EXTRUDED ALUMINUM RAIN RESISTANT WALL LOUVERS

- A. HVAC Contractor is responsible for installation of Louvers in accordance with the following:
 - 1. Examination
 - a. Inspect areas to receive louvers. Notify the Architect of conditions that would adversely affect the installation or subsequent utilization of the louvers. Do not proceed with installation until unsatisfactory conditions are corrected.

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- b. Notify Architect of unsatisfactory preparation before proceeding.
- 2. Preparation
 - a. Clean opening 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.
- 3. Installation
 - a. Install louvers at locations indicated on the drawings and in accordance with manufacturer's instructions.
 - b. Install louvers plumb, level, in plane of wall, and in alignment with adjacent work.
 - c. Install joint sealants as specified in Section 079200.
- 4. Cleaning
 - a. Clean louver surfaces in accordance with manufacturer's instructions.
 - b. Touch-up, repair or replace damaged products before Substantial Completion.

3.12 INSTALLATION OF DUCT MOUNTED HOT WATER COIL

- A. Vibration Control and Seismic Restraint: Refer to Section 230548 and Drawing VS-1 for the appropriate support of each piece of HVAC equipment noted as requiring such. The vibration control and seismic restraint manufacturer shall recommend the correct connection and device as outlined in Section 230548 and Drawing VS-1.
- B. General: Install unit heaters as indicated, and in accordance with manufacturer's installation instructions.
- C. Uncrate units and inspect for damage. Verify that nameplate data corresponds with unit designation.
- D. Hang units from building substrate, not from piping. Mount as high as possible to maintain greatest headroom possible unless otherwise indicated.
- E. Support units with rod-type hangers anchored to building substrate.
- F. Install piping as indicated.
- G. Protect units with protective covers during balance of construction.
- H. Adjusting & Cleaning:
 - 1. General: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean terminal coils and inside of cabinets.
 - 2. Retouch any marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

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- I. HVAC subcontractor shall own Replacement of construction filters with balancing filters during the balancing operations. Replace balancing filters with new filters immediately prior to occupancy. Also provide four additional complete extra sets of pre and final filters for attic stock. All these filters indicated above including the four sets of attic stock are additional to those provided for flush out and indoor air quality requirements per LEED requirements. Obtain receipt from Owner that new filters have been installed at substantial completion and attic stock provided.

3.13 INSTALLATION OF VARIABLE AIR VOLUME BOXES

- A. **VIBRATION CONTROL AND SEISMIC RESTRAINT:** Refer to section 23 05 48 and drawing VS-1 for the appropriate support of each piece of HVAC equipment noted as requiring such. The vibration control and seismic restraint manufacturer shall recommend the correct connection and device as outlined in section 23 05 48 and drawing VS-1.
- B. **General:** Install variable air volume boxes as indicated, and in accordance with manufacturer's installation instructions.
- C. **Location:** Install each unit level and accurately in position indicated in relation to other work; and maintain sufficient clearance for normal service and maintenance, but in no case less than that recommended by manufacturer.
- D. Install all transformers within junction boxes and maintain three foot clearance in front per the electrical code. This will allow the VAV control box to only utilize low voltage wiring and not be susceptible to the three foot clearance requirement by the electrical code.
- E. **Report:**
 1. **Format:** Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
 - a. General Information and Summary.
 - b. Air Systems.
 - c. Hydronic heating and cooling systems.
 - d. Temperature Control Systems.
 2. **Contents:** Provide the following minimum information, forms and data:
 - a. **General Information and Summary:** Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Architect, Engineer, and Project. Include addresses, and contact names and telephone numbers. Also include a certification sheet containing the seal and name address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentation used for the procedures along with the proof of calibration.

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- b. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC for each respective item and system.
- c. Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

F. Quality Assurance:

- 1. An independent testing, adjusting, and balancing agency certified by the AABC or NEBB as a Test and Balance Engineer in those testing and balancing disciplines required for this project.
- 2. Codes and Standards:
 - a. AABC: "National Standards For Total System Balance".
 - b. ASHRAE: ASHRAE Handbook, 1984 Systems Volume, Chapter 37, Testing, Adjusting, and Balancing.
 - c. NEBB (National Environmental Balancing Bureau: "Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems" (Latest Edition)
- 3. Pre-Balancing Conference: Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a conference with the Architect/Engineer and Mechanical Contractor. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting, and balancing.
- 4. System Operation: Systems shall be fully operational prior to beginning procedures. All new automatic temperature controls shall be fully operational. Test, adjust and balance the air systems before refrigerant systems. Test, adjust and balance air conditioning systems during summer season, and heating systems during winter season, including at least a period of operation at outside conditions within 5° F. wet bulb temperature of maximum summer design condition, and within 10°F. dry bulb temperature of minimum winter design condition. Take final temperature reading during seasonal operation.

G. Preliminary Procedures:

- 1. Air Systems:
 - a. Obtain drawings and become thoroughly acquainted with the systems.
 - b. Compare drawings to installed equipment and field installations.
 - c. Walk the system from the system air handling equipment to terminal units to determine variations in installation.
 - d. Check filters for cleanliness.
 - e. Check all dampers (volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.
 - f. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a cross check with required fan volumes.
 - g. Determine best locations in main and branch ductwork for most accurate duct traverses. Traverses shall be performed in each supply and return duct main and sub-mains for each AHU and return air fan.
 - h. Place outlet dampers in the full open position.
 - i. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.

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- j. Verify lubrication of all motors and bearings.
 - k. Check fan belt tension.
 - l. Check fan rotation.
2. Hydronic Systems:
- a. Open valves to full open position. Close coil bypass valves.
 - b. Remove and clean all strainers.
 - c. Examine hydronic systems and determine if water has been treated and cleaned.
 - d. Check pump rotation.
 - e. Check expansion tanks to verify noted air pressure and that the system is completely full of water.
 - f. Check air vents at high points of system and determine if all are installed and operating freely.
 - g. Set temperature controls so all coils are calling for full flow.
 - h. Check operation of automatic bypass valves.
 - i. Check and set operating temperatures of chillers, boilers, and heat exchangers to design requirements.
 - j. Verify lubrication of all motors and bearings.
3. Measurements:
- a. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerance specified in the referenced standards. Instruments shall be properly maintained and protected against damage.
 - b. Provide instruments meeting the specifications of the referenced standards.
 - c. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.
 - d. Apply instrument as recommended by the manufacturer.
 - e. Use instruments with minimum scale and maximum subdivisions and with scaled ranges proper for the value being measured.
 - f. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5%. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.
 - g. Take all reading with the eye at the level of the indicated value to prevent parallax.
 - h. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.
 - i. Take measurements in the system where best suited to the task.
- H. Performing Commissioning, Testing, Adjusting, and Balancing:
- 1. Test, adjust and balance all noted systems according to SMACNA standards and as follows:
 - a. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.
 - b. Cut insulation and ductwork for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
 - c. Patch insulation, ductwork, and housings, using materials identical to those removed.
 - d. Seal ducts and test for and repair leaks.
 - e. Seal insulation to re-establish integrity of the vapor barrier.

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- f. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
 - g. Retest, adjust and balance system subsequent to significant system modifications, and resubmit test results.
2. System Deficiencies:
- a. The Balancing Contractor shall advise the Mechanical Contractor and the Engineer of all system deficiencies in writing. Report all motors not running, missing dampers, inoperative valves and controls, lack of access, etc.
 - b. Upon completion of system deficiencies, Balancing Contractor shall balance and record data.
 - c. Any re-balancing required to meet the desired CFM or modified CFM due to system modifications or owner changes shall be provided at no additional costs to the project/owner.
 - d. The Balancing Sub-subcontractor shall provide the necessary sheave and belt changes to motors and fans as required to achieve the desired CFM at no additional costs to the project/owner.

3.14 INSTALLATION OF COMMERCIAL GAS-OIL BOILER

- A. General: Install boilers in accordance with manufacturer's installation instructions, in accordance with State and Local Code requirements. Install units plumb and level, to tolerance of 1/8" in 10' - 0" in both directions. Maintain manufacturer's recommended clearances around and over boilers.
- B. Support: Install boilers on existing 4" thick concrete pad
- C. Erection: Field assemble boiler sections in proper sequence and with sealing between each section. Assemble boiler trim shipped loose, or unassembled for shipment purposes. Follow manufacturer's installation instructions.
- D. Electrical Work: Install electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
 - 1. Verify that electrical work installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until electrical work is acceptable to equipment Installer.
- E. Oil Piping: Disconnect & re-connect oil piping to boiler, full size of inlet to burner, provide shutoff valve and union with sufficient clearance for burner removal and service.
- F. Hot Water Piping: Connect supply, return, and blowdown boiler tappings as indicated, with shutoff valve and union or flange at each connection.
- G. Regulator Vents: Provide 3/4" vent from each main and pilot regulator. Each vent shall terminate outdoors per code requirements.
- H. Breeching: Connect breeching to boiler outlet, full size of outlet. Route as indicated.

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- I. Flush and clean cast iron boilers upon completion of installation, in accordance with manufacturer's start-up instructions.
- J. Hydrostatically test assembled boiler and piping in accordance with applicable sections of ASME Boiler and Pressure Vessel Code.
- K. Arrange with National Board of Boiler and Pressure Vessel Inspectors for inspection of boiler piping, observation of hydrostatic testing, and for certification of completed boiler units. Start-up cast iron boilers, in accordance with manufacturer's start-up instructions, and in presence of boiler manufacturer's start up representative. Test controls, and demonstrate compliance with requirements. Adjust burner for maximum burning efficiency. Replace damaged or malfunctioning controls and equipment.
- L. Owner's Instructions: Provide services of manufacturer's technical representative for 4-hour day to instruct Owner's personnel in operation and maintenance of cast iron boilers.
 - 1. Schedule training with Owner, provide at least 7-day notice to Contractor and Engineer of training date.

3.15 INSTALLATION OF HVAC PUMPS

- A. General: Install HVAC pumps where indicated, in accordance with manufacturer's published installation instructions, complying with recognized practices to ensure that HVAC pumps comply with requirements and serve intended purposes.
- B. Access: Provide access space around HVAC pumps for service as indicated, but in no case less than that recommended by manufacturer.
- C. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
 - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 00 00 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
- D. Adjusting and Cleaning:
 - 1. Alignment: Check alignment, and where necessary, realign shafts of motors and pumps within recommended tolerances by manufacturer, and in presence of manufacturer's service representative.
 - 2. Start-Up: Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions.
 - 3. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.16 INSTALLATION OF PACKAGED ROOFTOP UNITS

- A. General: Install rooftop units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in location indicated, and maintain manufacturer's recommended clearances.

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- B. Support: Contractor shall coordinate installation with the roofing contractor, and shall install and secure roof curb to roof structure, per details on the drawings and in accordance with National Roofing Contractors Association (NRCA) installation recommendations and shop drawings. Install and secure rooftop units on curbs and coordinate roof penetrations and flashing.
- C. Access: Provide access space around air handling units for service as indicated, but in no case less than that recommended by manufacturer.
- D. Duct Connections: Provide ductwork, accessories, and flexible connections as indicated.
- E. Grounding: Provide positive equipment ground for air-handling unit components.
- F. Provide two complete extra sets of filters for each air handling unit. Install new filters at completion of air handling system work, and after completion of testing, adjusting, and balancing work. Obtain receipt from Owner that new filters have been installed.
- G. Provide one spare set of belts for each belt-driven air handling unit, obtain receipt from Owner that belts have been received.
- H. Electrical Connections: Refer to electrical sections for final connections to equipment and installation of loose shipped electrical components.
- I. Start-Up Services:
 - 1. Provide the services of a factory-authorized service representative to start-up rooftop units, in accordance with manufacturer's written start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- J. Operating and Maintenance Training:
 - 1. Provide services of manufacturer's service representative (minimum 8 hrs.) to instruct Owner's personnel in operation and maintenance of rooftop units. Training shall include start-up and shut-down, servicing and preventative maintenance schedule and procedures, and trouble-shooting procedures plus procedures for obtaining repair parts and technical assistance.
 - 2. Schedule training with Owner, provide at least 7-day prior notice to the Architect/Engineer.
- K. Provide two cases of spare filters for each rooftop unit, both final filters and pre-filters for the energy recovery wheel. Obtain receipt from Owner that stock of spare filters has been received.
- L. Provide two complete extra sets of filters for each air handling unit. Install new filters at completion of air handling system work, and prior to testing, adjusting, and balancing work. Obtain receipt from Owner that new filters have been installed.
- M. Provide one spare set of belts for each belt-driven air handling unit, obtain receipt from Owner that belts have been received.

3.17 INSTALLATION OF AIR-TO-AIR ENERGY RECOVERY VENTILATOR

A. EXAMINATION

1. Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.
2. Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.
3. Proceed with installation only after all unsatisfactory conditions have been corrected.

B. INSTALLATION

1. Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's IOM, Best Practices and all applicable building codes.
2. Install unit with clearances for service and maintenance.

C. CONNECTIONS

1. ERV's are to be installed per manufacturers' guidelines and industry Best Practices shall be incorporated, and duct connections are to conform to use material, weight, thickness, gauge, construction, and installation methods as outlined in the SMACNA publications below, and Division 23 of this document, and are to be made subject to the installation requirements shown above.
 - a. HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition, 2005
 - b. HVAC Air Duct Leakage Test Manual, 2nd Edition, 2012
 - c. HVAC Systems - Duct Design, 4th Edition, 2006
 - d. Rectangular Industrial Duct Construction Standard, 2nd Edition, 2004
 - e. Round Industrial Duct Construction Standards, 2nd Edition, 1999
 - f. Thermoplastic Duct (PVC) Construction Manual, 2nd Edition, 1995
2. Electrical installation requirements are specified in Division 26 of this document.

D. FIELD QUALITY CONTROL

1. Contractor to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to Architect/Engineer in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM. Insert any other requirements here.

E. START-UP SERVICE

1. Contractor to perform startup service. Clean entire unit, comb coil fins as necessary, and install clean filters. Measure and record electrical values for voltage and amperage. Refer to Division 23 "Testing, Adjusting and Balancing" and comply with provisions therein.

F. DEMONSTRATION AND TRAINING

1. Contractor to train owner's maintenance personnel to adjust, operate and maintain the entire Make-Up Air unit. Refer to Division 01 Section Closeout Procedures and Demonstration and Training.

3.18 INSTALLATION OF METAL DUCTWORK

A. Installation of Metal Ductwork:

1. **General:** Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately with internal surface smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.
2. **Sealing:** All ductwork joints and seams shall be sealed with flexible duct sealer to assure an airtight installation.
3. **Penetrations:** Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gauge as duct. Overlap opening on 4 sides by at least 1-1/2". Fasten to duct and substrate.
 - a. Where ducts pass through fire-rated floors, walls, or partitions, provide firestopping between duct and substrate.
4. **Coordination:** Coordinate duct installation with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.
5. **Installation:** Install metal ductwork in accordance with "SMACNA HVAC Duct Construction Standards".

B. Installation of Duct Liners:

1. **General:** Install duct liners in accordance with SMACNA "HVAC Duct Construction Standards".

C. Installation of Flexible Ducts:

1. **Maximum Length:** For any duct run using flexible ductwork, do not exceed 4'-0" extended length.
2. **Installation:** Install in accordance with Section II of SMACNA's, "HVAC Duct Construction Standards, Metal and Flexible".

D. Equipment Connections:

1. **General:** Connect metal ductwork to equipment as indicated, provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery.

E. Adjusting and Cleaning:

1. Clean ductwork internally, unit by unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
2. Strip protective paper from stainless ductwork surfaces, and repair finish wherever it has been damaged.

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3. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until final connections are to be completed.
4. Balancing: Refer to Division 23 section "Testing, Adjusting, and Balancing" for air distribution balancing of metal ductwork. Seal any leaks in ductwork that become apparent in balancing process.

3.19 INSTALLATION OF DUCTWORK ACCESSORIES

- A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.
- B. Install turning vanes in square or rectangular 90 degree elbows in supply, return, and exhaust air systems, and elsewhere as indicated.
- C. Install splitter damper with adjusting rod in each supply branch. Install according to detail on drawings.
- D. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.
- E. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leakproof performance.
- F. Adjusting: Adjust ductwork accessories for proper settings, install fusible links in fire dampers and adjust for proper action.
- G. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
- H. Furnish extra fusible links to owner, one link for every 10 installed of each temperature range; obtain receipt.

3.20 INSTALLATION OF ACCESS DOORS

- A. General: Install access doors in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended function.
- B. All access doors shall be located in a workmanlike manner in closets, storage rooms, and/or other non-public areas, positioned so that the item or part can be easily reached, and the size shall be sufficient for this purpose (minimum size 12" x 16"). Furnish access doors to permit thorough inspection. When access doors are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the Architect.

3.21 INSTALLATION OF FIRESTOPPING AND SEALANTS

A. Examination

1. Examine the areas and conditions where firestops are to be installed and notify the architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected by the contractor in a manner acceptable to the architect and in accordance with Section 07 84 13.
2. Verify that environmental conditions are safe and suitable for installation of firestop products.
3. Verify that all pipe, conduit, cable, and other items which penetrate fire-rated construction have been permanently installed prior to installation of firestops.

B. Installation

1. General:
 - a. Installation of firestops shall be performed by an applicator/installer qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.
 - b. Apply firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, and manufacturer's recommendations.
 - c. Unless specified and approved, all in conjunction with through-penetrants shall remain intact and undamaged and may not be removed.
 - d. Seal holes and penetrations to ensure an effective smoke seal.
 - e. In areas of high traffic, protect firestopping materials from damage. If the opening is large, install firestopping materials from damage. If the opening is large, install firestopping materials capable of supporting the weight of a human.
 - f. Insulation types specified in other sections shall not be installed in lieu of firestopping material specified herein.
 - g. All combustible penetrants (e.g. non-metallic pipes or insulated metallic pipes) shall be firestopped using products and systems tested in a configuration representative of the field condition.
2. Dam Construction: When required to properly contain firestopping materials within openings, damming or packing materials may be utilized. Combustible damming material must be removed after appropriate curing. Noncombustible damming materials may be left as a permanent component of the firestop system.

C. Field Quality Control

1. Prepare and install Firestopping system in accordance with manufacturer's printed instructions and recommendations.
2. Follow safety procedures recommended in the Material Safety Data Sheets.
3. Finish surfaces of firestopping which are to remain exposed in the completed work to a uniform and level condition.
4. All areas of work must be accessible until inspection by the applicable Code Authorities.

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5. Correct unacceptable firestops and provide additional inspection to verify compliance with this specification.
6. Cleaning
7. Remove spilled and excess materials adjacent to firestopping without damaging adjacent surfaces.
8. Leave finished work in neat, clean condition with no evidence of spill overs or damage to adjacent surfaces.

3.22 INSTALLATION OF AUTOMATIC TEMPERATURE CONTROLS

A. Inspection:

1. Examine areas and conditions under which electric/electronic control systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

B. Installation of Control Systems:

1. General: Install systems and materials in accordance with manufacturer's instructions, roughing-in drawings and details shown on drawings.
2. Control Wiring: Install control wiring, without splices between terminal points, color-coded. Install in neat workmanlike manner, securely fastened. Install in accordance with National Electrical Code.
 - a. Install circuits over 25-volt with color-coded No. 12 wire in electric metallic tubing.
 - b. Install circuits under 25-volt with color-code No. 18 wire with 0.031" high temperature 105° F. (41° C) plastic insulation on each conductor and plastic sheath over all.
 - c. Install electronic circuits with color-coded No. 22 wire with 0.023" polyethylene insulation on each conductor with plastic-jacketed copper shield over all.
 - d. Install low voltage circuits, located in concrete slabs and masonry walls, or exposed in occupied areas, in electrical conduit.
 - e. Power sources from lighting circuits and wall outlets shall not be used to power DDC controllers.
3. Controllers and safety devices:
 - a. All safety devices such as freezestats, duct mounted heat detectors, smoke detectors, etc., shall be hard wired to shut down the fans independently. Provide audible alarm with silence switch as well as DDC indication.
 - b. Humidifier controls shall be hard wired through fan proof flow differential switch and starter auxiliary contacts to disable humidifier system on fan shutdown. Provide DDC indication.
 - c. All supply, return and exhaust fans shall be provided with pressure differential switches. Current sensing devices, starter axillary contacts, and relay contacts are unacceptable proof of fan operation.
 - d. Primary and standby pumps shall be selectable through the DDC control system. Provide local pilot light to indicate selected pump as well as alarm and silence switch for failed pump. Provide differential pressure switch to prove flow.

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C. Adjusting and Cleaning:

1. Start-Up: Start-up, test, and adjust pneumatic control systems in presence of manufacturer's authorized representative. Demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
2. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
3. Final Adjustment: After completion of installation, adjust thermostats, control valves, motor and similar equipment provided as work of this section.
 - a. Final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of primary temperature control system.

D. Closeout Procedures:

1. Owner's Instructions: Provide services of manufacturer's technical representative for one 8-hour day to instruct Owner's personnel in operation and maintenance of control systems, and 40 hours of onsite instruction on running and basic troubleshooting of DDC control system.
2. Validation: The automatic temperature control contractor shall completely check out, calibrate and test all connected hardware and software to insure that the system performs in accordance with the approved specifications and sequence of operation submitted.
 - a. Witnessed validation demonstration shall consist of:
 - 1) Execute digital and analog commands in English and graphic mode.
 - 2) Demonstrate all specified diagnostics.
 - 3) Demonstrate scan, update, and alarm responsiveness.
3. Training:
 - a. All training shall be by the automatic temperature control contractor and shall utilize specified manuals and as-build documentation.
 - b. Operator training shall include:
 - 1) Sequence of Operation review.
 - 2) Sign on-Sign off.
 - 3) Modifying warning limits, alarm limits and start-stop times.
 - 4) System initialization.
 - 5) Use of Portable Operators Terminal.
 - 6) Troubleshooting of sensors (determining bad sensors).
 - 7) Point disable/enable.
 - 8) Software review of Sequence of Operation programs.
 - 9) Modification of control programs.
 - 10) Add/Delete/Modify data points.
 - 11) Use of diagnostics.
 - 12) Review of initialization.
 - c. Training shall be for Owner-designated personnel at the subject site, and shall be scheduled by the Owner with two week notice.

- E. Adjusting and Cleaning:
1. Start-up: Start-up, test, and adjust electric control systems in presence of manufacturer's authorized representative. Demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
 2. Cleaning: Clean factory finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
 3. Final Adjustment: After completion of installation, adjust thermostats, control valves, motors and similar equipment provided as work of this section.
 - a. Final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of primary temperature control system.
- F. Closeout Procedures:
1. Owner's Instructions: Provide services of manufacturer's technical representative for one 8-hour day to instruct Owner's personnel in operation and maintenance of control systems.
 - a. Schedule instruction with Owner; provide at least 7-day notice to Contractor and Engineer of training.

3.23 TESTING, ADJUSTING, BALANCING, AND COMMISSIONING

- A. Requirements:
1. Requirements include verification of HVAC system operation, measurement of all system capacity, and establishment of the quantities of the mechanical systems as required to meet specifications, and recording and reporting the results.
 2. Commission, test, adjust and balance the following mechanical systems:
 - a. Supply air systems.
 - b. Return air systems.
 - c. Exhaust air systems.
 - d. Outside air systems.
 - e. Hydronic heating systems.
 - f. Verify temperature control system operation.
 3. Do not include:
 - a. Testing boilers and pressure vessels for compliance with safety code.
 - b. Installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing. Contact Mechanical Contractor and the Engineer for direction.
- B. Report:
1. Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
 - a. General Information and Summary.

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- b. Air Systems.
 - c. Hydronic heating and cooling systems.
 - d. Temperature Control Systems.
2. Contents: Provide the following minimum information, forms and data:
- a. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Architect, Engineer, and Project. Include addresses, and contact names and telephone numbers. Also include a certification sheet containing the seal and name address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentation used for the procedures along with the proof of calibration.
 - b. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC for each respective item and system.
 - c. Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.
- C. Quality Assurance:
- 1. An independent testing, adjusting, and balancing agency certified by the AABC or NEBB as a Test and Balance Engineer in those testing and balancing disciplines required for this project.
 - 2. Codes and Standards:
 - a. AABC: "National Standards For Total System Balance".
 - b. ASHRAE: ASHRAE Handbook, 1984 Systems Volume, Chapter 37, Testing, Adjusting, and Balancing.
 - c. NEBB (National Environmental Balancing Bureau: "Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems" (Latest Edition)
 - 3. Pre-Balancing Conference: Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a conference with the Architect/Engineer and Mechanical Contractor. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting, and balancing.
 - 4. System Operation: Systems shall be fully operational prior to beginning procedures. All new automatic temperature controls shall be fully operational. Test, adjust and balance the air systems before refrigerant systems. Test, adjust and balance air conditioning systems during summer season, and heating systems during winter season, including at least a period of operation at outside conditions within 5° F. wet bulb temperature of maximum summer design condition, and within 10°F. dry bulb temperature of minimum winter design condition. Take final temperature reading during seasonal operation.
- D. Preliminary Procedures:
- 1. Air Systems:
 - a. Obtain drawings and become thoroughly acquainted with the systems.
 - b. Compare drawings to installed equipment and field installations.

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- c. Walk the system from the system air handling equipment to terminal units to determine variations in installation.
 - d. Check filters for cleanliness.
 - e. Check all dampers (volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.
 - f. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a cross check with required fan volumes.
 - g. Determine best locations in main and branch ductwork for most accurate duct traverses. Traverses shall be performed in each supply and return duct main and sub-mains for each AHU and return air fan.
 - h. Place outlet dampers in the full open position.
 - i. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
 - j. Verify lubrication of all motors and bearings.
 - k. Check fan belt tension.
 - l. Check fan rotation.
2. Hydronic Systems:
- a. Open valves to full open position. Close coil bypass valves.
 - b. Remove and clean all strainers.
 - c. Examine hydronic systems and determine if water has been treated and cleaned.
 - d. Check pump rotation.
 - e. Check expansion tanks to verify noted air pressure and that the system is completely full of water.
 - f. Check air vents at high points of system and determine if all are installed and operating freely.
 - g. Set temperature controls so all coils are calling for full flow.
 - h. Check operation of automatic bypass valves.
 - i. Check and set operating temperatures of chillers, boilers, and heat exchangers to design requirements.
 - j. Verify lubrication of all motors and bearings.
3. Measurements:
- a. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerance specified in the referenced standards. Instruments shall be properly maintained and protected against damage.
 - b. Provide instruments meeting the specifications of the referenced standards.
 - c. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.
 - d. Apply instrument as recommended by the manufacturer.
 - e. Use instruments with minimum scale and maximum subdivisions and with scaled ranges proper for the value being measured.

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- f. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5%. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.
 - g. Take all reading with the eye at the level of the indicated value to prevent parallax.
 - h. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.
 - i. Take measurements in the system where best suited to the task.
- E. Performing Commissioning, Testing, Adjusting, and Balancing:
- 1. Test, adjust and balance all noted systems according to SMACNA standards and as follows:
 - a. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.
 - b. Cut insulation and ductwork for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
 - c. Patch insulation, ductwork, and housings, using materials identical to those removed.
 - d. Seal ducts and test for and repair leaks.
 - e. Seal insulation to re-establish integrity of the vapor barrier.
 - f. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
 - g. Retest, adjust and balance system subsequent to significant system modifications, and resubmit test results.
 - 2. System Deficiencies:
 - a. The Balancing Contractor shall advise the Mechanical Contractor and the Engineer of all system deficiencies in writing. Report all motors not running, missing dampers, inoperative valves and controls, lack of access, etc.
 - b. Upon completion of system deficiencies, Balancing Contractor shall balance and record data.
 - e. Any re-balancing required to meet the desired CFM or modified CFM due to system modifications or owner changes shall be provided at no additional costs to the project/owner.
 - f. The Balancing Sub-subcontractor shall provide the necessary sheave and belt changes to motors and fans as required to achieve the desired CFM at no additional costs to the project/owner.

END OF SECTION

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SECTION 260000

ELECTRICAL

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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 DESCRIPTION OF WORK

- A. Work described herein shall be interpreted as work to be done by the Electrical Sub Contractor. Work to be performed by other trades will be referenced to a particular contractor.
- B. Where the contract drawings conflict with themselves or specifications. The contractor shall carry higher quantity or quality.
- C. Provide all labor, materials, tools, and equipment, including scaffolding, to complete the installation of the electrical system. Install, equip, adjust, and put into operation the respective portions of the installation specified, and so interconnect various items or sections of work in order to form a complete and operating whole. Systems may be referenced in singular or plural terms, also refer to drawings to confirm quantities. The work shall consist of, but shall not necessarily be limited to the following:
 - 1. Disconnect and reconnect existing rooftop equipment, exhaust fans, receptacles, and light fixtures.
 - 2. All raceway systems, including boxes, couplings, and fittings.
 - 3. All branch circuit wiring systems, including wiring devices, plates, etc.
 - 4. Connections for all new equipment, including mechanical, plumbing, and the like.
 - 5. All testing of equipment installed.
 - 6. Drilling, coring, and cutting of holes (where the largest dimension thereof does not exceed 12 inches) for electrical conduit systems, and equipment.
 - 7. Any other item of work hereinafter specified or indicated on electrical drawings.
 - 8. Systems Identification.
 - 9. Scaffolding, Rigging, and Staging required for all Electrical Work.
 - 10. Fire stopping for penetrations shall be performed by Electrical Contractor. Refer to Architectural Drawings for fire rated surfaces.
 - 11. Provide Vibration Control and Seismic Restraints for all Electrical Systems conforming to the requirements of Rhode Island State Code.
 - 12. Phasing and demolition.
 - 13. Sealing of all penetrations through walls, slabs, partitions, which are not fire rated.
 - 14. Temporary Lighting and Power

1.3 DEFINITIONS

- A. Most terms used within the documents are industry standard. Certain words or phrases shall be understood to have specific meanings as follows:
1. Provide: Furnish and install completely connected up and in operable condition.
 2. Furnish: Purchase and deliver to a specific location within the building or site.
 3. Install: With respect to equipment furnished by others, install means to receive, unpack, move into position, mount and connect, including removal of packaging materials.
 4. Conduit: Raceways of the metallic type which are not flexible. Specific types as specified.
 5. Connect: To wire up, including all branch circuitry, control and disconnection devices so item is complete and ready for operation.
 6. Subject to Mechanical Damage: Equipment and raceways installed exposed and less than eight feet above finished floor in mechanical rooms or other areas where heavy equipment may be in use or moved.
 7. Finish Space: Any space where public/students have access including but not limited to corridors, classrooms, offices, toilets, cafeteria, gym, and auditorium.

1.4 RELATED WORK

- A. The following related work is to be performed under designated sections.
1. Payment for energy for temporary light and power shall be made by the Owner.
 2. Cutting and patching will be by respective sections of the trade responsible for the surface on which the penetration occurs. Cutting and patching shall be in accordance with Division 01 requirements.
 3. Automated Temperature Control: Section 230010-Heating, Ventilating, and Air Conditioning.

1.5 CONTRACT COST BREAKDOWN

- A. Submit a breakdown of contract price to aid Architect in determining value of work installed as job progresses.

1.6 INSPECTION OF SITE

- A. Electrical bidders will be permitted to inspect site. Failure to inspect existing conditions or to fully understand work which is required shall not excuse Electrical Subcontractor from his obligations to supply and install work in accordance with specifications and the drawings and under all site conditions as they exist.

1.7 COOPERATION

- A. Work shall be carried on under usual construction conditions, in conjunction with other contractors work. Cooperate with other contractors, coordinate work and proceed in a manner as not to delay progress.

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- B. Before proceeding, examine all construction drawings and consult other contractors to coordinate installation and avoid interference.
- C. In case of dispute, the Architect will render a decision in accordance with General and Supplementary General Conditions.

1.8 CODES, ORDINANCES, AND PERMITS

A. Codes and Ordinances:

- 1. All material and work provided shall be in accordance with all applicable codes including the following codes and standards as most recently amended.
 - State of Rhode Island Building Code
 - National Electric Code, 2023 Edition
 - State Department of Public Safety
 - NFPA 101 "Life Safety Code"
 - NFPA Standards
 - Standards of the Underwriters Laboratories (UL)
 - Occupational Safety and Health Act (OSHA)
 - Americans with Disabilities Act (ADA)
 - Energy Conservation Code
 - City of East Providence
- 2. Where contract documents indicate more stringent requirements than codes, the contract documents shall take precedence.

- B. Permits: Be responsible for filing documents, and securing of inspection and approvals. Permit fees shall be paid by Electrical Sub-contractor. Refer to INSTRUCTIONS TO BIDDERS.

1.9 SUBMITTALS

- A. Refer to Supplementary General Conditions for information relative to submission of shop drawings. No equipment shall be installed prior to approval.
- B. Notwithstanding any restrictions upon contractor proposed substitutions, should apparatus or materials be permitted by Architect to be substituted for those specified for good cause, and such substitution necessitates changes in or additional connections, piping, supports, or construction, same shall be provided. Assume cost and entire responsibility thereof.
- C. Submit the following samples:
 - 1. Items as may be requested.
- D. Refer to Section 01 33 00 – SUBMITTAL PROCEDURES.

1.10 GUARANTEE

- A. Keep work in repair without expense to Owner as far as concerns defects in workmanship or materials for a period of not less than one year from date of substantial completion.

1.11 ELECTRICAL CHARACTERISTICS

- A. In general, and unless specifically indicated otherwise, all building service, heating, ventilating, air conditioning, and plumbing equipment shall be of the following characteristics:
 - 1. Motors up to and including 1/3 HP shall be suitable for 120 volts, one phase operation.
 - 2. Motors larger than 1/3 HP shall be suitable for 208 volts, three-phase operation.

1.12 TEMPORARY ELECTRICAL SUPPORT FACILITIES

- A. Refer to Section 01 50 00 – CONSTRUCTION TEMPORARY FACILITIES AND CONTROLS.
- B. Provide own field office and/or storage facilities which shall be located as directed by the Architect. Provide all tools, equipment, ladders, and temporary construction required for execution of the work.
- C. All scaffolding, ladders, and other temporary construction shall be rigidly built in accordance with all local and state requirements, and shall be removed upon completion.

1.13 INSPECTIONS AND TESTS

- A. Inspection: If inspection of materials installed shows defects, such defective work, materials, and/or equipment shall be replaced and inspection and tests repeated.
- B. Tests: Make reasonable tests and prove integrity of work and leave electrical installation in correct adjustment and ready to operate. All panels shall have phases balanced as near as practical. A consistent phase orientation shall be adhered to at all terminations.

1.14 INFORMATION TECHNOLOGY & SECURITY SYSTEM PROVISIONS

- A. Electrical Contractor shall work closely with the I.T. Sub-Sub Contractor and the Owner's Security System Contractor to assure a first class installation. Coordinate all back boxes and conduits required prior to installation. In general, the electrical contractor shall provide conduits from (I.T. & Security equipment) outlets to accessible ceiling spaces.
- B. Responsibilities of the Electrical Contractor: The Electrical Contractor shall be responsible for furnishing and installing all related system provisions including, but not limited to: power, cable trays, conduits with bushings, conduit stubs with bushings, j-hooks every 5 ft. along cable paths, sleeves with bushings, backboxes, plaster rings, pull strings, bonding, and grounding, Specialty backboxes will be furnished by I.T. Sub-Sub Contractor and Owner's Vendor and installed under Section 26 00 00.

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- C. Responsibilities of the Electrical Contractor: The Electrical Contractor shall be responsible for furnishing and installing all related building preparation including, but not limited to: outlet boxes with plaster rings, 120 volt, power, surface raceways, conduits with bushings, conduit stubs with bushings, sleeves with bushings (all conduits, stubs, sleeves, etc. shall be brought to an accessible ceiling of the same floor), backboxes, plaster rings, pull strings, j-hooks (every 5 feet along main paths to communications closets), bonding, grounding, core drilling, cutting, environmental seals, seismic supports, etc., for a completely operational system, as specified. Special backboxes furnished by Owners security vendor and Communications System Contractors, shall be installed by Electrical Contractor.
1. The Electrical Contractor shall be responsible for furnishing and installing: conduits from each door strike, latch, mag lock, door contact, electric closures, card reader, etc. to an accessible ceiling space. Provide power and fire alarm interface at each power supply, door controller requiring same.
- D. Responsibilities of the Communications System Contractor: The Communications System Contractor will be responsible for furnishing, installing, wiring, programming, troubleshooting, training and warranty service of all cabling, terminal equipment, headend equipment, as specified in Section 27 00 00 for a completely operational system.
- E. Responsibilities of the Integrated Electronic Security Systems (IESS) Contractor also referred to as Owner's Security Vendor will be responsible for furnishing, installing, wiring, programming, trouble shooting, training, and warranty service of all cabling, terminal equipment, and head-end equipment for a completely operational system.
- F. The work shall be so performed so that the progress of the entire building construction, including all other trades, shall not be delayed and not interfered with. Materials and apparatus shall be installed as fast as conditions of the building will permit and must be installed promptly when and as directed.
- G. Responsibilities of the Communications System Contractor: The Communications System Contractor will be responsible for furnishing, installing, wiring, programming, troubleshooting, training and warranty service of all cabling, terminal equipment, headend equipment, as specified in Section 27 00 00 for a completely operational system.
- H. Responsibilities of the Integrated Electronic Security Systems (IESS) Contractor will be responsible for furnishing, installing, wiring, programming, trouble shooting, training, and warranty service of all cabling, terminal equipment, and head-end equipment for a completely operational system.
- I. Keep fully informed as to the shape, size and position of all openings required for all apparatus and give information in advance to build openings into the work.
- J. All distribution systems which require pitch or slope such as plumbing drains, steam and condensate piping shall have the right of way over those which do not. Confer with other trades as to the location of pipes, ducts, lights and apparatus and install work to avoid interferences.
- K. Coordinate exact locations and roughing in dimensions of all work before installation and make all final connections as required. Any changes required to avoid interference or to provide adequate clearances for Code and maintenance requirements shall be made at no additional costs.

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- L. Structural elements of the project shall not be relocated, altered or changed to accommodate the work without written authorization from the Architect.
- M. Work that is installed before coordination with other trades, or that causes interference with the work of other trades shall be changed to correct condition.
- N. Obtain a complete set of Project Drawings and Specifications for coordination and to determine the full scope of work.
- O. Attend project coordination meetings to coordinate work of this Section, work of other trades and project and phasing retain a complete set of Project Drawings and Specifications for coordination and to determine the full scope of work.

1.15 RECORD DRAWINGS

- A. Refer to Section 017700 - PROJECT CLOSEOUT, One set shall be maintained at site and which shall be accurate, clear, and complete showing actual location of all equipment as installed. Record drawings shall be updated at least monthly. Record drawings shall show outlet from which homeruns are taken, and location of all junction boxes and access panels. These drawings shall be available to Architect/Engineer field representative.
- B. Any addenda sketches and supplementary drawings issued during course of construction shall be attached to drawings.
- C. At completion, submit an accurate checked set of drawings.
- D. After approval of these drawings, photo reproductions of original tracings shall be revised to incorporate changes, including addenda sketches and supplementary drawings. These "as-built" photo reproductions shall be certified as correct and delivered to the Architect along with an AutoCAD CD of the revised drawings.

1.16 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

- A. Operating Instructions: Refer to Section 017823 - OPERATION AND MAINTENANCE DATA, Furnish operating instructions to Owner's designated representative with respect to operations, functions and maintenance procedures for equipment and systems installed. Cost of such instruction up to a full three days of Electrical Subcontractor's time shall be included in contract. Cost of providing a manufacturer's representative at site for instructional purposes shall also be included.
- B. Maintenance Manuals:
 - 1. At completion of the project, provide three hard copies and one electronic copy (refer to Section 017823) of complete manuals containing the following:
 - a. Complete shop drawings of equipment.
 - b. Operation description of systems.
 - c. Names, addresses, and telephone numbers of suppliers of systems.
 - d. Vendors' P.O. numbers for equipment installed.
 - e. Preventive maintenance instructions for systems.

- f. Spare parts list of system components.
- 2. All information shall be in three binders and one electronic copy.

1.17 PHASING, DEMOLITION AND MAINTAINING EXISTING SERVICES

- A. During the execution of the work, required relocation, rerouting, etc., of existing equipment and systems in the existing building areas where new work is to be installed or new connections are scheduled to be made, shall be performed by the Electrical Sub-contractor, as required by job conditions and as determined by the Architect in the field, to facilitate the installation of the new system, while demolition, relocation work or new tie-ins will be performed. Outages required for construction purposes shall be scheduled for the shortest practical periods of time, in coordination with the Owner's designated representative, for specified, mutually agreeable periods of time, after each of which the interruption shall cease and the service shall be restored. This procedure shall be repeated to suit the Owner's working schedule, as many times as required until all work is complete. Any outages of service shall be approved by the Owner, prior to commencing the work. No outages or shutdowns of service shall occur without the written authorization of the Owner prior to commencing the work. Give notice of any scheduled shutdowns, a minimum of two weeks in advance. Owner shall make their best effort to meet this request without adversely affecting the electric service to the existing building.
- B. Prior to any deactivation and relocation or demolition work, consult the drawings and arrange a conference with the Owner's representative in the field to inspect each of the items to be deactivated, removed or relocated. Care shall be taken to protect all equipment designated to be relocated and reused or to remain in operation and be integrated with the new systems.
- C. Where existing outlets are to be reused and are cut off by the remodeling, they shall be reconnected to existing circuits as required by field conditions. Where existing outlets, speakers, clocks, etc. are to be abandoned, they shall be removed and blank plates installed. Each bidder shall, before submitting his bid, visit the site and make a thorough examination of the conditions in the existing building in order to determine the extent of the work to be done.
- D. All deactivation, relocation and temporary tie-ins of electrical systems and equipment shall be provided by the Electrical Subcontractor. All demolition and removal of electrical systems and equipment designated to be demolished shall be by the Electrical Subcontractor. Disconnect and drop to floor all demolished electrical materials for removal by General Contractor. All hazardous electrical materials (PCB lighting ballasts, fluorescent lamps, etc.) shall be legally disposed of by the General Contractor.
- E. The Owner reserves the right to inspect the material scheduled for removal and salvage any items he deems usable as spare parts.
- F. Phasing
 - 1. The Electrical Subcontractor shall construct the project in phases as directed by the Architect to suit the project progress schedule, as well as the completion date of the project.

1.18 RETURN AIR PLENUM

- A. All wiring for areas above suspended ceilings shall be UL Listed plenum rated cable or wiring shall be installed in conduit.

1.19 STAGING AND SCAFFOLDING

- A. Unless otherwise specified, each sub-contractor shall provide all lifts and man-lifts, and furnish, erect and maintain in safe condition, all staging and scaffolding as specified under Section 01 50 00 Temporary Facilities and Controls, as needed for proper execution of the work of this Section. Staging and scaffolding shall be of adequate design, erected and removed by experienced stage builders having all accident prevention devices required by Federal, state and local laws.

1.20 EXAMINATION OF SITE AND DOCUMENTS

- A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. There will be a Pre-Bid Site Conference. It is the responsibility of each Bidders to visit the site for the Fire Station if she or her choses to inspect it prior to submitting their Bid. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor's or Filed Subcontractor's failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.

1.21 TEMPORARY LIGHT AND POWER

- A. Refer to Section 01 50 00 for Construction Temporary Facilities and Controls.

1.22 ENERGY REBATE PROGRAM

- A. This project has been designed to incorporate equipment approved for energy rebate such as fixtures, performance lighting. Meet with Utility Company prior to lighting shop drawing submittal to ascertain that submittal meets program guidelines. Fixtures shall be DLC listed or equivalent. Assist Owner and Engineer in effort to obtain utility rebates the Owner is eligible for. Equivalent lighting fixtures which meet DLC shall require lighting vendor to submit shop drawings to utility company for approval. It is the intent of this project to Qualify for incentives which requires an additional 30 days of reported kWh saved and six months of lighting energy use data as reported by the system post-installation.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Product specifications are written in such a manner so as to specify what materials may be used in a particular location or application and therefore do not indicate what is not acceptable or suitable for a particular location or application. As an example: non-metallic sheathed cable is not specified; therefore, it is not acceptable.
- B. For purpose of establishing a standard of quality and not for purpose of limiting competition, the basis of this Specification is upon specified models and types of equipment and materials, as manufactured by specified manufacturers.
- C. In all cases, standard cataloged materials and systems have been selected. Materials such as lighting fixtures specially manufactured for this particular project and not part of a manufacturers' standard product line will not be acceptable. In the case of systems, the system components shall be from a single source regularly engaged in supplying such systems. A proposed system made up of a collection of various manufacturers' products will be unacceptable.
- D. Where Specifications list manufacturers' names and/or "as approved" or "equal approved by Architect", other manufacturers' equipment will be considered if equipment meets Specification requirements and has all features of the specified items as are considered essential by Architect.
- E. All material shall be new and shall be UL listed.

2.2 RACEWAYS AND FITTINGS

- A. Raceways - General:
 - 1. No raceway shall be used smaller than 3/4 in. diameter and shall have no more than four 90 deg. bends in any one run, and where necessary, pull boxes shall be provided. Only rigid metal conduit or intermediate metal conduit is allowed for slab work. Cable systems, if allowed to be used by other sections of this specification, shall not be used exposed or in slabs, whether listed by "UL" for such use or not.
 - 2. Rigid metal conduit conforming to, and installed in accordance with, Article 344 shall be heavy wall zinc coated steel conforming to American Standard Specification C80-1 and may be used for service work, exterior work, slab work, and below grade level slab, wet locations, and in penthouse for drops down to equipment from elevations below eight feet and also where raceway may be subject to mechanical damage.
 - 3. Intermediate metal conduit conforming to, and installed in accordance with, Article 342, may be used for all applications where rigid metal conduit is allowed by these specifications.
 - 4. Electrical Metallic Tubing (EMT), conforming to, and installed in accordance with, Article 358 shall be zinc coated steel, conforming to industry standards, may be used in masonry block walls, stud partitions, above furred ceilings, where exposed but not subject to mechanical damage in unfinished spaces, and may be used for fire alarm work where concealed or exposed in unfinished spaces.

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5. Flexible metal conduit shall be used for final connections to recessed lighting fixtures from above ceiling junction boxes and for final flexible connections to motors and other rotating or vibrating equipment. Liquid tight flexible metal conduit shall be used for the above connections which are located in moist locations. Moist locations shall include mechanical rooms, penthouses and exterior locations with mechanical equipment. All flexible connections shall include an insulated grounding conductor.
6. Acceptable manufacturers:
Pittsburgh Standard Conduit Company
Republic Steel and Tube
Youngstown Sheet and Tube Company
Carlson
Or equal.
7. Fittings:
 - a. Provide insulated bushings on all raceways 1 inch diameter or larger.
 - b. Manufacturer's standard fittings shall be used for raceway supports.
 - c. Expansion Fittings: Expansion fittings shall be used where structural and concrete expansion joints occur and shall include a ground strap.
 - d. Couplings for rigid metal and intermediate metal conduit shall be threaded type.
 - e. Threadless fittings for EMT shall be watertight compression type or set-screw type (dry-locations). All fittings shall be concrete tight. No diecast fittings allowed except for raceways larger than 1 inch diameter.
 - f. Cable supports in vertical raceways shall be of the split wedge type. Armored cable supports for vertical runs to be of wire mesh basket design.
 - g. Wall entrance seals shall be equal to O.Z. Gedney type "WSK".
 - h. Couplings, elbows and other fittings used with rigid nonmetallic conduit shall be of the solvent cemented type to secure a waterproof installation.
 - i. Acceptable manufacturers:
O.Z.
Crouse Hinds
Appleton
EFCOR
Steel City
Or equal

B. Outlets, Pull and Junction Boxes:

1. Outlets:
 - a. Each outlet in wiring or raceway systems shall be provided with an outlet box to suit conditions encountered. Boxes installed in normally wet locations or surface mounted shall be of the cast-metal type having hubs. Concealed boxes shall be cadmium plated or zinc coated sheet metal type. Old work boxes with Madison clamps not allowed in new construction. Thru the wall boxes are not permitted.
 - b. Each box shall have sufficient volume to accommodate number of conductors in accordance with requirements of Code. Boxes shall not be less than 1-1/2 in. deep unless shallower boxes are required by structural conditions and are specifically approved by Architect. Ceiling and bracket outlet boxes shall not be less than 4 in. octagonal except that smaller boxes may be used where required by particular fixture to be installed. Flush or recessed fixtures shall be provided with separate junction boxes when required by fixture terminal temperature requirements. Switch and receptacle boxes shall be 4 in. square or of comparable volume.

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- c. Far side box supports shall be Caddy J-1A.
 - d. Acceptable manufacturers:
 - Appleton
 - Crouse Hinds
 - Steel City
 - RACO
 - Or equal
2. Pull and Junction Boxes: Where indicated on drawings, and where necessary to terminate, tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish, and install appropriately designed boxes. Boxes shall be fabricated from code gauge steel assembled with corrosion resistant machine screws. Box size shall be as required by Code. Boxes in moist or wet areas shall be galvanized type. Boxes larger than 4-11/16 inches square shall have hinged covers. Boxes larger than 12 inches in one dimension will be allowed to have screw fastened covers, if a hinged cover would not be capable of being opened a full 90 degrees due to installation location.
- a. Acceptable Manufacturers:
 - Brasch
 - Hoffman
 - Keystone
 - Lee Products Co.
 - McKinstry Inc.
 - Eldon Inc.
 - Or equal

2.3 CONDUCTORS

- A. All conductors shall be a minimum size of #12 AWG except for control wiring and fire alarm wiring where #14 AWG may be used. For all exit sign circuits, normal/emergency and/or emergency only circuits, exterior lighting circuits, and also where distance from panelboard to first outlet exceeds 100 ft. at 120 volts and 150 ft. at 277 volts, #10 AWG shall be minimum size wire allowed. All feeder and branch circuit conductors shall be color coded as follows:
 - 1. 208Y/120V Phase A Black
 - 2. 208Y/120V Phase BRed
 - 3. 208Y/120V Phase CBlue
 - 4. Grounded Conductor 120/208 White
 - 5. Equipment Ground 120/208 Green
- B. All conductors not installed in accordance with color scheme shall be replaced. All conductors larger than #6 AWG must be identified with colored tape.
- C. Connections throughout the entire job shall be made with solderless type devices.
 - 1. For #10 AWG and smaller: spring type.
 - 2. For #8 AWG and larger: circumferential compression type.
 - 3. Acceptable manufacturers:
 - 3M "Scotchlock"
 - IDEAL "Wingnut"

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BURNDY
MAC
Or equal

4. Any splices made up in ground mounted pull boxes shall be resin cast waterproof type or waterproof pressure type.
- D. Conductors shall be copper, soft drawn, and annealed of 98 percent conductivity. Conductors larger than #10 AWG shall be stranded; #10 AWG and smaller shall be solid. Conductors shall be insulated for 600 volts and be of following types:
1. All conductors shall have heat/moisture resistant thermoplastic insulation type THHN/THWN (75 degrees C) except as follows:
 - a. In sizes #1 AWG and larger: Crosslinked polyethylene insulation type XHHW (75 degrees C – 90 degrees C) may be used.
 - b. Fire alarm system conductors shall be #14 AWG, type THHN, solid. Color coding of fire alarm conductors shall be in accordance with fire codes.
 - c. Fixture whips #16AWG type "SF".
- E. Stranded conductors for all wiring systems except fire alarm will be allowed if installed and terminated as specified under Execution Section.
- F. Mineral-Insulated Metal-Sheathed Fire-Resistive Cables (Type MI) - Cables shall consist of a factory assembly of one or more solid copper conductors insulated with highly-compressed magnesium oxide and enclosed in a seamless, liquid-and-gas-tight continuous copper sheath. Cables shall be rated for 600 volts and less. Cables shall comply with Article 332 of the National Electrical Code. Cables shall be classified by Underwriters Laboratories, Inc. as having a 2-hour fire resistive rating. Cable terminations shall be made with UL listed mineral-insulated cable fittings.
- G. Type MC cable may be used for branch circuits and fire alarm system above ceilings and in hollow spaces where concealed and allowed by code and not subject to damage if installed and terminated as specified under Execution Section. Armor to be galvanized steel and shall be UL listed for 2 hour fire wall penetration. Fire Alarm MC Cable armor shall be red. Lightweight steel metal clad cable is acceptable.
- H. Acceptable manufacturers:
- AFC Cable Systems
 - American Wire & Cable
 - Cerro
 - Cornish
 - Crescent
 - General Cable
 - Okonite
 - Or equal

2.4 SLEEVES, INSERTS, AND OPENINGS

- A. Sleeves: Provide sleeves of proper sizes for all openings required in concrete floors and walls. Sleeves passing through floors shall be set with top of sleeve 1 in. above finished floor. Core drilling will also be acceptable if in accordance with any structural standards. Any unsleeved openings shall be waterproofed.
- B. Inserts: Provide inserts or other anchoring devices in concrete and masonry construction as required to support raceways and equipment.
- C. Openings: Where an opening is required in concrete slabs to allow passage of a multitude of raceways, give adequate notice to General Contractor so he may box out opening in form work.
- D. Any openings through fire rated surfaces shall be closed off with fireproofing materials providing the same rating as the surface penetrated.
Acceptable Manufacturers:
Specified Technologies Inc.
Thomas & Betts
International Protective Coatings Corp.
3M Fire Protection Products
Dow Corning
Or equal

2.5 PANELBOARDS

- A. Panelboards shall be dead front, door in door safety type equipped with single or multi pole circuit breakers suitable for 120/208 volt, 3 phase, 4 wire operation.
- B. Buses shall be copper. Panelboards shall have a circuit directory card mounted in a frame with plastic cover on inside of door. Panelboards to have a copper ground bus with terminals for each circuit. Panelboards serving isolated ground receptacles shall have a separate ground bus for terminations of the isolated grounds. The isolated ground bus shall be mounted to the panel tub via non conducting means with a separate grounding conductor run to the normal panel ground bus. Provide oversize lugs for any termination requiring same due to oversize conductors. Provide 200 percent neutral buses on 120/208 volt panelboards as indicated on plans.
- C. Cabinets shall be minimum of 20 inches wide and be made of code gauge steel. Surface type shall be ordered without knockouts.
- D. Trims shall be made of code gauge steel, surface or flush as indicated. Panelboards shall be keyed alike. Trims shall be provided with full length piano hinge on one side, and secured to tub with sufficient quantity of latches opposite the hinge side to allow trim to fit flush with tub and when released, allow full access to wiring gutters. Inner door shall allow access to circuit breakers only.

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- E. Panelboards shall be of the following types with minimum circuit breaker frame sizes listed below. Refer to schedules for larger circuit breaker frame sizes due to fault current availability.
1. 120/208 volt, three phase, four wire. Symmetrical interrupting capacity 42,000 AIC.
Style

Westinghouse type PRL-1	BAB Breakers (bolt-on)
Square D type NQOD	QOB Breakers (bolt-on)
Siemens type CDP 7	BQ Breakers (bolt on)
General Electric Type AQ	HHQB Breakers (bolt-on)
 2. Distribution Panels:
 - a. Where scheduled as circuit breaker type, symmetrical interrupting capacity 42,000 AIC and UL service entrance rated.

Westinghouse type PRL 3	FD Breakers
Square D I Line type	FA Breakers
Siemens SPP	FXD6 Breakers
General Electrical Spectra	THED Breakers
- F. Panelboards and distribution panels shall be of same manufacturer. Refer to drawings where higher interrupting ratings are required.
- G. Provide electrical metering and voltage protection system equal to Square D, Westinghouse IQ Data Plus or Siemens 4700 Series at main breaker.
1. Main service entrance device shall be an insulated-case circuit breaker (ICCB): Rating as shown on drawings, 100 percent rated, sealed circuit breaker with interrupting capacity rating to meet available fault current.
 2. Fixed circuit-breaker mounting.
 3. Two-step, stored-energy closing.
 4. Microprocessor-based trip unit with interchangeable rating plug, trip indicators, and the following field-adjustable settings:
 5. Instantaneous trip.
 6. Long- and short-time time pick-up and time delay adjustments.
 7. Ground-fault pickup level, time delay, and I2t response.
 8. Safety features: Phase loss protection.
 9. Provide maintenance mode arc flash reduction feature on main circuit breaker.
- H. Switchboard feeder protective devices shall be molded case circuit breakers. The circuit breakers 200 amperes and larger shall be with a solid-state trip, all other circuit breakers shall be of thermal-magnetic type. Breakers shall be built, tested, and labeled in accordance with UL 489.
- I. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits.

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2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with field-replaceable rating plug and the following field-adjustable settings:
 4. Instantaneous trip.
 5. Long- and short-time pickup levels.
 6. Long- and short-time time adjustments.
 7. Ground-fault pickup level, time delay, and I₂t response.
 8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 9. Standard frame sizes, trip ratings, and number of poles.
 10. Lugs: Suitable for number, size, trip ratings, and conductor material.
 11. Application Listing: Type HACR for heating, air conditioning and refrigeration equipment power feeders.
 12. Shunt Trip: 120-V trip coil energized from separate circuit, where shown on the drawings.
- J. Branch Devices shall be standard molded case circuit breakers, current limiting circuit breakers, or other devices as scheduled. Branch devices shall be mounted in panelboard type construction. Provide electronic trip breakers with adjustable settings for all breakers 200 amp and larger.
- K. Include space and provisions for utility company metering. Refer to electric service section of this Division.

2.6 ELECTRICAL POWER EQUIPMENT

- A. Motor Controls - Manual and Magnetic:
1. Individually-mounted magnetic starters shall be NEMA rated across-the-line type with thermal overload on each phase, single-speed, two-speed, or reduced voltage start as indicated.
 2. Motor Starters shall be furnished by Electrical Sub-contractor unless part of package mechanical equipment such as rooftop units.
 3. Starters shall be of maintained contact type, of size and type required for particular motor horsepower and voltage. Minimum size starter to be size 1 FVNR, unless noted otherwise.
 - a. Starters shall have OL reset button, green push-to-test type pilot light to indicate "ON", and "HAND-OFF-AUTO" switch in cover.
 - b. Starters to have 120 volt control transformers with fused output being provided for those units operating on 277/480 volt system.
 - c. Provide Class 20 fixed heater overloads with auto/manual reset.
 - d. Provide four sets of auxiliary contacts of convertible type N.O. to N.C. for each starter.
 - e. Motor starters shall have NEMA I enclosures. Those in wet locations shall be NEMA 3R.
 - f. Acceptable Manufacturers:
Westinghouse/Culter-Hammer
Square D/Groupe Schneider
Siemens
Allen Bradley
GE
Or equal.

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4. Manual motor starters shall have pilot lights and shall be furnished with thermal overloads on each phase.
- B. Motors: Each motor shall have disconnect switch and starter provided under this section. Starters which are a part of "factory assembled" control panel will be provided under section supplying equipment to be controlled but connected under this section.
1. Provide motor terminal boxes for each motor not furnished with same.
- C. Disconnect Switches:
1. Disconnect (safety) switches shall conform to industrial standards of NEMA, be UL listed and shall be heavy duty type, quick-make, quick-break type with interlocking cover mechanism and provisions for padlocking switch handle in "OFF" position. Three pole toggle switches are not acceptable as substitute for disconnect switches.
 2. Disconnect switches shall be of fused or unfused type as indicated with number of disconnecting poles indicated. The grounded conductor shall not be switched. Switches for use with current limiting fuses shall be rejection type and those used in conjunction with motors shall be horsepower rated. Provide oversize termination lugs if required by conductor size.
 3. Enclosures shall be of proper NEMA type for intended location and shall be phosphate coated or equivalent code gauge galvanized sheet steel with ANSI #24 dark gray baked enamel finish.
 4. Acceptable Manufacturers:
Westinghouse/Culter-Hammer
Square D/Groupe Schneider
Siemens
Allen Bradley
Or equal.
- D. Fuses:
1. Provide a complete set of fuses for each item of fusible type equipment. Fusible equipment furnished by other contractors will be complete with fuses, unless noted otherwise on Electrical Drawings.
 2. Turn over to authorized representative of Owner upon completion a spare set of fuses of each different type and ampere rating installed. These spares shall be bound with twine and tagged.
 3. Secondary system fuses, rated at 600 volts or less, shall be UL listed and constructed in conformance with the applicable standards set forth by NEMA and ANSI. All fuses of a particular class shall be of same manufacturer.
 4. All fuses in distribution panelboards and switchboards shall be class "L" above 600 amperes and class "RK1" for 600 amperes and below.
 5. Acceptable Manufacturers:
Bussmann, Division of McGraw
Gould/Shawmut
GEC-ALSTHOM
Or equal

2.7 LIGHTING FIXTURES

A. General

1. Submit the following in accordance with project submittal procedures:
 - a. Catalog Data: Submit catalog data describing luminaires, lamps, and ballasts. Include data substantiating that materials comply with specified requirements. Arrange data for luminaires in the order of fixture designation.
 - b. Performance Curves/Data:
 - 1) Submit certified photometric data for each type of luminaire.
 - 2) Submit light level calculations when requested by Engineer in accordance with IESNA standards to support proposed fixtures are of equal performance to the specified products (applies to all fixture types in all spaces).
 - c. Drawings: Submit shop drawings for non-standard luminaires.
 - d. Warranty: Submit warranties for luminaires and for electronic ballasts.
 - e. Warranty for all lighting fixtures shall be a minimum of 5 years.
2. All lamps, ballasts, led sources, drivers, and controls shall meet the latest utility company incentive requirements. Refer to the latest program requirements documentation and coordinate with the utility company to ensure compliance.

B. Quality Assurance

1. Comply with the National Electrical Code (NEC) and the Rhode Island Building Code (RIBC) for components and installation.
2. Provide luminaires listed and labeled by a nationally recognized testing laboratory (NRTL) for the application, installation condition, and the environments in which installed.
3. Use manufacturers that are experienced in manufacturing luminaires, lamps and ballasts similar to those indicated for this Project and have a record of successful in-service performance.
4. Coordinate luminaires, mounting hardware and trim with the ceiling system.

C. LED Assemblies

1. LED luminaires shall conform to UL 1598 and to UL 8250 – Safety Standard for Light-Emitting Diode (LED) Light Sources for Use in Lighting Products.
2. Products shall be lead and mercury free.
3. Photometric characteristics shall be established using IESNA LM-79-08, IESNA Approved Method for the Electrical and Photometric Measurement of Solid-State Lighting Products.
4. Color characteristics of LED luminaires shall be as follows in accordance with ANSI C78.377 – Specifications for the Chromaticity of Solid State Lighting Products.
5. LED and driver cooling system shall be passive and shall resist the buildup of debris.
6. LED luminaire output after 50,000 hours of operation shall be not less than 70 percent of the initial lumen output when determined in accordance with IESNA LM-80-08 – IESNA approved Method for Measuring Lumen Maintenance of LED Lighting Sources.
7. LED source package electrical characteristics:
 - a. Supply voltage: 120 V, 208 V, 240 V, 277 V, or 480 V as indicated on the Drawings. Provide step-down transformers if required to match driver input voltage rating.
 - b. Total harmonic distortion (current): Not more than 10 percent
 - c. Power factor: Not less than 90 percent
 - d. RF interference: Meet FCC 47 CFR Part 15/18
 - e. Transient protection: IEEE C62.41 Class A.

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D. Interior General:

1. Furnish interior luminaries that comply with requirements specified below, indicated on the Drawings, to meet conditions of installation.
2. Metal parts shall be free from burrs and sharp corners and edges.
3. Metal components shall be formed and supported to prevent sagging and warping.
4. Steel parts shall be finished with manufacturer's standard finish applied over a corrosion-resistant primer. Finish shall be free from runs, streaks, stains, holidays or defects.
5. Doors and frames shall be smooth operating and free from light leakage under operating conditions. Relamping shall be possible without the use of tools. Doors, frames, lenses and diffusers shall be designed to prevent accidental falling during relamping and when secured in the operating position.
6. Luminaires shall have minimum reflecting surface reflectance as follows unless specified otherwise on the Drawings:
 - a. White Surfaces: 85 percent
 - b. Specular Surfaces: 83 percent
 - c. Diffusing Specular Surfaces: 75 percent
7. Lenses, diffusers, covers and globes shall be 100 percent virgin acrylic unless specified otherwise on the Drawings. Lenses shall have 0.125 inches minimum thickness. Lenses for fluorescent troffers shall be injection molded.
8. Luminaires shall conform to UL 1598 - Luminaires. Provide product with damp location listing or wet location listing per installation location.

E. Interior Accessories

1. Provide stud supports, mounting brackets, frames, plaster rings and other accessories required for luminaire installation.
2. Furnish hangers as specified below and by conditions of installation:
 - a. Stem hangers shall be made of 1/2-inch steel tubing with 45 degrees swivel ball hanger fitting and ceiling canopy. Finish the same as the luminaire.
 - b. Rod hangers shall be made of 1/4 inch threaded zinc-plated steel rod.
 - c. For HID luminaires provide hook hangers that are integrated assemblies matched to the luminaire and line voltage; equip with threaded attachment, power cord and locking type plug. Provide a safety chain or cable for each luminaire that will attach to the building structure, the ballast housing, and to the reflector/diffuser assembly.
3. Use NRTL-listed T-bar safety clips for lay-in fluorescent luminaires.
4. Where indicated on the Drawings or where lamp breakage is detrimental, such as above food counters, provide open fluorescent luminaires with:
 - a. Self-locking sockets or lamp retainers, two per lamp, and
 - b. Clear polycarbonate protective lamp sleeves with end caps over each lamp. Sleeve shall have a light transmission of 95 percent and shall be rated for the thermal profile of the lamp and ballast.

F. Interior Installation

1. Install interior lighting system in accordance with the NEC, manufacturer's installation instructions, approved shop drawings, and NECA National Electrical Installation Standards.
2. Have the manufacturer's installation instructions available at the Project site.
3. Mounting heights specified or indicated on the Drawings are to the bottom of the luminaire for ceiling-mounted fixtures and to the center of the luminaire for wall-mounted fixtures.
4. Where the ceiling forms the protective membrane of a fire resistive assembly, install protective coverings over luminaires in accordance with NRTL requirements.

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5. Install slack safety wires as described below for luminaires in or on suspended ceilings.
 - a. Wire shall be minimum 12 gage galvanized soft annealed steel wire conforming to ASTM A641.
 - b. Attach wire to the building structure directly above the attachment point on the box or luminaire; make trapezes of framing channel material to span obstacles
 - c. Secure wire(s) at each end with not less than three tight turns in 1-1/2 inches.
 6. Support pendant-mounted or cable-supported luminaires directly from the structure above using a 9 gage wire or an approved alternate support without using the ceiling suspension system for direct support.
 - a. Install seismic restraints for pendant-mounted and cable-supported luminaires.
 - b. Pendants, rods, cables, or chains 4 ft or longer shall be braced to prevent swaying using three cables at 120 degrees separation.
 7. Connect luminaires in suspended ceilings using 6 ft. lengths of flexible wiring method arranged accommodate not less than 4 inches of differential seismic movement in any direction.
- G. Interior Quality Control
1. Make electrical connections, clean interiors and exteriors of luminaires, install lamps, energize and test luminaires, inspect interior lighting system, and deliver spare parts in accordance with manufacturer's instructions and NECA National Electrical Installation Standards:
 2. Test electronic dimming ballasts for full range dimming capability.
 - a. Burn-in dimmer controlled fluorescent lamps at full output for not less than 100 hours before dimming.
 - b. Check for visually detectable flicker over the full dimming range.
 3. Prior to turnover to Owner, replace lamps that were installed and used during construction if more than 15 percent of their rated lamp life has been used.
- H. Exterior - General
1. Furnish exterior luminaires that comply with requirements specified in this Section and in the luminaire schedule on the Drawings.
 2. Luminaire photometric characteristics shall be based on IESNA approved methods for photometric measurements performed by a recognized photometric laboratory.
 3. Luminaire housing shall be primarily metal.
 - a. Metal parts shall be free from burrs and sharp corners and edges.
 - b. Sheet metal components shall be fabricated from corrosion-resistant aluminum, formed and supported to prevent sagging and warping.
 - c. Exposed fasteners shall be stainless steel.
 4. Doors and frames shall be smooth operating and free from light leakage under operating conditions.
 - a. Relamping shall be possible without the use of special tools.
 - b. Doors, frames, lenses and diffusers shall be designed to prevent accidental falling during relamping and when secured in the operating position.
 - c. Door shall be removable for cleaning or replacing lens.
 5. Luminaires shall have minimum reflecting surface reflectance as follows unless scheduled otherwise:
 - a. White surfaces: 85 percent
 - b. Specular surfaces: 83 percent
 - c. Diffusing specular surfaces: 75 percent

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6. Provide lenses, diffusers, covers and globes as scheduled on the Drawings fabricated from materials that are UV stabilized to be resistant to yellowing and other changes due to aging or exposure to heat and ultraviolet radiation.
 7. Doors shall have resilient gaskets that are heat-resistant and aging-resistant to seal and cushion lens and refractor.
- I. Exterior Installation
1. Install products in accordance with manufacturer's instructions, NECA/IESNA 501, and approved shop drawings.
 2. Install surface mounted luminaires directly to an outlet box which is supported from structure.
 3. Install lamps in luminaires in accordance with manufacturer's instructions.

2.8 ELECTRICAL SYSTEM CONTROLS AND INSTRUMENTS

- A. Provide a complete power system consisting of branch circuits, motor disconnect switches, pushbutton stations, motor starters, and other devices to connect up and leave in operating condition each piece of electrically operated equipment provided either under this section or other Divisions.
- B. All control wiring, not indicated in the electrical specifications or not shown on electrical drawings, will be provided by Temperature Control Subcontractor.

2.9 GROUNDING SYSTEM

- A. All equipment and systems shall be grounded. Refer especially to NEC Section 250 Requiring Connections to Building Steel, Foundation, Water Service, and Interior Piping.
- B. The grounded conductor shall be supplemented by an equipment grounding system.
- C. The equipment grounding system shall be installed so all conductive items in close proximity to electrical circuits operate continuously at ground potential and provide a low impedance path for ground fault currents.
- D. Grounding conductors shall be so installed as to permit shortest and most direct path to ground.
- E. Maximum measured resistance to ground of 5.0 ohms shall not be exceeded. Ground separately derived systems (dry type transformers) in accordance with Article 250-26 by grounding neutral to transformer ground lug and providing insulated grounding electrode conductor to nearest effectively grounded building steel or, if unavailable, to nearest available effectively grounded metal water pipe.
- F. Equipment grounding conductors and straps shall be sized in compliance with Code Table 250.
- G. Grounding conductors shall be insulated with green color. Grounding conductors for use on isolated ground receptacles shall be green with trace color to differentiate between normal ground conductors.

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- H. Branch circuits shall consist of phase, grounded and grounding conductor installed in common metallic raceway. The raceway system may not serve as the grounding conductor only. All circuits shall have a separate insulated grounding conductor installed. Any flexible cable system or non-metallic raceway system shall have an insulated grounding conductor. Any cable system for use on isolated ground circuits shall have both an isolated ground conductor as well as an equipment ground conductor, both of which shall be insulated.
- I. Each electrical expansion fitting shall be furnished with a bonding jumper. Provide grounding bushings and ground connections for all raceways terminating below equipment where there is no metal-to-metal continuity.
- J. Continuity between all metallic and non-metallic raceway systems and equipment shall be maintained.

2.10 SEALS

- A. Water Tight Seals
 - 1. Conduits entering from the exterior or below grade shall have water tight fittings on the outside and on the inside of the conduit.
- B. Fittings on the outside of the conduit shall be O-Z Gedney type FSK or approved equal. Provide type WSK if penetration is within two feet of the high water table. Provide grounding attachment.
- C. Fittings on the inside of the conduit shall be O-Z Gedney type CSBI or approved equal. Provide type CSBG if penetration is within two feet of the high water table. Provide a blank fitting to seal spare or empty conduits.
- D. O-Z Gedney type CSM fitting may be used when sealing within a sleeve or cored hole.
 - 1. Submit on seals to be used.
- E. Environmental Seals
 - 1. Provide seals on raceways exposed to widely different temperatures, as in refrigerating or cold storage areas. Install seal to prevent circulation of air from warmer to colder sections through the raceway.
- F. Hazardous Area Seals
 - 1. Provide explosion proof seals as required by the Electric Code.
- G. Smoke and Fire Stopping Seals
 - 1. Provide a seal around raceways or cables penetrating full height walls (slab to slab), floors or ventilation or air handling ducts so that the spread of fire or products of combustion shall not be substantially increased.

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2. Penetrations through fire-resistant-rated walls, partitions, floors or ceilings shall be firestopped using approved methods and NRTL listed products to maintain the fire resistance rating.
3. Fire stopping in sleeves or in areas that may require the addition or modification of installed cables or raceways shall be a soft, pliable, non-hardening fire stop putty. Putty shall be water resistant and intumescent. Provide for all sleeves and raceways.
4. Firestopping in locations not likely to require frequent modification shall be NRTL listed putty, caulk or mortar to meet the required fire resistant rating.
5. Box penetrations into a fire rated wall or shaft shall have a fire stopping pad installed on the back of the box.
6. Firestopping of cable trays or busways through walls shall be with a non-hardening putty or with seal bags.
7. Firestopping materials shall be NRTL listed to UL 1479 (ASTM E814). Installation methods shall conform to a UL firestopping system. Submit specifications and installation drawings for the type of material to be used. Firestopping materials shall be as manufactured by 3M, International Protective Coatings Corp., RayChem or approved equal.

2.11 ACCESS PANELS

- A. Provide access panels for access to concealed junction boxes and to other concealed parts of system that require accessibility for operation and maintenance. In general, electrical work shall be laid out so access panels are not required.
- B. Access panels shall be located in a workmanlike manner in closets, storage rooms, and/or other non-public areas, positioned so that junction can be easily reached and size shall be sufficient for purpose (minimum size 12 in. x 12 in.). Access panels shall be prime painted and equipped with screwdriver operated cam locks.
- C. Access panels once coordinated with the architect and the G.C. shall be furnished by this trade contractor to the G.C. for installation. Coordinate all locations so that the finish trades can locate the rough openings appropriately.
- D. Furnish Access panels in compliance with Section 08 31 00.
- E. Furnish access panel shop drawings.

2.12 CIRCUIT BREAKERS IN EXISTING PANELS

- A. Type. Provide molded case circuit breaker combination starter type

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- B. Circuit Breakers
 - 1. Provide circuit breaker combination starters with single/three pole magnetic only motor circuit protectors specifically designed for motor circuit protection in accordance with NEC.
 - 2. Provide branch feeder circuit breakers of three pole thermal magnetic molded case type with frame size and trip ratings as specified, and having minimum interrupting capacity of 10,000 amperes rms symmetrical or higher required.
- C. Mounting
 - 1. Provide units mounted on unit support pan or in bucket type housing.
 - 2. Provide units of either tilt and lift-out or drawout type utilizing rails in order that rearrangement of relocation of individual units can be readily accomplished.

2.13 LIGHTING CONTROL DEVICES

- A. RELATED DOCUMENTS
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. SUMMARY
 - 1. Section Includes:
 - a. Wall Box Occupancy Sensors
 - b. Ceiling Occupancy Sensors
 - c. Daylight Sensors
 - d. Low Voltage Wall Stations
 - e. Load Control Relays
- C. DEFINITIONS
 - 1. BAS: Building-Automation System
 - 2. FC: Footcandles
 - 3. LED: Light-Emitting Diode.
 - 4. PIR: Passive Infrared.
 - 5. VAC: Volts, Alternating Current
 - 6. VDC: Volts, Direct Current
- D. SUBMITTALS
 - 1. Submit under provisions of Section 01 30 00 – Administrative Requirements.
 - 2. Product Data:
 - a. Bill of Materials: Complete list of parts required to provide a complete and functioning Lighting Control System.
 - b. Manufacturer's Data Sheets: Data Sheets are to provide information on item function, features, and dimensions.
 - c. Shop and Wiring Drawings
 - 1) Submit typical wiring diagrams for all components including, but not limited to, wall box occupancy sensors, ceiling mounted occupancy sensors, daylight sensors, load control relays, and low-voltage wall stations.
 - 2) Show installation locations and details for occupancy sensors, daylight sensors, load control relays, and low-voltage wall stations.
 - d. Warranty: Provide copy of applicable device warranty.

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3. Coordination:
 - a. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including luminaires, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

E. WARRANTIES

1. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in material or workmanship within specified warranty period.
 - a. Failures include any faulty operation of lighting control device(s).
 - b. Warranty Period: Five (5) years from date of Substantial Completion.

F. Acceptable MANUFACTURERS

1. Manufacturer Qualifications: Manufacturer of Lighting Control System listed in this Section must be comparable to Basis of Design and equal system must meet operational requirements.
 - a. SENSORWORX (Basis of Design)
2. Quality Assurance: All control devices shall be visually inspected by an individual to be free of defects and tested for proper device functionality.

G. WALL BOX OCCUPANCY SENSORS

1. General: Provide wall box occupancy sensor for stand-alone control of lighting load in areas shown on Drawings.
2. System Components: Occupancy sensor lighting control shall include, but not be limited to, all required sensors, relays, power supplies, and low-voltage or line-voltage wiring.
3. Sensor Requirements:
 - a. Sensor unit to be self-contained in impact resistant plastic, suitable for mounting in a standard switch box.
 - b. Sensor shall be less than one (1) inch deep into the switch box in order to provide maximum space for wire connections.
 - c. Sensor shall have interchangeable face colors that can be field changed without removing the unit from wall box or rewiring.
 - d. Sensor unit shall be available with the following powered methods:
 - 1) Line voltage, 120VAC or 277VAC, supplied by utility through a local circuit.
 - 2) Low voltage, 12-24VDC, supplied by power supply or power pack.
 - e. Sensor unit (Line voltage version) is rated for 800 Watts @ 120VAC and 1200 Watts @ 277VAC. Low voltage version is to be wired to a self-contained powerpack.
 - f. Sensor unit accommodates neutral (3-wire) and no neutral (2-wire) installation. Unit meets NEC 404.2© & 404.22 guideless regarding powering over ground & current leakage.
 - g. Sensor unit shall have interchangeable line and load wires.
 - h. Sensor unit shall contain a passive infrared detector and an optional on-board microphone in dual technology models. Sensor unit requires a passive infrared detection event to activate lights and will maintain occupied state dependant on continued passive infrared detection or, when dual technology is present, acoustic detection of occupants by the microphone.

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- i. Sensor unit shall have an option of an integrated photocell for ambient light sensing. The functional mode of this photo sensor shall be initial inhibit only; i.e. if enough ambient light is sensed for a duration of five (5) minutes, unit will prevent the lights from automatically turning on. Sensor unit shall have an auto-setpoint option or a manual setpoint from 2.5fc to 99fc.
- j. Sensor unit shall have several programable modes of operation:
 - 1) Occupancy Mode
 - 2) Vacancy Mode
 - 3) Automatic On with Exit Time
 - 4) Override Off Mode
 - 5) Disable Switch Mode
 - 6) Presentation Mode
- k. Sensor unit settings shall be adjustable without removing wall plate cover or unit from wall box.
- l. Sensor unit shall have multiple colors of LED indicator light for the following:
 - 1) Detection of occupancy, either passive infrared or acoustic detection.
 - 2) Response to programming push button.
 - 3) Indication of function current setting when queried.
 - 4) Error code sequence.
- m. Sensor unit shall be available with the ability to control additional line-voltage loads via companion “sidecar” switches located in a common multi-gang wall box. All sidecars shall receive detection signal from the primary sensor unit. Sidecar units can operate with the same or different operational modes, time delays, and detection types as the primary sensor unit.
- n. Sensor unit shall have a multi-sensor option available with the low-voltage models. This allows multiple sensors (wall-box or ceiling mounted) and/or switches to control a single load together with combined coverage.
- o. Sensor unit shall have an operating temperature from 32°F to 122°F (0°C to 50°C) standard, and down to -40°F/C with an optional conformal coating.
- p. Sensor shall be UL Listed, RoHS Compliant, and BAA Compliant.
- q. Full electronic and mechanical assembly of sensors shall be in the USA.

H. CEILING OCCUPANCY SENSORS

- 1. General: Provide a complete and operable occupancy sensor lighting control system in areas shown on Drawings.
- 2. System Components: Occupancy sensor lighting control shall include, but not be limited to, all required sensors, relays, power supplies, and low-voltage or line-voltage wiring.
- 3. Sensor Requirements:
 - a. Sensors shall contain a passive infrared detector and an optional on-board microphone in dual technology models. Sensor unit requires a passive infrared detection event to activate lights and will maintain occupied state dependant on continued passive infrared detection or, when dual technology is present, acoustic detection of occupants by the microphone.
 - b. Sensors shall be available with the following powered methods:
 - 1) Low voltage, 12-24VDC, supplied by power supply or power pack.
 - 2) Line voltage, 120VAC or 277VAC, supplied by utility through a local circuit.
 - c. Sensor shall have an optional integral photocell with three different modes of operation available:
 - 1) Daylight Harvesting (0-10V Dimming to maintain the target light level).

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- 2) ON/OFF Photocell Control (Lights switched OFF if ambient level surpasses the threshold and back ON if level drops).
- 3) Inhibit Only Photocell Control (Lighting is held OFF if sufficient ambient light level is present upon initial occupancy).
- d. Sensor housing shall be impact resistant plastic.
- e. Sensors shall have adjustable time delay increment settings from 30 seconds to 30 minutes (default 10 minutes), that is easily accessible to the user.
- f. Sensors have been designed to fail to the ON condition for predictable internal failure conditions.
- g. Sensor shall have multiple colors of LED indicator light for the following:
 - 1) Detection of occupancy, either passive infrared or acoustic detection.
 - 2) Response to programming push button.
 - 3) Indication of function current setting when queried.
 - 4) Error code sequence.
- h. Sensors shall have the ability to be wired in parallel to provide detection coverage of large areas beyond the range of a single unit. All joined sensors must time out (i.e. register unoccupied) before the lights will turn OFF.
- i. Sensor shall be available with an isolated low voltage relay for providing interfaces. Relay shall communicate occupancy status to BAS, HVAC system, or any other system requiring a contact closure style status signal. Relay logic shall be programmable.
- j. Sensors shall be available with the following lens options:
 - 1) Ceiling-Mounted (lenses can be swapped in field, if necessary, without need for any tools):
 - a) 360° field of view for small motion (8 to 12 feet above finished floor).
 - b) 360° field of view for large motion (8 to 15 feet above finished floor).
 - c) 360° field of view for high bay application (15 to 40 feet above finished floor).
 - 2) Wall-Mounted
 - a) 120° field of view for corner mount application.
 - b) 45° field of view for hallway application.
- k. Sensors shall have an operating temperature from 32°F to 122°F (0°C to 50°C) standard, and down to -40°F/C with an optional conformal coating.
- l. Sensor shall be UL Listed, RoHS Compliant, and BAA Compliant.
- m. Full electronic and mechanical assembly of sensors shall be in the USA.

I. DAYLIGHT SENSORS

1. General: Provide a complete and operable daylight sensor system in areas shown on Drawings.
2. System Components: Daylight sensor lighting control shall include, but not be limited to, all required sensors, relays, power supplies, and low-voltage or line-voltage wiring.
3. Sensor Requirements:
 - a. Sensors shall be self-contained, photo-electric detectors which shall provide detection of ambient light level in a given area.
 - b. Sensors shall be available with the following powered methods:
 - 1) Low voltage, 12-24VDC, supplied by power supply or power pack.
 - 2) Line voltage, 120VAC or 277VAC, supplied by utility through a local circuit.
 - c. Sensor housing shall be impact resistant plastic.

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- d. Setpoint: The minimum overall light level that shall be maintained in a space by the sensor is referred to as the Setpoint.
 - 1) Sensor shall have manually adjustable setpoint from 2.5fc to 100fc.
 - 2) Sensor shall have an auto-setpoint method which shall automatically determine setpoint in a given area based on the controlled and uncontrolled light sources.
- e. Sensor shall have the following operational modes:
 - 1) Daylight Harvesting to Low Trim
 - 2) Daylight Harvesting to Off (requires power pack)
 - 3) Photocell Override (On/Off)
 - 4) Initial Inhibit Only (Hold Off)
- f. Sensor with Daylight Harvesting option restricts the manual dimming range by a wall dimmer station to a maximum level that equals the setpoint down to the low-trim and/or off position. Sensor will ignore any attempt to raise the lighting above the setpoint with any wall dimmer station.
- g. Sensor shall have multiple colors of LED indicator light for the following:
 - 1) Notification of upcoming transition to On or Off
 - 2) Indication of ambient level of lighting being sufficient
 - 3) Response to programming push button
 - 4) Indication of function current setting when queried
- h. Sensor shall have an operating temperature from 32°F to 122°F (0°C to 50°C) standard, and down to -40°F/C with an optional conformal coating.
- i. Sensor shall be UL Listed, RoHS Compliant, and BAA Compliant.
- j. Full electronic and mechanical assembly of sensors shall be in the USA.

J. LOW VOLTAGE WALL STATIONS

- 1. General: Provide low voltage wall stations as required in areas shown on Drawings. These devices are to function seamlessly with other control devices.
- 2. System Components: Low Voltage Wall Station shall include, but not be limited to, all required sensors, relays, power supplies, and low-voltage wiring.
- 3. Wall Station Requirements:
 - a. Station shall be capable of switching and/or dimming the lighting load with a momentary pulse length of 250msec.
 - b. Station shall have multiple colors of LED indicator light for the following:
 - 1) Location of switch when lighting load is Off
 - 2) Relay status
 - 3) Response to programming push button
 - 4) Indication of function current setting when queried
 - 5) Current dimming level with five (5) stacked LEDs displayed to the user (dimming station only)
 - c. Station shall be capable of Multiway Switching with all connected stations indicate the same state. Manual dimming control shall be available at one (1) location.
 - d. Station shall have an operating temperature from 32°F to 122°F (0°C to 50°C) standard, and down to -40°F/C with an optional conformal coating.
 - e. Station shall be UL Listed, RoHS Compliant, and BAA Compliant.
 - f. Full electronic and mechanical assembly of sensors shall be in the USA.
 - g. Dimming Station:
 - 1) Station shall have High-End and Low-End Trim settings:
 - a) High End Trim enables energy saving task tuning by setting a maximum level (100%-50%) to which users are allowed to raise lights.

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- b) Low-End Trim enables minimum user level of dimmer to be customized.
- 2) Station shall have Turn On/Turn Off Dimming Operation (when used with a load controller and an occupancy sensor):
 - a) Turns On lighting to last user level or can be programmed to a pre-set level (100%, 50%, or custom).
 - b) Lighting can turn Off lighting by switching Off power (by opening relay) or dimming below electronic Off Level.
 - c) Lighting can also be held at low-end trim level during unoccupied/off state.
- 3) Station shall have adjustable Fade On and Fade Off Times;
 - a) Adjustable time interval for level to ramp up to Turn On Level is 0.75 sec, 1.5 sec, 3 sec, 5 sec, or 15 sec.
 - b) Adjustable time interval for level to ramp down to Off is 0.75 sec, 1.5 sec, 3 sec, 5 sec, or 15 sec.
- 4) Station shall have selectable Dimming Curves, which define how the dimmer unit adjusts its voltage output in response to button commands:
 - a) Linear (default)
 - b) Logarithmic
 - c) Square Log

K. LOAD CONTROL RELAYS

- 1. General: Provide a complete and operable load control relay system to be used in conjunction with occupancy sensors, daylight sensors, and wall stations in areas shown on Drawings.
- 2. System Components: Load Control Relays shall include, but not be limited to, all required sensors, wall stations, power supplies, and low-voltage or line-voltage wiring.
- 3. System Requirements:
 - a. Load Control Relay shall have an operating voltage of 120VAC or 277VAC.
 - b. Load Control Relay shall have a Class 2 Output Rating of at least 18VDC, 150mA with 80mA dedicated to powering connected devices. Voltage will be higher when a reduced low voltage load is connected.
 - c. Load Control Relay shall be capable of switching the following loads:
 - 1) 20A @ 120VAC – General Purpose Plug Load
 - 2) 20A @ 120/277 VAC – General Purpose, Tungsten, Magnetic Ballast
 - 3) 16A @ 120/277 VAC – Electronic Ballast, LED Driver
 - d. Load Control Relay shall have the following options to be ordered:
 - 1) PowerPack with Single Relay with 150mA Supply
 - 2) PowerPack as Secondary Relay
 - 3) Power Supply (No Relay) with 150mA Supply
 - e. Load Control Relay housing shall be impact-resistant plastic.
 - f. Load Control Relay shall have snaps integrated into the chase nipple to enable quick mounting to a junction box via a standard knockout.
 - g. Load Control Relay shall have an optional snap-on low voltage wiring chamber for concealing low voltage wire connections.
 - h. Load Control Relay shall have multiple colors of LED indicator light for the following:
 - 1) Indication of normal or other-than-normal operation
 - 2) Response to programming push button
 - 3) Indication of function current setting when queried

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- 4) Indication of successful or unsuccessful push button programming
- i. Load Control Relay shall have optional 0-10 Volt Stepped Dimming for Partial Off or Partial On Operation.
- j. Load Control Relay shall have optional Auxiliary Switch Input wires for Manual On, Hold On, or Hold Off Operation.
- k. Load Control Relay shall have a relay status output signal to keep all connected wall station indicator LEDs operating in unison.
- l. Load Control Relay shall have the following operational modes:
 - 1) Auto On / Auto Off (Occupancy Mode)
 - 2) Manual On / Auto Off (Vacancy Mode) – requires Low Voltage Wall Station(s)
 - 3) Override On for Logic High or Logic Low
 - 4) Override Off for Logic High or Logic Low
- m. Load Control Relay shall have an operating temperature from 32°F to 122°F (0°C to 50°C) standard, and down to -40°F/C with an optional conformal coating.
- n. Load Control Relay shall be UL Listed, Plenum Rated (UL2043), RoHS Compliant, and BAA Compliant.
- o. Full electronic and mechanical assembly of load control relay shall be in the USA.

L. INSTALLATION

- 1. Coordinate layout and installation of ceiling-mounted devices with other constructions that is supported by and/or penetrates the ceiling, including luminaires, smoke detectors, HVAC equipment, and fire-suppression systems.
- 2. Install and aim sensors to achieve not less than 90 percent coverage of indicated areas. Do not exceed coverage dimensions as specified by the manufacturer. Allow six (6) feet of cable slack for sensor location adjustment.

M. IDENTIFICATION

- 1. Identification: Refer to Section 26 05 53, “Identification of Electrical Systems”, for specific identification requirements, including, but not limited to, identification of circuits and luminaires, labelling, nameplates, and applicable painting.

N. WIRING

- 1. Wiring Method: Comply with Section 26 05 19 “Low-Voltage Electrical Power Conductors and Cables”.
- 2. Size conductors according to lighting control device manufacturer’s written instructions, unless otherwise indicated.

O. FIELD QUALITY CONTROL

- 1. Field Testing: Perform the following field tests and inspections and prepare test reports:
 - a. After installing all sensors, load controllers, and wall stations, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - b. Operational Test: Verify operation of each lighting control device and confirm the time delay duration.
- 2. Demonstration: Upon completion of testing and adjustment, the Contractor shall demonstrate operation of the system to representatives of the Owner and Engineer.
- 3. Training: The Contractors shall instruct the Owner's personnel in proper maintenance, adjustment, and operation of the occupancy sensor lighting controls.

2.14 VARIABLE FREQUENCY DRIVES (VFD'S)

- A. The variable frequency drives (VFD's) shall be solid state, with a Pulse Width Modulated (PWM) output waveform (VVI, six-step, and current source drives are not acceptable). The VFD package as specified herein shall be enclosed in a NEMA 1 enclosure, completely assembled and tested by the manufacturer. The VFD shall employ a full wave rectifier (to prevent input line notching), DC Line Reactor, capacitors, and Insulated Gate Bipolar Transistors (IGBT's) as the output switching device (SCR's, GTO's and Darlington transistors are not acceptable). The drive efficiency shall be 97 percent or better at full speed and full load. Fundamental power factor shall be 0.98 at all speeds and loads.
- B. Specifications at 208 volts:
1. Input VAC +/-10 percent, 3 phase, 48-63Hz. Output 0 - Input Voltage, 3 phase, 0 to 500 Hz for drives up to 75 HP; 0 to 120 Hz for drives over 75 HP. Operation above 60 Hz. shall require programming changes to prevent inadvertent high speed operation. Environmental operating conditions: 0 to 40 C @ 3 klz switching frequency, 0 to 3300 ft. above sea level, less than 95 percent humidity, non-condensing. Units shall be UL, CUL and CA approved.
- C. All VFD's shall have the following standard features:
1. All VFD's shall have the same customer interface, including digital display, keypad and customer connections; regardless of horsepower rating. The keypad is to be used for local control, for stepping through the displays and menus.
 2. The VFD shall give the user the option of either (1) displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last reference revised, or (4) cause a Warning to be issued, if the input reference (4-20mA or 2-10V) is lost; as selected by the user. The VFD shall provide a programmable relay output for customer use to indicate the loss of reference condition.
 3. The VFD's shall utilize plain English digital display (code numbers and letters are not acceptable). The digital display shall be a 40-character (2 line X 20 characters/line) LCD display. The LCD shall be backlit to provide easy viewing in any angle. All set-up parameters, indications, faults, warnings and other information must be displayed in words to allow the user to understand what is being displayed without the use of a manual or cross-reference table.
 4. The VFD's shall utilize pre-programmed application macro's specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time.
 5. The VFD shall have the ability to automatically restart after an overcurrent, overvoltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between reset attempts shall be programmable. If the time between reset attempts is greater than zero, the time remaining until reset occurs shall count down on the display to warn an operator that a restart will occur.
 6. The VFD shall be capable of starting into a rotating load (forward or reverse) and accelerate or decelerate to setpoint without safety tripping or component damage (flying start).
 7. The VFD shall be equipped with an automatic extended power loss ride-through circuit which will utilize the inertia of the load to keep the drive powered. Minimum power loss ride-through shall be one-cycle, based on full load and not inertia. Removing power from the motor is not an acceptable method of increasing power loss ride-through.
 8. The customer terminal strip shall be isolated from the line ground.

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9. Prewired three-position Hand-Off-Auto switch and speed potentiometer. When in "Hand", the VFD will be started, and the speed will be controlled from the speed potentiometer. When in "Off", the VFD will be stopped. When in "Auto", the VFD will start via an external contact closure, and its speed will be controlled via an external speed reference.
10. The drive shall employ three current limit circuits to provide trip free operation:
11. The Slow Current Regulation limit circuit shall be adjustable to 125 percent (minimum) of the VFD's variable torque current rating. This adjustment shall be made via the keypad, and shall be displayed in actual amps, and not as percent of full load. The Rapid Current Regulation limit shall be adjustable to 170 percent (minimum) of the VFD's variable torque current rating. The Current Switch-off limit shall be fixed at 255 percent (minimum, instantaneous) of the VFD's variable torque current rating. The overload rating of the drive shall be 110 percent of its variable torque current rating for one minute every ten minutes, and 140 percent of its variable torque current rating for two seconds every 15 seconds, input line fuses standard in the drive enclosure. VFD shall have a DC Line Reactor to reduce the harmonics to the power line and to increase the fundamental power factor.
12. The VFD shall be optimized for a three kHz carrier frequency to reduce motor noise and provide high system efficiency. The carrier frequency shall be adjustable by the start-up engineer in ACH 501 units. The VFD shall have a manual speed potentiometer in addition to using the keypad as a means of controlling speed manually.

D. All VFD's to have the following adjustments:

1. Five programmable critical frequency lockout ranges to prevent the VFD from continuously operating at an unstable speed.
2. PI Setpoint controller shall be standard in the drive, allowing a pressure or flow signal to be connected to the VFD, using the microprocessor in the VFD for the closed loop control.
3. Two programmable analog inputs shall accept a current or voltage signal for speed reference or for reference and actual (feedback) signals for PI controller. Analog inputs shall include a filter; programmable from 0.01 to 10 seconds to remove any oscillation in the input signal. The minimum and maximum values (gain and offset) shall be adjustable within the range of 0-20 MA and 0-10 Volts. Additionally, the reference must be able to be scaled so that maximum reference can represent a frequency less than 60 Hz, without lowering the drive maximum frequency below 60 Hz.
4. Six programmable digital inputs for maximum flexibility in interfacing with external devices. One digital input is to be utilized as a customer safety connection point for fire, freeze, and smoke interlocks (Enable). Upon remote, customer reset (reclosure of interlock) drive is to resume normal operation.

E. The following operating information displays shall be standard on the VFD digital display. The display shall be in complete English words (alpha-numeric codes are not acceptable):

- Output Frequency
- Motor Speed (RPM, Percent, or Engineering units)
- Motor Current
- Calculated Motor Torque
- Calculated Motor Power
- DC Bus Voltage
- Output Voltage
- Heatsink Temperature
- Analog Input Values
- Keypad Reference Values
- Elapsed Time Meter

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kWh meter

- F. Speed Command Input shall be via:
1. Keypad.
 2. Two Analog inputs, each capable of accepting a 0-20mA, 4-20mA, 0-10V, 2-10V signal. Input shall be isolated form ground, and programmable via the keypad for different uses.
 3. Floating point input shall accept a three-wire input from a Dwyer photohelic (or equivalent type) instrument.
- G. Accessories to be furnished and mounted by the drive manufacturer.
1. Customer Interlock Terminal Strip-provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external interlocks and start/stop contacts shall remain fully functional whether the drive is in hand, Auto or Bypass.
 2. All wires to be individually numbered at both ends for ease of troubleshooting.
 3. Door interlocked thermal magnetic circuit breaker which will disconnect all input power from the drive and all internally mounted options. The disconnect handle shall be thru-the-door type, and be padlockable in the "Off" position.
 4. Manual transfer to line power via contactors. Include motor thermal overload and fuse or circuit breaker protection while in bypass operation. A three position selector switch to control the bypass contactor and the drive output contactor is to be mounted on the enclosure door. When in the "Normal" mode, the bypass contactor is open and the drive output contactor is closed. In the "Test" position both contactors are open, and in the "Bypass" position, the drive output contactor is open, and the bypass contactor is closed. The drive output contactor shall also open when a stop command is given, isolating the motor from the drive. Start/stop signals and safety interlocks will work in drive and bypass modes.
 5. Pilot lights shall be provided for indication of "Normal" operation, "Bypass" operation, and "External Fault". All pilot lights shall be push-to-test type.
 6. Service contactor (drive input contactor) which provides the ability to service the drive (electrically isolate the drive while in bypass operation without having to remove power from the motor). The service contactor shall open when the drive is switched to bypass, and also be controlled by a switch which is mounted inside the drive enclosure so that its access is limited to service personnel only.
 7. A class 20 bimetallic thermal motor overload relay shall be provided to protect the motor in bypass.
- H. Compliance to IEEE - 519
1. The VFD manufacturer shall provide calculations specified to this installation showing that the Total harmonic Distortion for the VFD's, reflected into the electrical distribution system is limited to the level defined by IEEE - 519 (latest edition) for general systems. Harmonic analysis shall be included with VFD submittal for approval by the engineer.
 2. The VFD manufacturer shall conduct on site harmonic measurements before and after start up of the VFD's. Results of the measurements, showing harmonic contribution of the VFD's, shall be provided to the engineer one month after start up.
 3. Three phase A. C. input line reactors shall be provided as a minimum, with all VFD's. The line reactors are to provide attenuation of line side voltage transients, thus preventing overload trips or other unnecessary V.F.D. shutdown, and provide a reduction in harmonic distortion.

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4. Line reactors shall have the following requirements:
 - a. Three (3) percent line impedance (line side of drive).
 - b. 150 percent continuous current rating for one minute.
 - c. Saturation rating no less than 2.5 times the continuous current rating.
 - d. U.L. recognized.

- I. General: Install variable frequency drives where indicated, in accordance with manufacturer's published installation instructions, complying with recognized practices to ensure that variable frequency drives comply with requirements and serve intended purposes.

- J. Access: Provide access space around control panels for service as indicated, but in no case less than that recommended by manufacturer.

- K. Support: Install drive control panels on walls where indicated on drawings. Provide necessary Unistrut and structural steel to provide adequate support.

- L. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

- M. Start-Up
 1. Certified factory start-up shall be provided for each drive by a factory authorized service center. A certified start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.

- N. Adjusting and Cleaning:
 1. Alignment: Check compatibility of control panel to motor and where necessary, adjust frequency and provide necessary filters to assure noise free operation of motors. Verify response from control panel to motor to assure turn down ratio specified and that static pressure signals are being received and that drives are controlling as specified and within recommended tolerances by manufacturer. Provide start-up report prepared by manufacturer's representative to assure operation is as specified.
 2. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

- O. Acceptable Manufacturers:
 1. Square D
 2. Allen – Bradley
 3. ABB
 4. Siemens
 5. Or Equal

2.15 FLOOR OUTLETS (FLUSH TYPE)

- A. Section includes flush floor boxes equal to Wiremold RFB Series. Provide appropriate floor box model that meets the intent of what is shown on the drawings.

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B. Quality Assurance

1. Electrical Raceways and Components: Comply with requirements of applicable local codes, NEC, UL, and NEMA Standards pertaining to raceways and components. Listed and labeled in accordance with NFPA 70, Article 100.

C. Floor Boxes

1. RFB4 and RFB4-4DB Series Floor Boxes: Manufactured from stamped steel and approved for use on above grade floors. The box shall be 12-3/4 in. L x 10 in. W x 3-7/16 in. H [324mm x 254mm x 87mm]. Provide the box with four (4) independent wiring compartments that allow capacity for up to four duplex receptacles, communication and/or audio/video services. The RFB4 Series Box shall permit tunneling from end power compartment to end power compartment. The RFB4-4DB Series Box shall permit tunneling from adjacent or opposite compartments. Two (2) of the four (4) compartments shall have a minimum wiring capacity of 16.4 cu in [269cu cm], one (1) compartment shall have a minimum capacity of 32.3 cu in [529cu cm], and one (1) compartment shall have a minimum capacity of 50 cu in [820cu cm]. Four (4) compartments shall have a minimum of two (2) inches of space behind the device plates. The box shall include the following number of conduit knockouts: one (1) 1/2-inch [12.7mm], three (3) 1-inch [25mm], six (6) 3/4-inch [19.1mm], and six (6) 1-1/4-inch [32mm]. The box shall be fully adjustable, providing a maximum of 1-7/8-inch [47.7mm] pre-pour adjustment, and a maximum of 3/4-inch [19.1mm] after-pour adjustment. The box shall include a series of device mounting plates that will accept both duplex power devices as well as plates that will accommodate Ortronics® workstation connectivity outlets and modular adapters, Legrand AVIP audio/video device plates, and other open system devices.
2. RFB4-CI-1 and RFB4-CI-NA Series Floor Boxes: Manufactured from cast-iron and approved for use on grade and above grade floors. The box shall be 14-1/2 in. L x 11-7/8 in. W x 3-7/16 in. H [368mm x 302mm x 87mm]. Provide the box with four (4) independent wiring compartments that allow capacity for up to four duplex receptacles and/or communication services. The box shall permit tunneling from adjacent or opposite compartments. Two of the four compartments shall have a minimum wiring capacity of 27 cu in [443cu cm], and two compartments shall have a minimum wiring capacity of 36 cu in [590cu cm]. Four compartments shall have a minimum of two (2) inches of space behind the device plates. The box shall include the following number of conduit hubs: four 1-inch [25mm] and four 1-1/4-inch [32mm]. The box shall be fully adjustable, providing a maximum of 1-7/8-inch [48mm] pre-pour adjustment, and a maximum of 3/4-inch [19.1mm] after-pour adjustment. The box shall include a series of device mounting plates that will accept both duplex power devices as well as plates that will accommodate Ortronics® workstation connectivity outlets and modular adapters, Legrand AVIP audio/video device plates, and other open system devices.
3. RFB4-SS Series Floor Boxes: Manufactured from stamped-steel and approved for use on above grade floors. The box shall be 13-5/8 in. L x 10 in. W x 2-7/16 in. H [346mm x 254mm x 62mm]. Provide the box with four (4) independent wiring compartments that allow capacity for up to four duplex receptacles, communication and/or audio/video services. The box shall permit feed through tunneling from adjacent compartments. Two of the four compartments shall have a minimum wiring capacity of 15.7 cu in [257cu cm] and two compartments shall have a minimum wiring capacity of 31.2 cu in [511cu cm]. Four compartments shall have a minimum of two (2) inches of space behind the device plates. The box shall contain the following number of conduit knockouts: two 1/2-inch [12.7mm], six 3/4-inch [19.1mm], and eight 1-inch [25mm]. The box shall be fully adjustable, providing a maximum of 1-7/8-inch [48mm] pre-pour adjustment, and a

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- maximum of 3/4-inch [19.1mm] after-pour adjustment. The box shall include a series of device mounting plates that will accept both duplex power devices as well as plates that will accommodate Ortronics® workstation connectivity outlets and modular adapters, Legrand AVIP audio/video device plates, and other open system devices.
4. RFB4E Series Floor Boxes: Manufactured from stamped steel and approved for use on above grade floors. The box shall be 13-1/8 in. L x 13-1/8 in. W x 4-1/16 in. H [333mm x 333mm x 103mm]. Provide the box with four (4) independent wiring compartments that allow capacity for up to four duplex receptacles, communication and/or audio/video services. The box shall permit feed through removable barriers from adjacent compartments. Four compartments shall have a minimum wiring capacity of 75 cu in [1230cu cm]. Four compartments shall have a minimum of 3-1/2 inches of space behind the device plates. The box shall contain the following number of conduit knockouts: six 3/4-inch [19.1mm], 10 1-inch [25mm], and eight 1-1/4-inch [32mm]. The box shall have two removable knockout plates that can be replaced with a 2-inch trade size conduit hub (2HUB). The box shall be fully adjustable, providing a maximum of 2-inch [35mm] pre-pour adjustment, and a maximum of 3/4-inch [19.1mm] after-pour adjustment. The box shall include a series of device mounting plates that will accept both duplex power devices as well as plates that will accommodate Ortronics workstation connectivity outlets and modular adapters, Legrand AVIP audio/video device plates, and other open system devices.
 5. RFB4E-OG Series Floor Boxes: Manufactured from stamped steel and painted with a fusion-bonded epoxy designed for use on metal reinforcement bar and related accessories before encapsulation in concrete, and approved for use on grade and above grade floors. The box shall be 13-1/8 in. L x 13-1/8 in. W x 4-1/16 in. H [333mm x 333mm x 103mm]. Provide the box with four independent wiring compartments that allow capacity for up to four duplex receptacles, communication and/or audio/video services. The box shall permit feed through removable barriers from adjacent compartments. Four compartments shall have a minimum wiring capacity of 75 cu in [1230cu cm]. Four compartments shall have a minimum of 3-1/2 inches of space behind the device plates. The box shall contain the following number of conduit knockouts: six 3/4-inch [19.1mm], 10 1-inch [25mm], and eight 1-1/4-inch [32mm]. The box shall have two removable knockout plates that can be replaced with a 2-inch trade size conduit hub (2HUB). The box shall be fully adjustable, providing a maximum of 2-inch [35mm] pre-pour adjustment, and a maximum of 3/4-inch [19.1mm] after-pour adjustment. The box shall include a series of device mounting plates that will accept both duplex power devices as well as plates that will accommodate Ortronics workstation connectivity outlets and modular adapters, Legrand AVIP audio/video device plates, and other open system devices.
 6. RFB6 Series Floor Boxes: Manufactured from stamped steel and approved for use on above grade floors. The box shall be 13-1/8 in. L x 12-1/2 in. W x 3-1/4 in. H [333mm x 317mm x 83mm]. Provide the box with six independent wiring compartments that allow capacity for up to six duplex receptacles, communication and/or audio/video services. The box shall permit feed through tunneling from adjacent compartments. Two of the six compartments shall have a minimum wiring capacity of 23 cu in [376cu cm] and four compartments shall have a minimum wiring capacity of 52cu in [850cu cm]. Four of the six compartments shall have a minimum of 3-1/4 inches of space behind the device plates and two of the six) compartments shall have a minimum of 2-3/8 inches of space behind the device plates. The box shall contain the following number of conduit knockouts: twelve 3/4-inch [19.1mm], four (4) 1-inch [25mm], and twelve 1-1/4-inch [32mm]. The box shall be fully adjustable, providing a maximum of 1-3/8-inch [35mm] pre-pour adjustment, and a maximum of 3/4-inch [19.1mm] after-pour adjustment. The box shall include a series of

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- device mounting plates that will accept both duplex power devices as well as plates that will accommodate Ortronics workstation connectivity outlets and modular adapters, Legrand AVIP audio/video device plates, and other open system devices.
7. FB6-OG Series Floor Boxes: Manufactured from stamped steel and painted with a fusion-bonded epoxy designed for use on metal reinforcement bar and related accessories before encapsulation in concrete, and approved for use on grade and above grade floors. The box shall be 13-1/8 in. L x 12-1/2 in. W x 3-1/4 in. H [333mm x 317mm x 83mm]. Provide the box with six independent wiring compartments that allow capacity for up to six duplex receptacles, communication and/or audio/video services. The box shall permit feed through tunneling from adjacent compartments. Two of the six compartments shall have a minimum wiring capacity of 23 cu in [376cu cm] and four compartments shall have a minimum wiring capacity of 52cu in [850cu cm]. Four of the six compartments shall have a minimum of 3-1/4 inches of space behind the device plates and two of the six compartments shall have a minimum of 2-3/8 inches of space behind the device plates. The box shall contain the following number of conduit knockouts: twelve 3/4-inch [19.1mm], four 1-inch [25mm], and twelve 1-1/4-inch [32mm]. The box shall be fully adjustable, providing a maximum of 1-3/8-inch [35mm] pre-pour adjustment, and a maximum of 3/4-inch [19.1mm] after-pour adjustment.
The box shall include a series of device mounting plates that will accept both duplex power devices as well as plates that will accommodate Ortronics workstation connectivity outlets and modular adapters, Legrand AVIP audio/video device plates, and other open system devices.
 8. RFB6E Series Floor Boxes: Manufactured from stamped steel and approved for use on above grade floors. The box shall be 13-1/8 in. L x 12-1/2 in. W x 4 in. H [333mm x 317mm x 102mm]. Provide the box with six independent wiring compartments that allow capacity for up to six duplex receptacles, communication and/or audio/video services. The box shall permit feed through tunneling from adjacent compartments through 1-1/4-inch grommet openings. Two of the six compartments shall have a minimum wiring capacity of 23 cu in [376cu cm] and four compartments shall have a minimum wiring capacity of 52cu in [850cu cm]. Four of the six compartments shall have a minimum of 3-1/4 inches of space behind the device plates and two of the six compartments shall have a minimum of 2-3/8 inches of space behind the device plates. The box shall contain the following number of conduit knockouts: twelve 3/4-inch [19.1mm], four 1-inch [25mm], and twelve 1-1/4-inch [32mm]. The box shall be fully adjustable, providing a maximum of 1-3/8-inch [35mm] pre-pour adjustment, and a maximum of 3/4-inch [19.1mm] after-pour adjustment. The box shall include a series of device mounting plates that will accept both duplex power devices as well as plates that will accommodate Ortronics workstation connectivity outlets and modular adapters, Legrand AVIP audio/video device plates, and other open system devices.
 9. RFB6E-OG Series Floor Boxes: Manufactured from stamped steel and painted with a fusion-bonded epoxy designed for use on metal reinforcement bar and related accessories before encapsulation in concrete, and approved for use on grade and above grade floors. The box shall be 13-1/8 in. L x 12-1/2 in. W x 4 in. H [333mm x 317mm x 102mm]. Provide the box with six (6) independent wiring compartments that allow capacity for up to six duplex receptacles, communication and/or audio/video services. The box shall permit feed through tunneling from adjacent compartments. Two of the six compartments shall have a minimum wiring capacity of 23 cu in [376cu cm] and four compartments shall have a minimum wiring capacity of 52cu in [850cu cm]. Four of the six compartments shall have a minimum of 3-1/4 inches of space behind the device plates, and two of the six compartments shall have a minimum of 2-3/8 inches of space behind the device plates. The

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box shall contain the following number of conduit knockouts: twelve 3/4-inch [19.1mm], four (4) 1-inch [25mm], and twelve 1-1/4-inch [32mm]. The box shall be fully adjustable, providing a maximum of 1-3/8-inch [35mm] pre-pour adjustment, and a maximum of 3/4-inch [19.1mm] after-pour adjustment.

The box shall include a series of device mounting plates that will accept both duplex power devices as well as plates that will accommodate Ortronics workstation connectivity outlets and modular adapters, Legrand AVIP audio/video device plates, and other open system devices.

D. Activation Covers

1. FloorPort FPCT, FPBT, and FPFPT Series Covers: Manufactured of die-cast aluminum or die-cast zinc, and available in brushed aluminum finish and powder-coated paint finishes (black, gray, bronze, nickel and brass). Activation covers shall be available in flanged and flangeless versions. Covers shall be available with options for tile or carpet inserts, or flush covers. The cover's hinge shall allow for the cover to open 180 degrees. The furniture feed covers shall come equipped with one 1-inch trade size screw plug opening and one combination 1-1/4-inch and 2-inch trade size screw plug.
 - a. Flanged covers shall be 7-3/4 in. L x 6-9/16 in. W [197mm x 167mm].
 - b. Flangeless covers shall be 6-3/4 in. L x 5-9/16 in. W [171mm x 142mm].
2. 6CT, 6CTC, 6CFFTC, 8CTC, and 8CT Series Covers: Manufactured of die-cast aluminum alloy and available in powder-coated gray, black, brass, nickel or bronze finish. The covers shall be available in carpet and tile versions. Provide covers with two gaskets (one for carpet and one for tile) to go under the trim flange to maintain scrub water tightness. The activation cover for the 8CTC and 8CT series shall be 9-1/4-inch [235mm] in diameter. The activation cover for the 6CT and 6CTC series shall be 7-1/4-inch [184mm] in diameter and the activation cover for the 6CFFTC series shall be 7-3/4-inch [197mm] in diameter. The carpet covers shall be surface mounted and the tile covers shall be flush with the finished floor covering. The covers shall have spring loaded slides to allow cables to egress out of the unit and maintain as small an egress opening as possible.
3. The covers shall have been evaluated by UL to meet the applicable U.S. and Canadian safety standards for scrub water exclusion when used on tile, terrazzo, wood, and carpet covered floors.

E. Communication Modules Mounting Accessories

1. The floor box manufacturer shall provide a complete line of faceplates and bezels to facilitate mounting of UTP, STP (150 ohm), fiber optic, coaxial, and communication devices. The box shall provide a series of device mounting plates that will accommodate Ortronics workstation connectivity outlets and modular adapters, and other open system devices.

F. Installation

1. Strictly comply with manufacturer's installation instructions and recommendations and approved shop drawings. Coordinate installation with adjacent work to ensure proper clearances and to prevent electrical hazards.
2. Mechanical Security: Raceway systems shall be mechanically continuous and connected to all electrical outlets, boxes, device mounting brackets, and cabinets, in accordance with manufacturer's installation sheets.
3. Accessories: Provide accessories as required for a complete installation, including insulated bushings and inserts where required by manufacturer.

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4. Unused Openings: Close unused box openings using manufacturer's recommended accessories.
 5. Provide a minimum concrete pour depth of 3-7/16-inch [87mm] plus 1/16-inch [1.6mm] above the top of the box for the RFB4, RFB4-4DB, RFB2, and the RFB2-OG Series Boxes; 2-7/16-inch [62mm] plus 1/16-inch [1.6mm] for the RFB4-SS and RFB2-SS Series Boxes; and 3-7/16-inch [87mm] plus 13/16-inch [21mm] above the top of the box for the RFB4-CI-1, RFB6, and RFB6-OG Series Boxes; and 4-1/16-inch [103mm] above the top of the RFB4E and RFB4E-OG Series Boxes; and 4-inch [102mm] above the top of the RFB6E and RFB6E-OG Series Boxes. Provide the box with four (4) locations to accommodate leveling for pre-concrete pour adjustment and include four (4) leveling screws for the pre-pour adjustment.
- G. Poke-Through Assemblies:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hubbell.
 - b. Pass & Seymour.
 - c. Thomas & Betts Corporation.
 - d. Wiremold
 - e. Or equal
 2. Poke-Thru Assembly
 - a. Floor Fitting
 - 1) The floor fitting shall consist of an insert and an activation cover. Floor fitting shall accommodate power and communications services in a single unit. Floor fitting shall have one ¾ in. trade size channel for power and one 2" trade size channel for communication cabling. Floor fitting shall consist of intumescent fire stop material to maintain the fire rating of the floor slab and UL Listed with a fire rating of 1, 1½, & 2 hours in an unprotected reinforced concrete floor or a 1 or 2 hour rating in floors employing steel floor units and concrete topping. The floor fitting shall be suitable in concrete floor thicknesses of 2.5 in. or greater. The insert shall have 12 installation barbs that will hold the poke-thru device in the floor slab without additional fasteners.
 - b. Insert Body
 - 1) The insert body shall allow the devices to be recessed 3.5-inches, or 2.25-inches with the use of 1 ¼ in. supplied stand-offs. There shall be complete separation of channels allowing for individual separation of power and communications services. There shall be one channel arranged such that communication cables can be conduit protected and connected with a 2-inch trade size openings to accept both rigid and flexible conduit connectors. The inserts shall consist of multiple compartments that allow for up to 2 duplex receptacles that can be wired in configurations including standard receptacles, isolated ground or up to 12 communication ports.
 - c. Activation Cover/ Flange Assembly
 - 1) Activation covers and Flange shall be manufactured of die-cast aluminum alloy and be capable of being plated in brushed brass, satin nickel, and bronze finish, lacquer coated brushed aluminum or powder-coated in , black, finishes. Flange shall be suitable for either carpet, tile, terrazzo and wood covered floors. Flange shall include a gasket adhered to the top inside surface to maintain scrub water tightness with sub plates. Flange shall include a gasket for assembly against the floor to maintain scrub water tightness. Cover

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assembly shall provide a single hinged access doors that rotate 180 degrees flush with flange and incorporate foam gaskets to maintain scrub water tightness by preventing water, dirt, and debris from entering the power and communication compartment. Cover assembly shall feature cable access doors which secure to the underside of the closed cover that allow each cable access door to be opened and closed independently

- d. Communication Modules Mounting Accessories
 - 1) The poke-through manufacture shall have available modular inserts to facilitate mounting UTP (including Category 5, 5e, 6, 6a), STP, fiber optic, coaxial, and data/communications devices. The S1R6 series shall accommodate Extron MAAP or Extron AAP adapter plates. Where indicated provide connectivity outlets and modular inserts by Hubbell or approved equal.

H. FURNITURE FEED POKE-THRU DEVICES

- 1. Poke-Through Assemblies:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hubbell.
 - 2) Pass & Seymour.
 - 3) Thomas & Betts Corporation.
 - 4) Wiremold
 - 5) Or equal
- 2. Classification and Use: Furniture feed poke-thru devices shall have been examined and tested by Underwriters Laboratories Inc. to meet UL514A and/or UL514C and Canadian Standard C22.2, No. 18-98 and bear the U.S. and Canadian UL Listing Mark. Furniture poke-thru devices shall also have been tested by Underwriters Laboratories Inc. and Classified for fire resistance and bear the U.S. and Canadian UL Classification Mark. Poke-thru devices are approved for use in recessed and flush floor construction and meet and exceed the UL scrub water exclusion test.
 - a. Devices shall be classified for use in 1-, 1-1/2-, or 2-hour rated, unprotected reinforced concrete floors and 1-, 1-1/2-, or 2-hour rated floors employing unprotected steel floor units and concrete toppings (D900 Series designs), or concrete floors with suspended ceilings. Fire resistive designs with suspended ceilings shall have provisions for accessibility in the ceiling below the poke-thru fittings.
 - b. These devices are not suitable for wet or damp locations, or other areas subject to saturation with water or other liquids such as commercial kitchens.
 - c. Floor boxes shall be suitable for use in air handling spaces in accordance with Section 300-22(c) of the National Electrical Code.
- 3. MATERIALS
 - a. RC7AFFTC Flush Furniture Feed Poke-Thru Assembly for power: Consists of an insert and activation cover. Overall poke-thru assembly length shall be 16-1/2 in. [419mm].
 - 1) Insert: Insert body shall have the necessary channels to provide complete separation of power and communication services. There shall be one 3/4-inch trade size channel for power and two 1/2-inch trade size channels for communication cabling. The channels shall be arranged such that communication cables can be conduit protected and connected to the insert

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body using a die-cast zinc conduit connector with two 1/2-inch trade size threaded openings to accept both rigid and flexible conduit connections.

- a) The body will consist of an intumescent fire stop material to maintain the fire rating of the floor slab. The intumescent material will be held securely in place in the insert body and shall not have to be adjusted to maintain the fire rating of the unit and the floor slab. Insert shall have a spring-steel retaining ring that will hold the poke-thru device in the floor slab without additional fasteners. The poke-thru insert shall also consist of one 3/4-inch trade size conduit stub and one 1-1/2-inch trade size conduit stub that are connected to the insert body. There shall also be a 24.5 cu in [402ml] stamped steel junction box for wire splices and connections. The stamped steel junction box shall also contain the necessary means to electrically ground the poke-thru assembly.
- 2) Activation Cover: The activation cover shall provide three conduit openings to feed modular furniture applications and provide a flush appearance. The activation cover trim flange shall be one-piece and be manufactured of forged aluminum alloy and be capable of being powder coated or plated. Coated finish is to be textured, two-stage epoxy paint in gray or black. Activation cover trim flange shall also be available in a solid brass forging and a die cast brushed aluminum finish. Aluminum and brass finish shall be a brushed finish with a lacquer sealant. The activation cover shall be seven inches [178mm] in diameter. A gasket is attached to the underside of the trim flange assembly to maintain scrub water tightness by preventing water, dirt, and dust from entering the power and communication compartments.
 - a) The activation cover insert shall provide one 3/4-inch NPSM threaded opening for power and two 1/2-inch NPSM threaded openings for communication to feed modular furniture workstations. Each activation cover shall also be supplied with one 3/4-inch trade size and two 1/2-inch trade size threaded conduit connectors and one (1/4-inch trade size and one 3/4-inch trade size and two 1/2-inch trade size conduit closure plugs.
- b. RC9AM2TC Furniture Feed Poke-Thru Assembly for data: Consists of an insert and activation cover. Overall poke-thru assembly length shall be 10 inches [254mm].
 - 1) Insert: There shall be one 2-inch trade size channel for all power or all communication cabling. The body will also consist of an intumescent fire stop material to maintain the fire rating of the floor slab. The intumescent material will be held securely in place in the insert body and shall not have to be adjusted to maintain the fire rating of the unit and the floor slab. Insert shall have a spring-steel retaining ring that will hold the poke-thru device in the floor slab without additional fasteners.
 - 2) Activation Cover: The activation cover shall be manufactured of aluminum die-cast alloy and consist of a trim flange and a hexagonal service head. The activation cover shall be capable of being powder coated or plated. Finish shall be textured, two-stage epoxy paint available in a gray or black finish. A gasket is attached to the underside of the activation cover trim flange to maintain scrub water tightness. Trim flange shall have a combination 1-1/4 in. - 2 in. trade size conduit opening and closure plugs. The trim flange shall be seven inches [178mm] in diameter. All power connections must be made in a junction box below (not supplied).

- I. Cleaning and Protection
 1. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer.
 2. Protect boxes and fittings until acceptance.

2.16 WIRING DEVICES

- A. Manufacturers:
 1. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - a. Cooper Wiring Devices.
 - b. Hubbell.
 - c. Leviton.
 - d. Pass & Seymour.
- B. Straight Blade Receptacles:
 1. Duplex Receptacles: Comply with NEMA WD 1, NEMA WD 6 configuration NEMA5-20R, UL 498 and FS W-C-596. Specification grade industrial series, straight-blade, 2 pole 3 wire grounding type, back and side wired, nylon face, rated for 120 volts, 20 amperes. Hubbell No.5362 or equal. Hubbell No.5362WR or equal for weather-resistant listed receptacles. Receptacles that are controlled by an automatic control device shall be marked per NEC with the international power symbol. Provide as indicated on the drawings with one controlled face and split circuit hot tab equal to Hubbell BR20C1 series.
 2. Ground fault interrupter (GFI) receptacles: Duplex receptacles conforming to UL 943, specification grade heavy duty, feed-through type, rated for 120 volt, 20 amperes, NEMA 5-20R, GFI Class "A" with a sensitivity to leakage 5 milliamps, weather-resistant and tamper-resistant listed. Hubbell No. GF20LA or equal.
 3. Transient-Voltage Surge-Suppressor (TVSS) Receptacles: Duplex type, NEMA 5-20R configuration, with integral transient-voltage surge protection in a minimum of 3 modes: line-to-ground, line-to-neutral, and neutral-to-ground; listed as complying with UL 1449. Hubbell HBL5362SA or equal.
 4. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Specification grade, straight-blade, 2 pole 3 wire grounding type, back and side wired. Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498. Listed as tamper-resistant with "T" marking. Hubbell BR20TR or equal.
 5. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498. Straight blade; equipment grounding contacts connected only to the green grounding screw terminal of the device, with inherent electrical isolation from mounting strap. Hubbell CR 5253IG or equal.
 6. Duplex Receptacles with Integral USB jacks, 125 V, 20 A: Specification grade, straight-blade, 2 pole 3 wire grounding type, back and side wired. Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498. "USB" marking indicates USB receptacle duplex grounding type NEMA 5-20R equal to Hubbell MX20X2 or equal
- C. Exterior Outlets with Lockable Covers:
 1. Provide exterior outlets with lockable covers at all exterior outlet locations. Provide GFCI Circuit Breakers on all branch circuits. Provide in-use weatherproof locking covers.
- D. Snap Switches:

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1. Comply with NEMA WD 1 and UL 20.
2. Switches, heavy duty, side wired, 120/277V, 20A:
3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way).
 - b. Hubbell; C1221 (single pole), C1222 (two pole), C1223 (three way).
 - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way).
 - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way).

- E. Securely fasten wiring devices in place, plumb, level, and true to finished lines and surfaces.

- 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. Provide gaskets on all wiring device plates where devices are on walls separating conditioned and non-conditioned spaces and exterior walls.

- H. Composition material of wiring devices to be nylon with ivory finish. Outlets intended for computer use shall be grey finish, outlets on emergency shall be red finish.

- I. Wall Plates:
 1. Single and combination types to match corresponding wiring devices.
 - a. Plate-Securing Screws: Metal with head color to match plate finish.
 - b. Material for Finished Spaces: Satin-finished Type 302 stainless steel.
 - c. Material for Unfinished Spaces: Galvanized steel.
 - d. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."
 2. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum.

- J. Finishes:
 1. Color: Wiring device catalog numbers as specified do not designate device color.
 - a. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by referenced Electrical Code or device listing.
 - b. Wiring Devices Connected to Uninterrupted Power System (UPS): Red.
 - c. Isolated-Ground Receptacles: Orange.

2.17 FIRE ALARM AND DETECTION SYSTEM (EXTENSION OF EXISTING)

- A. Scope:
 1. Provide extension of existing fire alarm system as required and indicated on drawings. Provide all necessary power supplies, relays and addressable cards for work indicated on drawings.
 2. Basic System Functional Operation:
 3. When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
 - a. The FACP alarm LED on the FACP shall flash.

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- b. A local piezo-electric signal in the FACP control panel shall sound.
 - c. The 80-character LCD display on the local FACP node and on the intelligent network display shall indicate all information associated with the fire alarm condition, including the type of alarm point, and its location within the protected premises.
 - d. Printing and history storage equipment shall log the information associated with the fire alarm control panel condition, along with the time and date of occurrence.
 - e. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated on either local outputs or points located on other network nodes.
 - f. Program system to reflect new devices.
 - g. Test system so that alarm transmits to campus police and fire department simultaneously.
4. Software Modifications:
- a. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes.
 - b. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm network on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.
 - c. Certifications:
 - d. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer and trained on network applications. Include names and addresses in the certification.

B. Applicable Publications:

The publications listed below form a part of this specification. The publications are referenced in text by the basic designation only.

- 1. National Fire Protection Association (NFPA) - USA:
 - No. 72 National Fire Alarm Code
 - No. 70 National Electric Code
 - No. 101 Life Safety Code

- 2. Underwriters Laboratories Inc. (UL) - USA:
 - No. 50 Cabinets and Boxes
 - No. 268 Smoke Detectors for Fire Protective Signaling Systems
 - No. 864 Control Units for Fire Protective Signaling Systems
 - No. 268A Smoke Detectors for Duct Applications

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No. 521	Heat Detectors for Fire Protective Signaling Systems
No. 228	Door Closers-Holders for Fire Protective Signaling Systems
No. 464	Audible Signaling Appliances
No. 38	Manually Actuated Signaling Boxes
No. 346	Waterflow Indicators for Fire Protective Signaling Systems
No. 1481	Power supplies for Fire Protective Signaling Systems
No. 1076	Control Units for Burglar Alarm Proprietary Protective Signaling Systems
No. 1971	Visual Notification Appliances

3. Local and State Building Codes:
4. All requirements of the Authority Having Jurisdiction (AHJ).

C. Approvals:

1. The system must have proper listing and/or approval from the following nationally recognized agencies:

UL	Underwriters Laboratories Inc.
FM	Factory Mutual
MEA	Material Equipment Acceptance (NYC)
CSFM	California State Fire Marshal

D. Conduit and Wire:

1. Conduit:
 - a. Conduit shall be in accordance with the National Electrical Code (NEC), local and state requirements.
 - b. Where exposed, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
 - c. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.
 - d. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
 - e. Conduit shall not enter any FACP, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
 - f. Conduit shall be 3/4 inch (19.1 mm) minimum.
 - g. MC Fire Alarm Control Cable with red armor may be used for fire alarm where concealed and allowed by code.

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2. Wire:
 - a. All fire alarm system wiring must be new, unless specified herein.
 - b. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 16 AWG (1.02 mm) for initiating device circuits and signaling line circuits, and 14 AWG (1.32 mm) for notification appliance circuits.
 - c. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
 - d. Wiring used for the SLC multiplex communication loop shall be twisted and shielded unless specifically accepted by the fire alarm equipment manufacturer.
 - e. All field wiring shall be completely supervised.
3. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

E. Intelligent Photoelectric Smoke Detector:

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density. Smoke detector shall be compatible with existing FACP model #4098-9714 with #4098-9792 base.

F. Two Wire Detector Monitor Module:

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
2. The two-wire monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box or with an optional surface backbox.
3. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

G. Addressable Control Module:

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.
2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.

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3. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
4. Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply.
5. The control module shall be suitable for pilot duty applications and rated for a minimum of .6 amps at 30 VDC.

H. Isolator Module:

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each floor or protected zone of the building.
2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
3. The isolator module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall mount in a standard 4-inch deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

I. Intelligent Photoelectric Smoke Detector:

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

J. Batteries and External Charger:

1. Battery:
 - a. Batteries shall be 12 volt, Gell-Cell type.
 - b. The battery shall have sufficient capacity to power the fire alarm system for not less than 60 hours plus 10 minutes of alarm upon a normal AC power failure.
 - c. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills and leakage shall not be required.

K. Field Quality Control

1. 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.

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2. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:
 - a. Factory trained and certified.
 - b. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.
 - c. International Municipal Signal Association (IMSA) fire alarm certified.
 - d. Certified by a state or local authority.
 - e. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
3. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.
4. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.
5. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72.
6. 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.
7. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.
8. Final Test, Certificate of Completion, and Certificate of Occupancy:
 - a. Test the entire system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.
9. Provide 2 hours of Owner training.

PART 3 - EXECUTION

3.1 WORK COORDINATION AND JOB OPERATIONS

- A. Equipment shall not be installed in congested and possible problem areas without first coordinating installation of same with other trades. Relocate electrical equipment installed in congested or problem areas should it interfere with the proper installation of equipment to be installed by other trades.

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- B. Particular attention shall be directed to coordination of lighting fixtures and other electrically operated equipment requiring access which is to be installed in ceiling areas. Coordinate with other trades, the elevations of equipment in hung ceiling areas to insure adequate space for installation of recessed fixtures before said equipment is installed. Conflicts in mounting heights and clearances above hung ceilings for installation of recessed lighting fixtures or other electrically operated equipment requiring access shall be brought to the attention of Architect for a decision prior to equipment installation.
- C. Furnish to General Contractor and other Subcontractors information relative to portions of electrical installation that will affect other trades sufficiently in advance so that they may plan their work and installation.
- D. Obtain from other trades information relative to electrical work which he, the Electrical Subcontractor, is to execute in conjunction with installation of other trades' equipment.

3.2 DRAWINGS AND SPECIFICATIONS

- A. Drawings:
 - 1. Drawings showing layout of electrical systems indicate approximate location of raceways, outlets, and apparatus. Runs of feeders and branch circuits are schematic and are not intended to show exact routing. Final determination as to routing shall be governed by structural conditions and as indicated on the approved coordination Drawings.
- B. Specifications:
 - 1. Specifications supplement Drawings and provide specifics pertaining to methods and material to be used.

3.3 IDENTIFICATION

- A. Equipment shall be marked for ease of identification as follows.
 - 1. Provide screw-on nameplates on switchboards, panelboards, F.A. terminal cabinets, starters, and disconnect switches. Nameplates to be of black phenolic with white engraving. For starters and disconnect switches lettering shall be minimum of 1/4 in. high. Nameplates on panelboards shall have the following information.
 - a. Line 1 - Panel designation in 1/2 in. high letters.
 - b. Line 2 - Utilization voltage in 3/8 in. high letters.
 - c. Line 3 - Distribution source "Fed from " in 1/4 in. high letters.
 - 2. Neatly typed directory cards listing circuit designations shall be fastened inside the cover of panelboards. Spare circuits shall be penciled.
 - 3. Color coding schedules. If there is more than a single system voltage, different voltages shall have separate color codes, as previously specified. A copy of the color code schedule shall be affixed to each secondary switchboard and distribution panel and shall be of the phenolic nameplate type as previously specified. A typewritten color code schedule shall also be affixed, under plastic, inside each panelboard door.

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4. Outlet boxes both concealed and exposed shall be identified as to panel origination and circuit number by means of fibre pen on the inside of coverplate.
5. All conductors in boxes larger than standard outlet boxes, in all wireways, trench headers, etc. shall be grouped logically and be identified.
6. Grounding conductors and neutrals shall be labeled in panels, wireways, etc. as to circuits associated with.

3.4 PROTECTION AND CLEANUP

A. Protection:

1. Materials and equipment shall be suitably stored and protected from weather.
2. During progress of work, pipe and equipment openings shall be temporarily closed so as to prevent obstruction and damage.
3. Be responsible for maintenance and protection of material and equipment until final acceptance.

B. Cleanup:

1. Keep job site free from accumulation of waste material and rubbish. Remove all rubbish, construction equipment, and surplus materials from site and leave premises in a clean condition.
2. At completion, equipment with factory finished surfaces shall be cleaned and damaged spots touched up with the same type paint applied at factory.
3. Particular attention is called to Section 110-12(c) of the NEC, which requires that internal parts of electrical equipment not be contaminated by construction operations.

3.5 SAFETY PRECAUTIONS

- A.** Provide proper guards, signage, and other necessary construction required for prevention of accidents and to insure safety of life and property. Remove any temporary safety precautions at completion.

3.6 MOUNTING HEIGHTS

- A.** All electrical equipment shall be mounted at the following heights unless noted or detailed otherwise on Drawings. Notes on architectural Drawings shall supersede those noted below or detailed on the electrical Drawings. If mounting height of an electrical component is questionable, obtain clarification from Architect before installation.
1. Duplex convenience outlets, microphone outlets, and telephone outlets - 18 inches.
 2. Light switches, pushbutton stations, HOA switches, and all other toggle or control switches for the operation of heating, ventilating, and air conditioning, plumbing, and general service - 48 inches.
 3. Fire alarm pull stations - 48 inches.
 4. Fire alarm audio visual signals - 80 inches or 6 inches below ceiling, whichever is lower.
 5. Panelboards for lighting, power, telephone, and other auxiliary systems - 78 in. to top.
 6. Equipment located in lobbies shall be located as detailed on architectural Drawings or as directed by Architect.

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7. All receptacles, light switches, fire alarm signals, and clocks sharing a common location shall be symmetrically arranged.
 8. Exterior and interior wall brackets shall be as detailed on architectural Drawings or as directed by Architect.
- B. Mounting heights given are from finished floor to centerline. In the case of a raised floor, surface of raised floor is the finished floor.

3.7 WORKMANSHIP AND INSTALLATION METHODS

- A. Work shall be installed in first-class manner consistent with best current trade practices. Equipment shall be securely installed plumb and/or level. Flush-mounted outlet boxes shall have front edge flush with finished wall surface. No electrical equipment shall be supported by work of other trades. Cable systems shall be supported and not draped over ducts and piping or laid on ceiling suspension members. Lighting fixtures shall be installed to agree with Architects reflected ceiling plans.
- B. Supports:
1. Support work in accordance with best industry practice and by use of standard fittings.
 2. In general, walls and partitions will not be suitable for supporting weight of panelboards, dry type transformers and the like. Provide supporting frames or racks extending from floor slab to structure above.
 3. Provide supporting frames or racks for equipment, intended for vertical surface mounting in free standing position where no walls exist.
 4. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members, rigidly bolted or welded together and adequately braced to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of equipment.
 5. Provide 3/4 in. thick painted plywood mounting surfaces in all electric and telephone areas and for all equipment on free standing racks. All plywood shall be fire retardant and painted both sides and edges with 2 coats of white paint.
 6. No work for exposed installations in damp locations shall be mounted directly on any building surface. In such locations, flat bar members or spacers shall be used to create a minimum of 1/4 in. air space between building surfaces and work.
 7. Nothing (including outlet, pull and junction boxes and fittings) shall depend on electric raceways or cables for support. All outlet, pull, and junction boxes shall be independently supported.
 8. Nothing shall rest on, or depend for support on, suspended ceiling or its mounting members.
 9. Where support members must of necessity penetrate air ducts, provide airtight sealing provisions which allow for a relative movement between the support members and the duct walls.
 10. Provide channel sills or skids for leveling and support of all floor mounted electrical equipment.
 11. Where permitted loading is exceeded by direct application of electrical equipment to a slab or deck, provide proper dunnage as required to distribute the weight in a safe manner.
 12. Support metallic raceways by either running within steel frame or hung from the building frame. Anything hung from building frame shall be attached with metallic fasteners.

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C. Fastenings:

1. Fasten electric work to building structure in accordance with the best industry practice.
2. Where weight applied to attachment points is 100 pounds or less, fasten to building elements of:
 - a. Wood -- with wood screws.
 - b. Concrete and solid masonry -- with bolts and expansion shields.
 - c. Hollow construction -- with toggle bolts.
 - d. Solid metal -- with machine screws in tapped holes or with welded studs.
3. Where weight applied to attachment points exceeds 100 pounds, fasten as follows:
 - a. At field poured concrete slabs, provide inserts with 18 in. minimum length slip-through steel rods, set transverse to reinforcing steel.
 - b. Where building is steel framed, utilize suitable auxiliary channel or angle iron bridging between structural steel elements to establish fastening points. Bridging members shall be suitably welded or clamped to building steel. Provide threaded rods or bolts to attach to bridging members.
4. Floor mounted equipment shall not be held in place solely by its own dead weight. Provide floor anchor fastenings. Floor mounted equipment over 72 inches in height shall also be braced to nearest wall or overhead structural elements.
5. For items which are shown as being mounted at locations where fastenings to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging to building structural elements.
6. Fastenings for metallic raceways using the fastening as support shall be of the metallic type. Fastenings to hold raceways or cables in place may be via tyrap.

D. General Raceway Installation:

1. Install the various types of raceways in permitted locations as previously specified. All raceways shall be run concealed. Consult Architect for instruction for raceways which must be exposed in public spaces.
2. Raceways for normal-emergency or emergency only wiring cannot contain other conductors.
3. Raceways shall be properly aligned, grouped, and supported in accordance with code. Exposed raceways shall be installed at right angles to or parallel with structural members. Concealed raceways may take most direct route between outlets.
4. Raceways run on trapeze hangers shall be secured to the trapeze.
5. Raceways shall be continuous and shall enter and be secured to all boxes in such a manner that each system shall be electrically continuous from service to all outlets. Provide grounding bushings and bonding jumpers where raceways attach to painted enclosures or terminate below equipment.
6. Where raceways enter boxes, cabinets, tap boxes, other than those having threaded hubs, a standard locknut shall be used on the outside and locknut and bushing on the inside.
7. Where raceways terminate below equipment and there is no direct metal to metal continuity, provide grounding bushings on raceways and interconnect with equipment grounding conductor.
8. All empty raceways shall be provided with a pull wire.
9. All raceway sleeves, stub-ups, or stub-outs, where not connected to a box or cabinet, shall be terminated with a bushing.
10. All raceway joints shall be made up tight and no running threads will be permitted.
11. Where raceways are cut, the inside edge shall be reamed smooth to prevent injury to conductors.

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12. All vertical raceways passing through floor slabs shall be supported.
13. Raceways shall not be installed in concrete slabs above grade or below waterproofed slabs.
14. Electric raceways and/or sleeves passing through floors or walls shall be of such size and in such location as not to impair strength of construction. Where raceways alter structural strength or the installation is questionable, the structural engineer shall be contacted for approval.
15. Raceways shall not run directly above or below heat producing apparatus such as boilers, nor shall raceways run parallel within 6 inches of heated pipes. Raceways crossing heated pipes shall maintain at least a 1 inch space from them.
16. Raceways shall be installed in such a manner as to prevent collection of trapped condensates, and all runs shall be arranged to drain.
17. Raceways passing between refrigerated and non-refrigerated spaces and those penetrating enclosures with air movement shall be provided with seals.
18. Raceways feeding fire and jockey pumps shall be rigid metal conduit either run below slab or inside 2 hour rated enclosure. Final connections to motors shall be liquidtight flexible conduit.
19. Where two alternate wiring methods interconnect such as EMT to flexible metal conduit, an outlet box shall be provided.
20. All empty raceways entering building and all sleeves or core drilled openings through floors shall be sealed.
21. Rigid non-metallic raceways where allowed and run as a ductbank encased in concrete shall be installed with plastic spacers to ensure a separation of 3 inches between raceways.
22. Elbows and extensions of rigid non-metallic raceway systems which penetrate slabs shall be rigid or intermediate metal conduit.
23. Raceways used for transformer connections shall be flexible type and shall contain a grounding conductor.
24. Raceways entering building through foundation wall into a basement area shall be provided with wall entrance seals or with other acceptable waterproofing method.

E. General Outlet Box Installation:

1. Boxes shall be set flush with finish surface and provided with proper type extension rings or plaster covers. Thru the wall boxes are not permitted. Check device or fixture to be mounted to box to ensure box orientation is proper.
2. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling-in operation.
3. Remove knockouts only as required and plug unused openings.
4. Where required for horizontal and vertical alignment of boxes in stud partitions, bar hangers spanning two studs shall be used. Device boxes for insertion type receptacles shall be provided with far side box supports where there are less than two entering nonflexible raceways, and where bar rangers are not provided.
5. Boxes flush mounted in fire rated partitions and on opposite sides of the partition shall be separated by a distance of 24 inches in accordance with UL listing for the box.
6. Locations of outlets indicated on Drawings are approximate. For items exposed to view, refer to architectural Drawings and coordinate locations with masonry joints, panel joints, ceiling grids, structural members, etc.
7. In case of conflict with standard mounting heights and device alignment, consult Architect prior to roughing.
8. Check all door swings on architectural Drawings to ensure lighting switches are installed on strike side of door.

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9. The right to make any reasonable change in location of outlets prior to roughing is reserved by Architect. "Reasonable change" shall be interpreted as movement within 10 feet of location shown.
10. Obtain dimensioned plan from Architect for floor outlets.
11. Outlet boxes for use where surface metal raceways are allowed shall be of a type specifically designed to be used with such surface metal raceway systems.
12. Outlet boxes shall not line up back to back in partition walls.

F. Conductor Installation:

1. No conductors shall be pulled into individual raceways until such raceway system is complete and free of debris. No harmful lubricants shall be used to ease pulling.
2. All conductors shall be wired so that grounded conductor is unbroken; switches in all cases being connected in ungrounded conductor.
3. Connections throughout the entire job shall be made with solderless type devices of approved design satisfactory to Inspector of Wires.
4. All taps and splices shall be insulated equal to that of conductor insulation.
5. All conductors of each feeder in pull boxes etc. shall be grouped, tied together, supported, and identified.
6. All conductors in panelboards and other wiring enclosures shall be neatly formed and grouped.
7. All conductors of emergency only and/or normal/emergency shall be run in separate raceway systems to final outlet box.
8. Provide support for conductors in vertical raceways in accordance with Article 300-19.
9. Strip insulation from conductors with approved tools and only of sufficient length for proper termination. Cutting of conductor stranding is unacceptable.
10. Taps from paralleled conductors shall be of a type which tap each conductor, such as ILSCO "PTA" series.
11. Grounding conductors are to be identified as to associated power circuits.

G. Type MC Cable Installation:

1. Where cable is permitted under the products section, the installation of same shall be done in accordance with code and the following:
 - a. Cable shall be supported in accordance with code. Tie wire is not an acceptable means of support. Horizontally run cable supports such as Caddy WMX-6, and clamps on vertical runs such as Caddy CJ6 shall be used. Where cables are supported by the structure and only need securing in place, then ty-raps will also be acceptable. Ty-raps are not acceptable as a means of support. All fittings, hangers, and clamps for support and termination of cables shall be of types specifically designed for use with cable, i.e., romex connectors not acceptable.
 - b. Armor of cable shall be removed with rotary cutter device equal to roto-split by Seatek Co., not with hacksaw.
 - c. Use split "insuliner" sleeves at terminations.
 - d. Any cable system used in conjunction with isolated ground circuits shall have both an isolated ground conductor and an equipment ground conductor.

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- H. Stranded Conductor Installation:
1. If Contractor selects stranded conductors for #10 AWG and smaller, terminate such conductors as follows:
 - a. No stranded conductor may be terminated under a screwhead. Provide insulated terminal lugs for all screw connections equal to Thomas & Betts "STA-KON" type RC with forked tongue and turned up toes. Installation of lugs shall be done with compression tool such as T&B WT-145C which prevents opening of tool until full compression action is completed.
 - b. Backwired wiring devices shall be of clamp type; screw tightened. Force fit connections not allowed.
 2. Stranded conductors will not be allowed for fire alarm work.
- I. Accessibility:
1. Electrical equipment requiring service or manual operation shall be accessible.
 2. Work switches for equipment within accessible hung ceiling spaces, such as fan powered terminal boxes, shall be located at terminal box, and so located so as to be accessible.
- J. Vibration Elimination: All equipment connections to rotating equipment or equipment capable of vibration shall be made up by flexible raceways.
- K. Wiring Device Gaskets: Provide wiring device gaskets at coverplates where device is mounted in wall separating conditioned and non-conditioned spaces.

3.8 BRANCH CIRCUITS

- A. Provide all branch circuit wiring and outlets for a complete and operating system. The system shall consist of insulated conductors connected to the panelboards and run in raceways or as cable systems if permitted under products section, as required to the final outlet and shall include outlet boxes, supports, fittings, receptacles, plates, fuses, etc.
- B. Physical arrangement of branch circuit wiring shall correspond to circuit numbering on Drawings. Combining of circuits and raceways will be allowed up to a 3 phase, 4 wire circuit in a single raceway, unless shared neutrals are not allowed by other sections of this Division, or are indicated as separate neutrals on the Drawings. Any combination of homeruns such as this, however, shall be indicated on record Drawings. Combining of conductors and raceways for tenant fitup work is allowed only for fitup boxes in accordance with details on Drawings. When a common grounded conductor is used for more than one circuit, the arrangement shall be such that a receptacle, fixture, or other device may be removed or disconnected without disconnecting the grounded conductor for other circuits. Ground fault circuit breakers and isolated ground outlets shall be wired with separate neutrals and separate grounding conductors per circuit. A consistent phase orientation shall be adhered to throughout project at terminations.
- C. Circuits feeding three phase equipment shall not be combined into common raceways, unless specifically indicated.
- D. All wiring in panelboards and cabinets shall be neatly formed and grouped.

3.9 FIREPROOFING AND WATERPROOFING

- A. Fireproof and waterproof all openings in slabs and walls.

3.10 CUTTING AND PATCHING

- A. All cutting of surfaces, including core drilling of walls and slabs, shall be done by Electrical Sub-contractor.
- B. Patching shall be provided by Electrical Sub-contractor.

3.11 DEMOLITION, REMOVAL AND RELOCATION WORK

- A. The Electrical Subcontractor shall be responsible for disconnection and removal of existing electrical equipment and wiring from ceiling and walls as indicated and placed on the floor by this section. The General Contractor shall remove from the floor and dispose. Refer to drawings for extent of work. Field confirm existing equipment scheduled to remain and reefed when interrupted by equipment removal.

3.12 STORAGE AND INSTALLATION OF EQUIPMENT

- A. The electrical subcontractor shall store and install electrical equipment and wiring listed for dry locations only within the building.

3.13 FIRESTOP SYSTEMS

- A. General: Install firestop systems at all new and existing fire-rated construction where penetrated by the Work of this Section.
- B. Refer to Section 078400 - Firestopping, for all installation requirements for maintaining integrity of fire-rated construction at penetrations.

END OF SECTION

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SECTION 270000

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END OF INDEX

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 01 Section "Summary."

1.2 QUALITY ASSURANCE

- A. Sustainable Goals: The Architect has designed the project to meet the Owner's sustainable goals. Products and systems have been specified which meet certain third-party evaluations or have particular VOC and source requirements. Evaluation of products proposed for substitution will be evaluated based on the Owner's sustainable goals and other criteria included in Division 01. The Contractor is encouraged to use sustainable construction practices, means and methods. Unless specifically stated in a specification section, no sustainable design documentation is required of the Contractor.
- B. The systems integrator must provide (as part of the submittal process) a list of at least five (5) projects (provide the following information for each project: name, address, contact person, title of contact person, telephone number of contact person) of similar installations of equal cost and technical scope, size and nature and demonstrate that these projects were; furnished with persons on their payroll whom were authorized, certified, experienced and qualified to provide, install, program, troubleshoot, train, warrant and service these projects, in their entirety, satisfactorily.

1.3 COOPERATION AND COORDINATION WITH OTHER TRADES

- A. The work shall be so performed that the progress of the entire building construction, including all other trades, shall not be delayed and not interfered with. Materials and apparatus shall be installed as fast as conditions of the building will permit.
- B. These are the Responsibilities, Cooperation and Coordination requirements between other trades related to SECTION 27 00 00 TECHNOLOGY.
 - 1. This section shall be furnish/installed as follows by a firm/company that is a qualified systems contractor. The Electrical Subcontractor shall be responsible for properly preparing the project for installation by systems contractor, as specified.
 - 2. Electrical Subcontractor responsibilities shall include:
 - a. The Electrical Subcontractor shall be responsible for furnishing and installing all related building preparation including, but not limited to: outlet boxes with plaster rings, floor boxes, poke through devices, pathways, power, cableways, cable tray, cable protection, wiremold, surface raceways, cable supports, conduits with bushings, conduit stubs with bushings, sleeves with bushings (all conduits, stubs, sleeves, J-Hooks, shall be brought to an accessible ceiling or accessible area below floor), pull strings, bonding, grounding, core drilling, cutting, patching, fireproofing of penetration & openings, environmental seals, smoke and fire stopping seals including all conduits, raceways, sleeves, slots, where cables pass from one location to another, seismic supports, supplementary steel and channels, for a completely

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operational system, as specified. The Electrical Contractor is responsible for installing all required sleeves for a complete installation whether they are shown or not on the floor plans the routing of cables is determined by the Architecture and no Ethernet cable can exceed 90m or max distance rating of CAT6 or CAT6A cable use. The Electrical Subcontractor shall also accept delivery and properly store & secure all equipment and materials required by the systems contractor. The Electrical Subcontractor shall install all specialized backboxes (microphone, amplifier,) and any exterior antennas furnished by Systems Contractor.

- b. The Electrical Subcontractor shall provide cable tray over each rack and cabinet to facilitate a neat and orderly installation of cables and to secure the top of the racks to the structure. Cables shall drop straight down to equipment racks. Cable trays shall be secured at both ends to the structure and connected together for a complete contiguous installation. Utilize proper supports to support the cable tray to the building structure as well as the equipment rack and cabinet. Submit mounting supports for approval before installation.
 - Electrical Contractor shall provide 120VAC duplex 20amp dedicated circuits at each termination panel or backboard, twist lock 20amp dedicated circuit in cable tray over each rack, and 220VAC twist-lock 20amp over each server cabinet in the system. Provide all work related building preparation, including, but not limited to providing/terminating 120/220VAC power connection to and for equipment.
- c. The Electrical Subcontractor shall also accept delivery and properly store and secure all equipment and materials required by the systems Technology Contractor.
- d. This entire section: The Electrical Subcontractor shall read this section in its entirety and shall provide all requirements of the Electrical Subcontractor as detailed in this section.
- e. Electrical Subcontractor shall provide 4" square backboxes for all Single-gang and Dual-gang outlet faceplates. Electrical Subcontractor shall provide single- gang and dual-gang plaster rings for the specified Single-gang and Dual-gang outlet faceplates.
- f. Removal and re-installation of new and/or existing ceiling tiles as required
- g. Grounding
 - 1) All technology equipment racks & cabinets shall be bonded to the Ground Bus with #6 ground conductor.
 - a) Connect the ladder rack to the ground with a #6 ground conductor
 - b) Provide 18" Grounding Bus mounted on plywood backboards
- h. All devices that require specialty/custom boxes (i.e. speakers, clocks, microphone, amplifier, etc.), and all exterior antennas for the System shall be furnished by the Technology Contractor and installed by the Electrical Contractor.
- i. Floor boxes and poke-through devices shall be provided by the Electrical Contractor.
- j. Provide blank stainless-steel faceplates for applicable backboxes.

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3. Systems Contractor responsibilities for this section shall be:
 - a. Systems contractor shall be responsible for providing, installing, programming, troubleshooting, training and warranty service of all cabling, terminal equipment, headend equipment specified in this section for a completely operational system. The systems contractor shall furnish all specialized backboxes (speaker, microphone, amplifier) and all exterior antennas to the Electrical Subcontractor for their installation.
 - b. Keep fully informed as to the shape, size and position of all openings required for all apparatus and give information in advance to build openings into the work. The electrical subcontractor shall furnish and set in place all sleeves, pockets, supports and incidentals.
 - c. All distribution systems which require pitch or slope such as plumbing drains, steam and condensate piping shall have the right of way over those which do not. Confer with other trades as to the location of pipes, ducts, lights and apparatus and install work to avoid interferences.
 - d. Coordinate exact locations and roughing in dimensions of all work before installation and make all final connections. Any changes required to avoid interferences or to provide adequate clearances for Code and maintenance requirements shall be made at no additional costs.
 - e. Structural elements of the project shall not be relocated, altered or changed to accommodate the work without written authorization from the Architect.
 - f. Work that is installed before coordination with other trades or that causes interference with the work of other trades shall be changed to correct condition.
 - g. Obtain a complete set of Project Drawings and Specifications for coordination and to determine the full scope of work.
 - h. Attend project coordination meetings to coordinate work of this section, work of other trades and project and phasing requirements.
4. General Contractor Responsibilities, Cooperation and Coordination Between Trades
 - a. Coordinate all work between Technology Contractor and all other trades as required for completely operational systems
 - b. Interface with public utilities telephone service (DEMARC) shall be arranged by the Owner's service provider, and coordinated with the Technology Contractor.
5. Voice Communications Contractor Responsibilities and Coordination Between Trades
 - a. Interface between the Public-Address System and the Telephone System for telephone code authorized access to intercom system, zone paging, all-call paging and other features as specified.
 - 1) Telephone Contractor shall provide cabling to support 4-port interfaces between both systems and proper interface to the telephone systems.
 - b. Technology Contractor shall provide proper interface/programming to the public-address system and other features as specified.

1.4 SUBMITTALS

- A. Product Data for all materials specified and shown on drawings to be installed.

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B. Submittal Format

1. Provide a Submittal Bill of Materials Index/Equipment List, with column headings that clearly identify the information requested herein for every item submitted.
 - a. Each and every specification sheet submitted shall include a page number in the lower outside corner of the sheet. Double-sided specification sheets shall be identified by two (2) separate page numbers.
 - b. On each and every specification sheet submitted, indicate the applicable part numbers (s) on the sheet (s) by one of the following methods:
 - 1) Circling the applicable part number (s)
 - 2) Putting an arrow next to the applicable part number (s)
 - 3) The Submittal Bill of Materials Index/Equipment List column headings shall identify the following minimum information. Submittals must be submitted using the following “headings” in the order indicated from left-to-right on the Bill of Materials Index/Equipment List:
 - 4) All Bill of Material items shall be listed in the Bill of Material Index/Equipment List.
 - a) Bill of Material Index/Equipment List shall be in the SAME ORDER AS THEY APPEAR IN THE SPECIFICATION, starting from the beginning of the specification.
 - b) Provide reviewing authority with an electronic file/copy of the Bill of Material Index/Equipment List.
 - 5) “Specification Paragraph #”, reference specification paragraph/line number/location, that identifies each individual item, for every item specified and submitted.
 - a) Example of paragraph/line number/location: 2.13, B., 7., c., 4), e) Power Supply
 - 6) “Description” of each item
 - 7) Manufacturer’s “Name” for each item
 - 8) Manufacturer’s “Model #” for each item
 - 9) “Quantity” of each item being provided for reference use.
 - 10) Submittal Page Number(s) of specification sheet(s) for each item
2. Any submittal that does not include a submittal Bill of Materials, and provides a minimum of the information requested herein, shall be rejected without further review and returned to the applicable parties.

C. Submit supporting hardware for this system as part of the work for approval prior to installation.

D. Product Data: Include complete sets of indexed cut sheets, in quantity as dictated by the project, of all major pieces of equipment and materials being supplied. Arrange these sheets in the order the equipment appears in the Specification. Clearly highlight information showing compliance with this and/or all applicable Specifications. In the event that the manufacturer or representatives’ cut sheet contains more than one item, clearly indicate which items of the cut sheet are intended for installation.

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- E. Shop Drawings: Submit a set of complete Shop Drawings, by system, showing equipment to be installed. Include system configuration block diagrams of all equipment, indicating equipment type and model numbers. Show each and every component, system and subsystem, as well as all proposed connections between system components, and proposed layouts of equipment racks for the entire system.
1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
 2. Cabling administration drawings and printouts.
 3. Wiring diagrams to show typical wiring schematics including the cross-connects.
 4. Cross-connects. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
 5. Cross-connects and patch panels. Detail mounting assemblies and show elevations and physical relationship between the installed components.
 6. Cable tray layout showing cable tray route to scale with relationship between the tray and adjacent structural, electrical and mechanical elements.
- F. Quality Assurance Submittals:
1. Provide manufacturer's certification that Installer is qualified to install systems specified. Include a written statement signed by the Installer attesting that they have been in business for at least five years in the installation and servicing of systems specified. Include the names of at least five clients for whom similar Work as specified has been performed in the past three years; list the individual responsible for the day-to-day operation of the system along with their current telephone number and address.
 2. Provide names, qualifications, and certifications of installation personnel including Communication Systems Installer's site Supervisor/Foreman who shall be in charge of, and responsible for, all activities at the job site for the duration of the Project. The job Supervisor/Foreman shall not be changed during the project without notification and approval from the Owner.
 3. Complete warranty information including sample Registration Certificate.
 4. Technical Diagrams and Drawings:
 - a. Simplified single line block diagrams showing the interconnection of all equipment and functional relationships. Show all equipment, patch panels, cables and jacks, whether connected or not. The intent of these diagrams is to provide sufficient clear and complete information that a technician of average skill may efficiently troubleshoot and service the system, even if unfamiliar with the installation.
 - b. Provide "As Built" architectural quality plan Drawings at 1/8 inch = 1 ft-0 in. scale. Provide an electronic copy of the "As Built" drawings on CD(s).
 - c. All technical diagrams and drawings shall be mounted on the wall behind a clear plastic cover for protection. There shall be 1 set of the above drawings and diagrams provided per equipment room, this includes both the MDF Room and all IDFs.

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1.5 TELEPHONE/DATA SYSTEM

A. General:

1. All telecommunication and data system interconnecting wiring, terminal blocks, connections, terminations, shall be furnished and installed by a licensed and certified installer.
2. The Electrical Subcontractor (E.C.) shall furnish and install all raceways, and outlet boxes as indicated on the drawings, including pull wires for all empty raceways and all access panels. General contractor will furnish and install all backboards (3/4 inch thick by 78 in. high) which shall be mounted at the MDF room and each IDF room.
3. General Requirements:
 - a. Applicable Standards:
 - 1) Materials and equipment shall be installed in accordance with the most current versions of the National Electrical Code, local codes, safety codes, ANSI, ASTM, EIA, TIA, BISCI, IEEE, UL, NFPA.
 - a) The following industry standards are the basis for the structured cabling system described in this document.
 - i ANSI/TIA/EIA
 - ii TIA/EIA-568-B Commercial Building Telecommunications Cabling Standard
 - iii TIA/EIA-568-B.1 General Requirements
 - iv TIA/EIA-568-B.2 Balanced Twisted Pair Cabling Components Standard
 - v TIA/EIA-568-B.3 Optical Fiber Cabling Components Standard
 - vi TIA/EIA - 942 Telecommunications Infrastructure for Data Centers
 - vii TIA/EIA-569-A Commercial Building Standard for Telecommunications Pathway and Spaces
 - viii TIA/EIA-606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
 - ix J-STD-607-A Commercial Building Grounding/Bonding Requirements NFPA
 - x NFPA 70 National Electric Code (NEC) ISO/IEC
 - xi ISO 11801 Generic Cabling for Customer Premises
 - xii EIA/TIA-TSB 67. Telecommunications Systems Bulletin, Additional Transmission Specifications for Unshielded Twisted-Pair Cabling Systems"
 - xiii EIA/TIA-455-61. "FOTP-61, Measurement of Fiber or Cable Attenuation Using An OTDR".
 - xiv IEEE 802.3 "Carrier Sense Multiple Access With Collision Detection".

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xv ATM Forum	Standard for 155 Mb/s ATM over Category 6 (AF-PHY-0015.000, 9/94)
xvi BISI:	Telecommunications Distribution Methods and LAN Design Manual
xvii IEEE-802:	Standards for Local Area Networking
xviii	UL Performance Levels Certification Program
xix ANSI-IEEE-C2:	National Electrical Safety Code (NEC)
xx ANSI/NFPA-101:	Life Safety Code
xxi State of Rhode Island Electric Code	

- b. Exposed wiring is not acceptable in any occupied space.
- c. Contractor is responsible for strict adherence to Rhode Island electrical codes, and all other applicable codes.
- d. The contractor is responsible for obtaining municipal permits and inspections as mandated by law.
- e. All exposed cabling shall be run in raceway or conduit.
- f. All penetrations in station raceway shall have rubber or equivalent grommets to prevent cable cuts on trough edges.
- g. Raceway shall be of sufficient size to accommodate all wiring. Fill density not to exceed 40 percent, unless otherwise noted. It is the responsibility of the bidder to determine the size needed based upon the floor plans provided. A minimum size of ¾ in. conduit shall be adhered to.
- h. All raceways shall be attached to the building structure using screws and anchors.
- i. The I.T. sub-contractor is responsible for all aspects of MDF & IDF construction. Refer to drawings for configuration of each IDF and MDF.
- j. All cabling at the MDF and IDFs shall be neatly bundled and dressed to the termination blocks. All appropriate cable management materials (slotted duct, D rings) should be utilized for this purpose. All wiring at IDF cabinets shall be installed concealed.
- k. All labeling of cables shall be 6 in. back from the termination with machine generated labels, hand written labels are not permitted.
- l. All cable pulls in conduit, raceway, innerduct, shall have pull string left in place for future use.
- m. Color code identification of cables must be maintained throughout all splices.
- n. All station cabling shall be clearly and legibly labeled at both the faceplate end and the IDF/MDF termination blocks. In addition to labeling both the inside of the faceplates and IDF/MDF termination blocks, the cable jacket shall be labeled six inches back from the terminations on both ends. Labeling shall be machine generated.
- o. Labeling of the outside of the jack with identification numbers shall be made using a Panduit LS8 handheld label machine or equal. Samples shall be provided to Engineer for approval prior to installation.

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- p. In order to qualify for installation of the data communications system, Contractor must possess the required license classification, a performance history, experience in the installation and termination of optical fiber cable systems, and proof of time in business. Contractor must be trained and certified for the communications cable and hardware which it installs, and must furnish proof of certification.
- q. License Classification: Contractor must possess a valid state Contractor's License.

1.6 DEFINITIONS

- A. Main Cross Connect (MC): The MC is the location, within a building or complex of buildings, where the entire telecommunications system originates. It may include: the physical location, enclosure, wire and cable management hardware, termination hardware, distribution hardware, and patching and equipment racks.
- B. Horizontal Cross Connect (HC): The HC is the location in a building where a transition between the backbone or vertical riser system and the horizontal distribution system occurs.
- C. "Provide": Furnish and install, complete and ready for intended use

1.7 SYSTEM DESCRIPTION

- A. The data communications system shall consist of four components, active switch equipment, an optical fiber backbone, a copper twisted-pair backbone, and twisted pair copper work station cabling.
- B. The audio visual systems shall consist of wiring, jacks, amplification equipment, control equipment, and head end video equipment.

1.8 SCOPE OF WORK

- A. The work under this section includes providing of all material, labor, equipment and supplies and the performance of all operations to provide a complete working Integrated Instructional Technology Network System indicated by the Drawings and details and as specified herein. Where the Drawings, Specifications, Codes, Regulations, Laws, or the requirements of the local Authority conflict, provide the higher quality and higher quantity indicated or required and follow the strictest requirement. In general, the work includes, but is not limited to, the following:
 - 1. Cabling for Sound and Clock per manufacturers requirements.
 - 2. Equipment Racks and Cabinets.
 - 3. Relay Brackets.
 - 4. Terminations.
 - 5. Protection of all work.
 - 6. Record Drawings and Documentation.
 - 7. Staging.
 - 8. Telephone and data cabling.
 - 9. Data network racks, patch panels, and patch cables.
 - 10. Network fiber optic backbone cabling and patch panels.
 - 11. Operation and Maintenance Instructions and Manuals for the section's work.
 - 12. Nameplates, Labels and Tags.

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13. Testing and certification.
14. Coordination with manufacturers, other trades and Owner.
15. CATV wiring, amps and splitters.
16. Sound, Public Address and Intercom.
 - a. Integrated Sound, System Computer and Software.
 - b. Telephone System Integration Requirements.
 - c. Ceiling / Wall Mounted Speaker Assemblies.
 - d. Bell/Class Change Signaling System.
 - e. Public Address System.
 - f. Controls, Amplifiers, and Terminal Equipment.
 - g. Power Supplies.
 - h. Battery Backup for System Programming.
 - i. Program Distribution System.
 - j. Accessories.

- B. Provide and maintain in safe adequate condition all staging and scaffolding required for the proper execution of the work of this section.
- C. Coordinate work with that of all other trades affecting or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.9 PROTECTION OF WORK AND PROPERTY

- A. Be responsible for the care and protection of all work included under this section until it has been tested and accepted.
- B. Protect all equipment and materials from damage from all causes including theft. All materials and equipment damaged or stolen shall be replaced with equal material or equipment at the option of the Architect and Owner.
- C. Materials and equipment stored for this project shall be protected and maintained according to the manufacturer's recommendations and requirements and according to the applicable requirements of NFPA 70B.
- D. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen and make good any damage caused.
- E. Use caution to avoid damage to existing work, and to prevent harm to personnel working in all areas.
- F. Observe all safety precautions and requirements for the construction.
- G. When open-flame or spark producing tools such as blower torches, welding equipment, are required in the process of executing the work, the General Contractor shall be notified not less than twenty four hours in advance of the time that the work is to begin and the location where the work is to be performed. Provide, where necessary, fire protective covering and maintain a constant non-working fire watch where work is being performed and until it is completed.

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- H. The General Contractor and the Installer are responsible for initiating, maintaining, and supervising all safety precautions and requirements during construction.

1.10 SEQUENCING AND SCHEDULING

- A. Coordinate the work of this section with the respective trades responsible for installing interface work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.
- B. Continuity of all services shall be maintained in all areas which will be occupied or temporarily relocated during the construction period. If an interruption of service becomes necessary, such shall be scheduled in advance, made only upon consent of the Owner and at a time outside normal working hours as the Owner shall designate.
- C. Refer to the overall scheduling of the work of the project. Schedule work, process Submittal and order materials and equipment to conform to this schedule and install work to not delay nor interfere with the progress of the project.
- D. Inform Architect immediately of any delays or potential delays. Furnish manufacturer's letter to verify order date, equipment delays, expected shipment date, order number, and potential remedies to speed up delivery. Any costs to speed up delivery shall be implemented at no cost to the project if the equipment or material was not ordered as soon as possible after Contract award or within the time frames indicated with the Submittal.
- E. Include premium time required to comply with the project scheduling and phasing.
- F. Be aware of, and plan for, project scheduling and phasing. Provide for complete continuous operation of all systems. Coordinate scheduling and phasing with the Architect, Owner, other Trades, and the General Contractor.

1.11 WARRANTY

- A. Voice and Data Cabling Warranty: The products that shall best support the needs of the project, and provide the highest level of system performance over the life of the facility, shall be a voice and data cabling system that is made up of system components designed, manufactured and installed as a total system solution. This requirement also applies to data patch cords specified in this section; e.g. Ortronics patch cords shall be used with Ortronics jacks and patch panels.
- B. Provide a Manufacturer's Extended Product Warranty that covers product defects for all passive components of the Voice and Data Cabling System. Passive components are defined as those exhibiting no gain or contributing no energy to the Data Cabling System and include but are not limited to cabling, connectors, outlets, patch panels, patch cords, racks as outlined in PART 2 of this Specification.
1. The following shall be covered by the Manufacturer's Extended Product Warranty:
- a. All passive components that comprise the Voice and Data Cabling System will be free from manufacturing defects in material of workmanship under normal and proper use.

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- b. All passive components that comprise the Voice and Data Cabling System shall exceed the specifications of ANSI/TIA/EIA 568B series, and exceed ISO/IEC 11801 standards, including all subsequent changes to these standards that are in effect at the time of bidding, and shall meet or exceed the performance specifications as outlined in PART 2 of this Specification.
 - c. The installation shall exceed the insertion and return loss, attenuation and near end crosstalk (NEXT) requirements of ANSI/TIA/EIA 568B series and the ISO/IEC 11801 standards for cabling links/channel configurations specified in these standards including all subsequent changes to these standards that are in effect at the time of bidding.
 - d. Each Voice and Data Channel shall be capable of delivering data at 1.2 Gbps between active network electronics. A Data Channel is comprised of all passive components including cabling, connectors, patch panel port, and patch cords, with up to a total of 4 connections between Owner's network electronics (not in the contract).
2. Upon successful completion of the Voice and Data Cabling System installation by the Communication Systems Installer, and subsequent inspection by an authorized representative of the Manufacturer of the passive components, the Owner shall be provided with Registration Certificate, from the Manufacturer, registering the Installation.
 3. Duration of Warranty: The warranty shall run for 20 years from the Date of Substantial Completion of the Project, unless the Registration Certificate is issued by the Manufacturer at a later date, in which case the warranty shall run for 20 years from the date that the Registration Certificate is issued.
 4. The Extended Product Warranty is applicable to the Voice and Data Cabling System passive components at the original site of installation. Under the Extended Product Warranty, the Manufacturer of the passive components shall either repair or replace the defective product(s) at the Manufacturers cost. This includes the replacement or repair cost of defective materials and the cost of labor to repair or replace any and all defective products.
 5. The Communication Systems Installer shall be able to provide a Manufacturer's warranty that the Voice and Data Cabling System shall be free from failures which prevent operation of the specific applications for which the original Voice and Data Cabling System was designed to support, including but not limited to: 10Base-T; 100Base-T; 52/155 Mbps ATM; 622Mbps 64-CAP ATM; 1000Base-T Gigabit Ethernet.

1.12 MAINTENANCE

- A. Provide installers maintenance contract quote, upon request, for a period equal to warranty.
- B. Upon receipt of notice from the Owner of failure of any part of the systems during the warranty period, the affected parts shall be replaced. Any equipment requiring excessive service consisting of more than two unscheduled service calls, shall be considered defective and shall be replaced.
- C. Response times to warranty issues shall differ according to the level of the problem.
 1. A problem is considered to be corrected when the system and its components operate according to specified requirements.
 2. Warranty work shall be performed according to the procedures of the Owner, its staff and tenants and their normal operations.

1.13 SEISMIC REQUIREMENTS

- A. Equipment and work shall meet the restraint requirements for a Seismic Zone - 2 location including installation and connections of material and equipment to the building structure.

1.14 FUNCTION AND OPERATION

- A. The intended function of the data communications cable system is to transmit data signals from a central location to several individual data outlet locations. Upon completion of the work outlined in this specification, the system shall be capable of transmitting data signals at a rate of 1000 Mbps.
- B. Work station cable, from the HC to the work area, shall be installed in accordance with EIA/TIA-568-A specified installation practices, EIA/TIA TSB 67 recommended installation practices, manufacturer specified installation practices, and shall be capable of transmitting a signal at 1000 Mbps with acceptable attenuation and cross-talk measurements. The entire work station cable system, including wiring blocks, cable, and telecommunications outlets shall be tested for Category 6 compliance.

1.15 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Connecting Blocks: One of each type.
 - 2. UTP 4-pair Station Cable: 1,000 feet.
 - 3. UTP Backbone Cable: 300 feet.
 - 4. Patch-Panel Units: One of each type.
 - 5. Device Plate: 10 of each type.
 - 6. Patch Cables: 80 – Color and length to be determined.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Throughout Part 2, material quantities are given. These quantities are given for reference purposes only. It is the responsibility of the Contractor to provide appropriate quantities of materials to provide a complete, functional system.
- B. Equipment shall be installed in accordance with Technology drawings. General installation provisions are as follows:
 - 1. Equipment Racks: Equipment racks shall be assembled and mounted in locations shown in the Drawings and as described herein. Each rack shall be assembled in accordance with the manufacturer's instructions and recommendations. Each rack shall be mounted such that the side rails are plumb. Each rack shall be affixed to the building structure at each of the mounting holes provided. Attachment shall be by 1/2 in. X 1-1/4 in. lag bolts. A 3/8 in. pilot hole shall be drilled for each lag bolt. Each bolt shall be tightened to the extent that it holds the mounting hardware firmly, but not so tight as to distort the hardware or strip the threads.

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Equipment racks are to be co-located with the quadplex power outlets to allow for easy connection of racked equipment to the power system of the school.

2. Wiring Blocks and Wire Management Components: Where required, wiring blocks and wire management components shall be mounted to the plywood backboard. Wiring blocks and wire management shall be mounted in accordance with the attached drawings. Each device shall be mounted such that its horizontal dimension is level. In cases where more than one device is mounted, they shall be aligned vertically. Each device shall be affixed to the plywood backboard by means of screws suitable for fastening to plywood. A minimum of four (4) of the mounting holes provided shall be utilized for fastening. Screws shall be tightened to the extent that they hold the device snug to the backboard, but not so tight as to distort or damage the device. Wiring blocks shall be terminated in accordance with the manufacturer's instructions and recommendations. Installation of accessories shall also be conducted in accordance with the manufacturer's instructions and recommendations.

2.2 COMMUNICATION EQUIPMENT ROOM FITTINGS

A. Summary:

Section Includes:

1. Telecommunications mounting elements.
2. Pathways
3. Telecommunications equipment racks and cabinets
4. Grounding.

B. Coordination: Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
4. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.
5. Coordinate location of power raceways and receptacles with locations of communications equipment requiring electrical power to operate.

C. Pathways:

1. General Requirements: Comply with TIA/EIA-569-A.

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2. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.
 - a. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
 - b. Support brackets with cable tie slots for fastening cable ties to brackets.
 - c. Lacing bars, spools, J-hooks, and D-rings.
 - d. Straps and other devices.
- D. Equipment Frames (Racks)
1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. APC
 - b. Cooper B-Line, Inc.
 - c. Hubbell Premise Wiring.
 - d. Panduit
 - e. Or equal
 2. General Frame Requirements:
 - a. Distribution Frames: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
 - b. Module Dimension: Width compatible with EIA 310 standard, 19-inch panel mounting.
 - c. Finish: Manufacturer's standard, baked-polyester powder coat.
 3. Floor-Mounted Racks: Modular-type, four-post quick rail, aluminum construction.
 - a. Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug, and two power strips.
 - b. Baked-polyester powder coat finish.
 4. Equipment Cabinets:
 - a. 42RU, 24 in. W x 42 in. D.
 - b. Steel construction.
 - c. Treated to resist corrosion.
 - d. Perforated front and rear doors.
 - e. Lockable front and rear doors.
 - f. Louvered side panels.
 - g. Cable access provisions top and bottom.
 - h. Grounding lug.
 - i. Rack-mounted, 250-cfm fan.
 - j. 19 in. Dual slide rack mount monitor keyboard drawer (provide two)
 - k. Power strip (two).
 - l. All cabinets keyed alike.

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- m. Regulatory approvals: EIA-310-D
 - n. Warranty: 5-years
 - o. Standards: UL 60950
5. Cable Management for Equipment Frames:
- a. Metal, with integral wire retaining fingers.
 - b. Baked-polyester powder coat finish.
 - c. Vertical cable management panels shall have front and rear channels, with covers.
 - d. Provide horizontal crossover cable manager at the top of each relay rack, with a minimum height of two rack units each.
6. Power Strips: Comply with UL 1363.
- a. Rack mounting.
 - b. Receptacles: Six 20-A, 120-V ac, NEMA WD 6, Configuration 5-20R receptacles for each power strip. Provide two in each rack.
 - c. LED indicator lights for power and protection status.
 - d. LED indicator lights for reverse polarity and open outlet ground.
 - e. Circuit Breaker and Thermal Fusing: When protection is lost, circuit opens and cannot be reset.
 - f. Cord connected with 15-foot line cord.
 - g. Rocker-type on-off switch, illuminated when in on position.
 - h. Peak Single-Impulse Surge Current Rating: 33 kA per phase.
 - i. Protection modes shall be line to neutral, line to ground, and neutral to ground. UL 1449 clamping voltage for all 3 modes shall be not more than 330 V.
- E. Grounding:
- 1. Comply with requirements in 260000 Section "Grounding and Bonding for Electrical Systems." for grounding conductors and connectors.
 - 2. Telecommunications Main Bus Bar:
 - a. Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
 - b. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
 - c. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.
 - d. Comply with ANSI-J-STD-607-A.
- F. Labeling:
- 1. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.3 FIBER OPTIC CABLE:

- A. Fiber: The following cable specifications shall also be met by the cable manufacturer for fiber optic cable:
1. Attenuation: The LightSystem™ cable as noted in Tables 1 and 3 and LightSystem Plus™ cable as noted in Tables 2 and 4 shall perform in accordance with the attenuation limits when tested per ANSI/EIA/TIA-455-46, -53, -61 or -78 (as applicable).
 2. Bandwidth: LightSystem™ as noted in Table 1 cable and LightSystem Plus™ cable as noted in Table 2 shall perform in accordance with the bandwidth limits when tested per ANSI/EIA/TIA-455-51 or ISO/IEC 793-1-C2A
 3. Transmission distance: The protocol pertinent to the transmission distance noted in Table 1 for LightSystem™ and Table 2 for LightSystem Plus™ cable is Gigabit Ethernet per IEEE 802.3z.
 4. Zero Dispersion Wavelength and Slope: LightSystem™ cable shall perform as noted in Table 3 and LightSystem Plus™ cable as noted in Table 4 in accordance with the Zero Dispersion wavelength and slope limits when tested per ANSI/EIA/TIA-455-168, -169, or -175 (as applicable).
 5. Fiber 50/125 µm Multimode Optical fiber cables shall be manufactured by one of the following:
 - a. Belden
 - b. Berk-Tek
 - c. Commscope
 - d. General Cable
 - e. Mohawk
 - f. Or equal
 - g. Be a minimum of twelve strands of 50/125 µm multimode optical fiber for horizontal cabling.
 - h. Be appropriate for the environment in which it is installed.
 6. Fiber equipment cords shall:
 - a. Be available in standard lengths of 1, 3, and 5 meters, custom lengths shall also be available, and shall meet or exceed standards as defined in ANSI/TIA/EIA-568-A and ISO/IEC 11801.
 - b. Utilize duplex fiber cable that is 50/125 micron multimode, OFNR riser grade, and meets the requirements of UL 1666.
 - c. Utilize cable where the attenuation shall not exceed 3.5 dB/km @ 850 nm wavelength or 1.0 dB/km @ 1300 nm.
 - d. Have a cable jacket color for 50/125 in gray.
 - e. The connectors shall be SC or ST in accordance with TIA/EIA-568-A and must include a ceramic ferrule.
 - f. Have ST connectors with a metal coupling nut.
 - g. Have a minimum return loss of 20 dB (25 dB typical) at both 850 nm & 1300 nm.
 - h. Be made by an ISO 9001 and 14001 Certified Manufacturer.

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- i. Be UL 1666 approved.
 - j. Siemon Company FJ Series Fiber Jumpers Recommended Category 6:
7. Coordinate fiber patch cords with Owner prior to release. Provide SC to LC, ST to LC, or any combination of the two. Provide one per fiber port.
 8. Warning Tags: At each location where the fiber cable is exposed to human intrusion, it shall be marked with warning tags. These tags shall be yellow or orange in color, and shall contain the warning: "CAUTION FIBER OPTIC CABLE". The text shall be permanent, black, block characters, and at least 3/16 in. high. A warning tag shall be permanently affixed to each exposed cable or bundle of cables, at intervals of not more than five feet. Any section of exposed cable which is less than five feet in length shall have at least one warning tag affixed to it.
 9. T-Bar Suspended Ceilings: Copper station cabling may be run outside of conduits and above T-Bar suspended ceilings when available, at the option of the installer. Cables installed in this fashion are to be run horizontally in bundles and tied down neatly, well clear of any light fixtures or other electrical appliances that may affect data transmissions.
- B. Optical fiber Interconnect Equipment: Interconnect equipment may be mounted either on the plywood backboard or in the equipment racks, depending on the particular application. When mounted on the backboard, the horizontal dimension shall be level. A minimum of four of the mounting holes provided shall be utilized for fastening. Screws shall be tightened to the extent that they hold the device snug to the backboard, but not so tight as to distort or damage the device. Interconnect equipment mounted in racks shall be affixed to the rack by at least four screws. The screws shall be of the correct size and thread configuration for the holes in the rack. They shall be tightened to the extent that they hold the equipment firmly to the rack, without distorting the equipment or stripping the threads. All optical fiber interconnect devices shall be assembled and installed in accordance with the manufacturer's instructions and recommendations. All large openings into wall mounted cabinets shall be covered by a grommet.

2.4 UTP CABLE (BACKBONE)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Belden CDT Inc.; Electronics Division.
 2. CommScope
 3. Mohawk; a division of Belden CDT.
 4. Molex
 5. Superior Essex Inc.
 6. Or equal
- B. Description: Multi-pair Backbone Cable: Category 5e, 100-ohm, 25-pair UTP binder groups covered with a gray thermoplastic jacket.
 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 5e.

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- 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: Type CMP, complying with NFPA 262.
- C. Multi-pair backbone cables: Provide copper backbone cable that meets or exceeds the following specifications:
 - 1. Electrical Specifications:

Maximum DC Resistance	28.6 Ω /1,000 ft (9.4 Ω /100m)
Maximum DC Resistance Unbalanced	5 percent
Maximum Capacitance Unbalanced (pair to ground)	1,000 pF/1000 ft. (328 pF/m)
Mutual Capacitance @ 1kHz	18 nF/1000 ft (5.9 nF/100 m), max.

- 2. Attenuation (dB/100 m [328 ft.]):

<u>Frequency</u>	<u>Attenuation (Max.)</u>
1.00 MHz	2.3 dB
4.00 MHz	4.9 dB
10.00 MHz	8.5 dB
16.00 MHz	12 dB

- 3. Worst Pair Near-End Crosstalk (NEXT) dB/100 m [328 ft.]:

<u>Frequency</u>	<u>Pair-To-Pair NEXT (Max.)</u>
1.0 MHz	13.8 dB
4.0 MHz	11.2 dB
10.0 MHz	10.2 dB
16.0 MHz	9.2 dB

2.5 FIBER INNERDUCT

- A. DESCRIPTION: From the MDF to each IDF, segments of optical fiber innerduct shall be installed.
 - 1. Quantities Required: Innerduct runs do not have to be continuous throughout, breaks are expected at the pull boxes. Contractor is responsible for determination of actual lengths of innerduct required. Enough innerduct shall be provided and installed to extend from the fiber service loop in the MDF to the fiber service loop in each IDF. If the route passes through a pull box, the segments of innerduct shall extend twelve inches into the pull box. If the route passes through an enroute HC, each segment of innerduct shall extend at least twelve inches beyond the end of the service conduit.
- B. INSTALLATION: Fiber innerduct shall be installed in accordance with manufacturer's instructions and industry standards. Within the equipment rooms, the innerduct shall extend from the end of conduit to four feet above the floor and shall be affixed to the backboard by means of clamps designed for that purpose. Care shall be taken to avoid kinking the innerduct or applying excessive tension during the installation process.

2.6 FIBER DISTRIBUTION

- A. DESCRIPTION: From the MDF to each IDF a continuous segment of fiber cable shall be provided.
1. Product: 12 strands multi-mode 50/125 UM OM3 laser optimized and 6 strands single-mode 8.3/125 UM.
 2. Quantities Required: The contractor is responsible for determination of actual segment lengths. Actual quantities will be determined by the routing established by the electrical engineer.
 3. Required Accessories and Quantities:
 - a. Kit of Parts: Sufficient quantities to block and buffer both ends of each cable segment.
 - b. Sealant: Sealant sufficient quantities to block each end of each cable segment.
- B. INSTALLATION: Installation shall be conducted following guidelines established by the product manufacturer and industry standards.
1. Fiber Optic Cable: During installation of the optical fiber cable segments into the conduit system, special care shall be taken to avoid damage to the cable. While under pulling tension, the cable shall not be bent into a curve with a radius of less than 20 times the cable diameter. Pulling tension shall not exceed manufacturer's recommended maximum tensile load. Contractor shall utilize a winch with tension control or a "break-away" link designed to break away at or below the recommended maximum tension.
- C. The optical fiber cable shall be routed through the existing conduit and onto the appropriate HC backboard. Routing on the backboard shall be straight and plumb. A minimum ten foot service loop shall be provided at each terminal location. Refer to Drawings for cable configuration.

2.7 WORK STATION CABLE

- A. DESCRIPTION: From each MDF or IDF, 4-pair enhanced Category 6A cables shall be routed to each work station (data outlets).
1. Product:
 - a. Copper 4-pair UTP:
 - 1) UTP cables shall:
 - a) Be manufactured by one of the following:
 - i Hitachi Cable Manchester
 - ii Berk-Tek
 - iii Commscope
 - iv General Cable
 - v Mohawk
 - vi Or equal
 - vii Be 100 Ω 4-pair, category 6A cable.

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2. Required Accessories and Quantities (Hard Wall Locations):
 - a. Work Station: shall be metal with ivory or white finish (refer to drawings), Single Gang, Single Port Face plate. Using Panduit CMB**-X blank modules to fill unused ports. Refer to drawings for two, three, and four gang configurations. Modules shall be CJ688TP** – color to be selected by engineer.
3. Work Area Equipment Cords: The Work Area Equipment Cords shall meet or exceed the following criteria:
 - a. Modular Equipment Cords: Category 6A cable
4. Category 6A, modular equipment cords shall:
 - a. Be round, and consist of eight insulated 24 AWG, stranded copper conductors, arranged in four color-coded twisted-pairs within a flame-retardant jacket.
 - b. Be equipped with modular 8-position (RJ45 style) plugs on both ends, wired straight-through with standards compliant wiring.
5. Use modular plugs which exceed FCC CFR 47 part 68 subpart F and IEC 60603-7 specifications, and have 50 microinches minimum of gold plating over nickel contacts.
6. Be resistant to corrosion from humidity, extreme temperatures, and airborne contaminants.
7. Utilize cable that exhibit power sum NEXT performance.
 - a. Be available in several colors with or without color strain relief boots featuring a snagless design.
 - b. Provide one 10 foot cord per data jack shown on drawings.
 - c. Be made by an ISO 9001 and 14001 Certified Manufacturer.
 - d. Electrical Specifications:
 - e. DC resistance per lead: $9.38 \Omega / 100 \text{ m}$ maximum.
 - f. Input impedance without averaging: $100 \Omega + 15 \text{ percent}$ from 1 to 100 MHz.
 - g. 100 percent transmission tested with laboratory grade network analyzers for proper performance up to 1000 MHz. Vendor shall guarantee cords are compatible with category 6 links/3A links.
8. UL VERIFIED (or equivalent) for TIA/EIA proposed category 6/6A electrical performance.
9. UL LISTED 1863.
10. All information outlets for 100 Ω 22-26 AWG copper cable shall:
 - a. Be available in black, white, gray, ivory and light ivory.
 - b. Accommodate a minimum of two 8-position / 8-conductor modular jacks.
 - c. Utilize compliant pin technology 110 style insulation displacement connectors which allows the use of a 4-pair impact tool.
 - d. Allow for a minimum of 200 re-terminations without signal degradation below standards compliance limit.
 - e. Be constructed of high impact, flame-retardant thermoplastic.
 - f. Be available in a screened version for 100 Ω ScTP cable.
 - g. Be made by an ISO 9001 and 14001 Certified Manufacturer.
 - h. Electrical Specifications:

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- i. ANSI/TIA/EIA-568-B1, B2, B3 and ISO/IEC 11801 proposed category 6A compliant.
- j. The following requirements shall also be met (NEXT Loss and FEXT tested in both Differential and Common Mode):

Parameters	Performance	Performance @ 100 MHz *
NEXT Loss	+ 3.0 dB	43.0 dB
FEXT	+ 3.0 dB	43.0 dB **
Insertion Loss (Attenuation)	+ 40 percent	.24 dB
Return Loss	+ 6 dB	20 dB
LCL	40 dB (1-100 MHz)	**

B. **INSTALLATION:** Installation shall be conducted in accordance with guidelines established the manufacturer and industry standards. Wall Plates shall be mounted such that their vertical dimension is plumb. Each wall plate shall be labeled with its respective work station number. Each modular mounting frame shall be labeled with its respective work station number.

C. **Technical Requirements:** Horizontal cabling: the horizontal subsystem is the portion of the telecommunications cabling system that extends from the work area telecommunications outlet/connector to the horizontal cross-connect in the Telecommunications room/closet. It consists of the telecommunications outlet/connector, the horizontal cables, optional consolidation point, and that portion of the cross-connect in the telecommunications room/closet serving the horizontal cable.

- 1. **Cable Types:** All UTP and fiber optic cables shall conform to the following standards:
 - a. ANSI/TIA-568C.0 Generic Telecommunications Cabling for Customer Premises
 - b. ANSI/TIA-568C.1 Commercial Building Telecommunications Cabling
 - c. ANSI/TIA-568C.2 Balance Twisted Pair Telecommunications Cabling
 - d. ANSI/TIA-568C.3 Optical Fiber Cabling and Components Standard
 - e. Including all applicable addenda) and ISO/IEC 11801 (International) Generic Cabling for Customer Premises standard (latest amendment and including all applicable addenda).

f. Input Impedance	Bonded-Pair	Non-bonded Pair	
100 ±	12	1-20 MHz	-----
100 ±	15	20-250 MHz	1-100 MHz
100 ±	20	250-350 MHz	-----
100 ±	22	350-625 MHz	100-200 MHz
100 ±	32	-----	200-625 MHz

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g. Copper: The following cable specifications shall also be met by the cable manufacturer for 4-pair UTP, premium category 6 cables:

- 1) Attenuation: Qualified Cables shall exhibit worst case attenuation less than the values derived using the equations shown in the chart below from 1 MHz to the highest referenced frequency value. Worst case qualified cable attenuation performance for selected frequency points of interest is also provided.

Attenuation Limits Table			
		System 6SM	
Frequency Range		1-350 MHz	
Worst Case		$\leq 1.82\sqrt{f} + .017 \cdot f + \frac{0.20}{\sqrt{f}}$	
Frequency Points of Interest	MHz		
	100	19.8 dB	
	200	29 dB	
	300	35.3 dB	

h. Near End Crosstalk (NEXT) Loss:

- 1) Qualified Cables shall exhibit worst case NEXT Loss greater than the values derived using the equations shown in the chart below from 1 MHz to the highest referenced frequency value. Worst case qualified cable NEXT Loss performance for selected frequency points of interest is also provided.

NEXT Loss Limits Table			
		System 6SM	
Frequency Range		1-350 MHz	
Worst Case Cable NEXT Loss		$\geq 76 - 15\log\left(\frac{f}{0.772}\right)$	
Frequency Points of Interest	MHz		
	100	44.3 dB	
	200	39.8 dB	
	300	37.1 dB	

i. Power Sum Near-End Crosstalk (PSNEXT) Loss:

- 1) Qualified Cables shall exhibit worst case PSNEXT Loss greater than the values derived using the equations shown in the chart below from 1 MHz to the highest referenced frequency value. Worst case qualified cable PSNEXT Loss performance for selected frequency points of interest is also provided.

PSNEXT Loss Limits Table			
		System 6SM	
Frequency Range		1-350 MHz	
Worst Case PSNEXT Loss		$\geq 74 - 15\log\left(\frac{f}{0.772}\right)$	
Frequency Points of Interest	MHz		
	100	42.3 dB	
	200	37.8 dB	
	300	35.1 dB	

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- j. Equal Level Far-End Crosstalk (ELFEXT):
- 1) Qualified Cables shall exhibit worst case ELFEXT greater than the values derived using the equations shown in the chart below from 1 MHz to the highest referenced frequency value. Worst case qualified cable ELFEXT performance for selected frequency points of interest is also provided.

ELFEXT Limits Table			
		System 6SM	
Frequency Range		1-350 MHz	
Worst Case ELFEXT		$\geq 70 - 20\log\left(\frac{f}{0.772}\right)$	
Frequency Points of Interest	MHz		
	100	27.8 dB	
	200	22.7 dB	
	300	18.2 dB	

- k. Power Sum Equal Level Far-End Crosstalk (PSELFEXT):
- 1) Qualified Cables shall exhibit worst case PSELFEXT Loss greater than the values derived using the equations shown in the chart below from 1 MHz to the highest referenced frequency value. Worst case qualified cable PSELFEXT performance for selected frequency points of interest is also provided.

PSELFEXT Loss Limits Table			
		System 6SM	
Frequency Range		1-350 MHz	
Worst Case PSELFEXT		$\geq 67 - 20\log\left(\frac{f}{0.772}\right)$	
Frequency Points of Interest	MHz		
	100	24.8 dB	
	200	18.7 dB	
	300	15.2 dB	

- l. Return Loss:
- 1) Qualified Cables shall exhibit worst case Return Loss greater than the values derived using the equations shown in the chart below from 1 MHz to the highest referenced frequency value. Worst case qualified cable Return Loss performance for selected frequency points of interest is also provided.

Return Loss Limits Table			
		System 6SM	
Frequency Range		1-350 MHz	
Worst Case Return Loss		Frequency (MHz)	Return Loss (dB)
		$\leq f < 10$	$21 + 4 \cdot \log(f)\text{dB}$
		$10 \leq f < 20$	25 dB
		$20 \leq f \leq 300$	$25 - 7 \cdot \log(f/20)$

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Frequency Points of Interest	MHz		
	100		20.1 dB
	200		18 dB
	300		16.8 dB

m. Propagation Delay (ANSI/TIA/EIA-568-A-1):

- 1) Qualified Cables shall exhibit worst case Propagation Delay less than the values derived using the equations shown in the chart below from 1 MHz to the highest referenced frequency value. Worst case qualified cable Propagation Delay performance for selected frequency points of interest is also provided.

Propagation Delay Limits Table			
			System 6SM
Frequency Range			1-350 MHz
Worst Case Propagation Delay			$< 476 + \frac{36}{\sqrt{f_{MHz}}}$
Frequency Points of Interest	MHz		
	100		480 ns
	200		479 ns
	300		478 ns

n. Delay Skew (ANSI/TIA/EIA-568-A-1):

- 1) Qualified Cables shall exhibit worst case Delay Skew less than the values specified in the chart below per 100 m from 1 MHz to the highest referenced frequency value.

Delay Skew Limits Table			
			System 6SM
Frequency Range			1-350 MHz
Worst Case Delay Skew	MHz		
	100		25 ns
	200		25 ns
	300		25 ns

o. Longitudinal Conversion Loss (LCL):

- 1) For all categories of 100 Ω unshielded and screened cables, the worst case calculated LCL for any pair in a 100 m cable shall not be less than 35 dB, from 1 MHz to the highest referenced frequency for each performance category. LCL measurements shall be performed in accordance with ITU-T Recommendation O.9 (November, 1988) or equivalent. Calculated LCL performance shall be determined by subtracting the test balun loss correction factor (as specified by the balun manufacturer) from the measured value at all frequencies.

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LCL Limits Table			
		System 6SM	
Frequency Range		1-350 MHz	
Worst Case Delay Skew	MHz		
	100		35 dB
	200		35 dB*
	300		35 dB

p. Longitudinal Transfer Conversion Loss (LCTL):

- 1) For all categories of 100 Ω unshielded and screened cables, the worst case calculated LCTL for any pair in a 100 m cable shall not be less than 35 dB, from 1 MHz to the highest referenced frequency for each performance category. LCTL measurements shall be performed in accordance with ITU-T Recommendation O.9 (November, 1988) or equivalent. Calculated LCL performance shall be determined by subtracting the test balun loss correction factor (as specified by the balun manufacturer) from the measured value at all frequencies.

LCTL Limits Table			
		System 6SM	
Frequency Range		1-350 MHz	
Worst Case Delay Skew	MHz		
	100		35 dB
	200		35 dB*
	300		35 dB*

q. Attenuation to Crosstalk Ratio (ACR):

- 1) Using “pair-to-pair NEXT Loss”, all Qualified Cables shall exhibit worst case ACR performance for the specified frequency range shown in the following table.

ACR Limits Table			
		System 6SM	
Frequency Range		1-350 MHz	
Worst Case ACR	MHz		
	1-80		24.1 dB
	80-100		24.1 dB
	1-100		24.1 dB
	100-300		.5 dB
PSACR Limits Table			
		System 6SM	
Frequency Range		1-350 MHz	

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Worst Case PSACR	MHz		
	1-80		22.1 dB
	80-100		22.1 dB
	1-100		22.1 dB
	100-300		-1.5 dB

- r. Transfer Impedance:
- 1) Surface Transfer Impedance is specified for ScTP cables and is determined by the formula below in mΩ/m where f = frequency. All qualified ScTP cables shall have a margin greater than or equal to the values specified in the following table.

$$T_{cable} = 37 + 4f + 4\sqrt{f} + 5\sqrt[3]{f}$$

Transfer Impedance Limits Table			
Margin 1-100 MHz		System 6SM	
Transfer Impedance		10 percent	

2.8 MAIN DISTRIBUTION FACILITY (MDF)

- A. DESCRIPTION: The equipment shall be installed in accordance with Drawings.
1. Products and Quantities:
 - a. Equipment Rack: - As specified.
 - b. Fiber Interconnect: Panduit FRME24 rack mount fiber optic enclosure or equal. Supply and install as many as necessary to service all fiber strands entering the MDF.
 - c. Modular Patch Panels: Panduit angled patch panel or equal: 48-port patch panel wired Category 6A Patch Panel. One port for each workstation served from the MDF with a minimum of 12 spare ports are required. If the number of workstation cables, plus required spare count 12 is greater than 48, then a second 48-port patch panel is required. Supply and install as many patch panels in the MDF as necessary to service all workstation cables plus the required spare count. Patch panel jack colors shall be as follows: Colors shall be red for voice, yellow for data, green for wireless access points, blue for security.
 - d. Patch Cables: The length shall vary between 3 ft. and 15 ft. and shall be determined by the owner. Colors shall be red for voice, yellow for data, green for wireless access points, blue for security. Patch cables shall have snagless (double sharkfin style – refer to detail on drawings) molded boot.
 2. Required Accessories and Quantities:
 - a. Adapter Panels: Panduit FAP6WEIDSC – 6 Port Duplex Multimode LC Adapter Panels.
 - b. Fiber Jumpers: Panduit F6D3-3M3Y, 3 meter, Duplex, 50 micron OM4, LC to duplex LC Fiber Jumper or equal.
 - c. Cable Management: Panduit WMPH2E Front/Rear cable manager or Panduit WMPLS Low Profile Cable Manager or equal.

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- d. Cable Management Rings and Strain Relief: Panduit WMBV1 21 in. x5 in. Vertical Manager Ring, Panduit WMBV2 2 in. x5 in. Vertical Manager Ring and/or Panduit WMSRC1 or WMSRC2 strain relief clips. Provide and install sufficient quantities to conform to the attached Drawings.
- B. **INSTALLATION:** Installation shall be conducted in accordance with manufacturer's recommendations, industry standards, and this specification. Installation includes complete assembly and mounting of the fiber interconnect equipment, dressing the fiber and copper cables, complete assembly and mounting of the equipment rack, and mounting of the wiring blocks. Equipment shall be mounted in accordance with attached Drawings.

2.9 INTERMEDIATE DISTRIBUTION FACILITIES

- A. **DESCRIPTION:** The equipment shall be installed in accordance with Drawings.
- 1. Products and Quantities:
 - a. Equipment Rack: - As specified.
 - b. Fiber Interconnect: Panduit FRME24 rack mount fiber optic enclosure or equal. Supply and install as many as necessary to service all fiber strands entering the IDF.
 - c. Modular Patch Panels: Panduit angled patch panel or equal: 48-port patch panel wired Category 6A Patch Panel. One port for each workstation served from the MDF with a minimum of 12 spare ports are required. If the number of workstation cables, plus required spare count 12 is greater than 48, then a second 48-port patch panel is required. Supply and install as many patch panels in the MDF as necessary to service all workstation cables plus the required spare count. Patch panel jack colors shall be as follows: Colors shall be red for voice, yellow for data, green for wireless access points, blue for security.
 - d. Patch Cables: The length shall vary between 3 ft. and 15 ft. and shall be determined by the owner. Colors shall be red for voice, yellow for data, green for wireless access points, blue for security. Patch cables shall have snagless (double sharkfin style – refer to detail on drawings) molded boot.
 - e. Required Accessories and Quantities:
 - f. Adapter Panels: Panduit FAP6WEIDSC – 6 Port Duplex Multimode LC Adapter Panels.
 - g. Fiber Jumpers: Panduit F6D3-3M3Y, 3 meter, Duplex, 50 micron OM4, LC to duplex LC Fiber Jumper or equal.
 - h. Cable Management: Panduit WMPH2E Front/Rear cable manager or Panduit WMPLS Low Profile Cable Manager or equal.
 - i. Cable Management Rings and Strain Relief: Panduit WMBV1 21 in. x5 in. Vertical Manager Ring, Panduit WMBV2 2 in. x5 in. Vertical Manager Ring and/or Panduit WMSRC1 or WMSRC2 strain relief clips. Provide and install sufficient quantities to conform to the attached Drawings.
- B. **INSTALLATION:** Installation shall be conducted in accordance with manufacturer's recommendations, industry standards, and this specification. Installation includes complete assembly and mounting of the fiber interconnect equipment, dressing the fiber and copper cables, complete assembly and mounting of the equipment rack, and mounting of the wiring blocks. Equipment shall be mounted in accordance with Drawings.

2.10 TESTING AND DOCUMENTATION

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Visually inspect UTP jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
 - 2. Visually confirm Category 5e marking of outlets, cover plates, outlet/connectors, and patch panels.
 - 3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 4. Test UTP copper 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 cross-connection.
 - a. Provide test instruments that 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.
 - 5. Multi-pair Voice Riser Tests:
 - a. Test each pair of multi-pair voice riser cables for proper polarity; no reversals; no transpositions; continuity; no shorts; no AC voltages; no DC voltages; no opens; and proper numbering at each termination.
 - b. Bring cables and/or pairs not meeting the requirements of the standard into full compliance, at no additional cost to the Owner.
 - c. Document cable testing in accordance with Submittals Article. Provide a table of test results in a 3-ring binder submitted with the as-built Drawings.
 - 6. Category 6A Data, and Voice UTP Cable Testing:
 - a. Test voice and data jack in each Outlet for Category 6 ANSI/TIA/EIA 568B series compliance, using a Certified Level III testing instrument. Tests shall verify both the integrity of all conductors and correctness of the termination sequence. Tests shall also include length, mutual capacitance, characteristic impedance, attenuation and near-end and far-end crosstalk. Testing shall be performed between modular jacks at the Outlets and the modular jacks at the patch panel field.
 - b. The Communication Systems Installer shall bring cables and/or pairs not meeting the requirements of the standard into full compliance, at no additional cost to the Owner.
 - c. Document cable testing in accordance with Submittals Article. Provide a table of test results in a 3-ring binder submitted with the as-built Drawings.

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7. Fiber Optic Cable Testing:
- a. Test all fibers in the completed end-to-end system. Testing shall consist of a bi-directional end to end OTDR trace, or a bi-directional end to end power meter test performed per ANSI/TIA/EIA 455 53A. The system loss measurement shall be provided at 850 and 1310 nanometers.
 - b. Pre-installation cable testing: Test all fiber optic cable prior to the installation of the cable. Assume all liability for the replacement of the cable should it be found defective after the installation.
 - c. Loss Budget: Fiber links shall have a Maximum Loss of:
 - d. Maximum Loss = (allowable loss per km) (km of fiber in link) + (.4dB)(number of connectors) Note: A mated connector-to-connector interface is defined as a Single connector.
 - e. Loss numbers for the installed link shall be calculated by taking the sum of the bi-directional measurements and dividing that sum by two. Any link not meeting the requirements of the Maximum Loss shall be brought into compliance at no additional charge to the Owner.
 - f. Prepare a certification report listing the test results and both the calculated and measure loss for each fiber. Submit this report with the test results as called for in the Submittals Article.
 - g. Bring cables and/or strands not meeting the requirements of the standard into full compliance.

D. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.

1. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.

E. Document data for each measurement. Print data for submittals in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

F. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

G. End-to-end cabling will be considered defective if it does not pass tests and inspections.

H. Prepare test and inspection reports.

2.11 INTEGRATED ELECTRONIC COMMUNICATIONS NETWORK

A. GENERAL INFORMATION

1. The work described by this section includes the furnishing of all components, materials, equipment, installation and technical labor and the performance of all operations necessary for the complete installation of an IP based Bell, PA and Unified Mass Communication system in operating condition as indicated on the drawings and/or specification herein.

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2. All materials, equipment and apparatus provided shall be new and of the latest design or model offered for sale by the manufacturer.
3. The system vendor shall contact the Network Operations, Telecommunications Branches, and VoIP administrator of the district to arrange for system programming, configuration, interface, and testing.
4. The speaker output level of all areas shall meet the requirements of The Owner. Volume level changes shall be made to the Owner's satisfaction.

B. SYSTEM DESCRIPTION

1. Components of the Unified Mass Communication System (UMCS) shall provide a complete network system solution including fully functioning Intercom System (IC), Public Address System (PAS), and Emergency Notification System (ENS).
2. System shall include software from a single developer for complete control and monitoring of the system for a fully supported system.
3. System shall be digital and operate over the facility's Local Area Network (LAN) and Wide Area Network (WAN), with survivability/redundancy as shown on contract documents
4. System control software shall be capable of being configured for High Availability Multi-Server Deployments.
5. System shall be capable of being configured and controlled remotely via Owner provided connectivity.
6. System shall include General Purpose Input and Output (GPIO) trigger points for interfacing with other systems including Emergency and Security Systems to provide event driven system configuration scenarios.
7. System shall be capable of connecting to existing common area PAS, providing interface points from the LAN based system to existing analog systems.
8. Administration office IP Administrative Display Phone, IP Administrative Communication Console, or IP Master Paging Station shall be a PoE device attached to the school network.
9. Each classroom shall be a zone on the system capable of individual intercom use or as part of a zone group or all call group during PAS use.
10. Classroom IP endpoint device shall be a PoE+ device attached to the school network.
11. Classroom shall be capable of initiating an intercom call and an emergency call of different priority levels with full duplex operation from IP endpoint to network phone, IP Administrative Display Phone, IP Master Paging Station or network phone, IP Administrative Display Phone, IP Master Paging Station to IP endpoint operation.
12. System shall comply to ADA title II entities (State and local governments) and title III entities (businesses and nonprofit organizations that serve the public) communicate effectively with people who have communication disabilities. The goal is to ensure that communication with people with these disabilities is equally effective as communication with people without disabilities.
13. Common areas, including but not limited to hallways, cafeterias, gymnasiums, and auditoriums shall be provided with PAS coverage from the system for general and emergency announcements.
14. System shall provide multicast or hybrid unicast/multicast for configuration of LAN and WAN using standard Ethernet protocols.

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15. System shall be capable of operation with multiple telephone system manufacturers and mobile phone applications (iOS, Android) as directed by the Owner's Representative.
16. System shall be capable of 911 call monitoring as directed by the Owner's Representative.
17. System shall be capable of initiating an intruder on campus alert as directed by the Owner's Representative.
18. System shall be capable of initiating a school-wide or district-wide lockdown as directed by the Owner's Representative.
19. System shall provide mobile phone on/off premise Response/Confirmation request as directed by the Owner's Representative.
20. System shall be capable of operation with Two-Way Police/Security Radios as directed by the Owner's Representative.
21. System shall provide opening tones for announcements sent to IP endpoints equipped with speakers, and scrolling text messages sent to IP endpoints equipped with visual displays.
22. System shall be Common Alerting Protocol (CAP) compliant to provide automated warning notifications for subscription alerts such as Weather and Amber alerts as directed by the Owner's Representative.
23. All common area loudspeakers shall operate on a 70-volt distributed system. The loudspeakers shall be grouped in modular zones allowing maximum flexibility for paging area assignment.
24. Software and operating system shall be provided and connected to Owner's LAN using system servers as directed in Contract documents.

C. SYSTEM OPERATION REQUIREMENTS

1. The following functional capabilities are required for the Mass Communication System:
 - a. System operation shall allow administrator to define user privileges, define loudspeaker zones, pre-recorded messages, bell schedules, bell designations, event logs, background music streams, system configuration and IP endpoint status.
 - b. Manages dynamic requests for live, delayed and prerecorded messages (simple and assembled), record and playback of ad hoc messages, text-to-speech, mute actions (by zone or zone group) and two-way full duplex intercom connections.
 - c. Announcements and messages shall be initiated by contact closures, telephone call platforms, IP Administration Communication Console, IP Administrative Display Phone, IP Master Paging, Station mobile phone application (iOS, Android), tablets, computers using desktop clients and/or Microsoft Teams, using standard Ethernet protocols.
 - d. Includes a built-in comprehensive message/bell scheduling system that allows the creation of schedule profiles that can be applied to specific days of the week or date ranges. Multiple profiles can be applied simultaneously.
 - e. Any authorized administrator shall be able to call from outside the school into any classroom, zone, or entire school directly via the school district supplied network-based call platform or mobile phone application (iOS, Android). This shall allow remote monitoring, call-in annunciation, and two-way conversation from outside the facility as well as paging into the system. (Compliance with NEMA Standard SB-40 for emergency communications in K-12 Schools).

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- f. System shall interface with third party systems by IP endpoint device built-in logic inputs (2) and relay output (1) and/or balanced line level audio input (1) and balanced line level audio output (1) for connection to third party systems.
- g. System shall support a minimum of 100 message priority levels.
- h. System shall allow any authorized administrator to initiate an intruder on campus and school-wide and/or district-wide lockdown emergency notification via the school district supplied network-based call platform, IP Administration Communication Console, IP Administrative Display Phone, IP Master Paging, mobile phone application (iOS, Android), Microsoft Teams, or button touch.
- i. System operation shall allow for user defined visual color notification scheme for each messaging priority level. Supported IP visual endpoint devices shall automatically change its default background color to user defined normal, warning and emergency notifications.
- j. System shall provide classroom occupants the ability to confirm they have heard and executed the required instructions for any emergency announcement. Confirmation shall be achieved utilizing existing classroom network desktop phone, mobile phone application (iOS, Android), desktop client web console, email or Microsoft Teams. The authorized administrator can view real-time classroom status, either safely secured or non-secured via mobile phone application (iOS, Android) or web console user interface whether on-site or remote. Authorized administrator shall be able to initiate two-way communication, without a pre-announcement tone, to the classroom.
- k. System shall provide 911 call monitoring to alert authorized administrators of when 911 is dialed in the school buildings to assist with the incident and guide law enforcement or security officers. System control software can also record calls to provide additional context for what type of situation is taking place.
- l. System shall provide supervision and logging for all associated IP endpoint devices on the network with built-in email/SMS notification and SNMP capabilities and Active Failover.
- m. System shall provide interface to digital signage for visual paging and ADA compliance requirements.
- n. System shall provide interface to Two-Way Police/Security Radios for alerting law enforcement or security officers of an emergency.
- o. System shall provide full duplex intercom (hands free) sessions so that during an emergency event, the user can speak freely in the event they physically may not be able to work a push to talk feature
- p. System shall manage thousands of audio and visual output zones over local or wide area networks utilizing industry standard IP-based protocols to eliminate distance limitations.
- q. System shall allow push notifications to an unlimited number of IP endpoints using VoIP (Voice Over Internet Protocol) network architecture.
- r. IP endpoints shall use IEEE 802.3 standard PoE implementation so they can be used with any IEEE 802.3at (PoE+) 10/100Base-T switch.
- s. System shall be Cisco IVT (Interoperability Verifications Test) certified ensuring quality integration with Cisco products while not adversely affecting Cisco product operation.

D. RELATED DOCUMENTS

1. See Section 270000 "Communication" for additional requirements, and Ethernet cabling requirements and standards.

E. QUALIFICATIONS

1. Authorized Distributor for product supplied. Authorized Distributor Letter from manufacturer required upon request of specifying authority.
2. Applicable state and local licenses

F. SYSTEM CONTROL SOFTWARE REQUIREMENTS

1. The following functional capabilities are required for the System Control Software (SCS):
 - a. The System Control Software shall be one of Singlewire's Notification Applications, InformaCast Advanced, or InformaCast Fusion based on system requirements.
 - b. SCS shall manage audio announcements and visual messages using dynamically routed data on a standard OSI Ethernet network.
 - 1) Audio announcements shall support dynamic requests for live and delayed audio announcements, pre-recorded and scheduled messages, actions, defined events, and two-way full duplex intercom connections.
 - 2) SCS shall support dynamic requests for intruder on campus and school-wide and/or district-wide lockdown emergency audio and/or visual notifications.
 - 3) SCS shall support a minimum of 100 audio and visual message priority levels.
 - 4) Visual messaging shall include text and user defined priority messaging color style profile to automatically change the default background color of supported visual displays including Visual IP endpoints, supported network connected desktop phones, desktop notification clients, digital signage and mobile phone application.
 - 5) SCS shall include an integral interface for Microsoft Teams, Twitter, and Cisco Webex Calling.
 - 6) SCS shall include an integral interface for RSS feeds, IPAWS, and Common Alerting Protocol (CAP).
 - 7) Audio Announcements and visual messages shall be initiated via web console, Microsoft Teams, mobile phone application (iOS, Android), contact closures, IP Administration Communication Console, IP Administrative Display Phone, IP Master Paging and network connected desktop phones.
 - 8) SCS shall include an integral interface to answer intercom call-ins registered at IP Administration Communication Console, IP Administrative Display Phone, IP Master Paging.
 - 9) SCS shall include an integral interface for IP Administration Communication Console, IP Administrative Display Phone, IP Master Paging and connected phone to selectively monitor audio from any talkback IP endpoint during an emergency
 - 10) SCS shall manage the on/off premise Response/Confirmation request via mobile phone application.
 - 11) SCS shall include an internally hosted web console for sending notifications, configuration and monitoring.

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- c. SCS shall include internal support for IP endpoint logic inputs and relay output.
 - 1) IP endpoint logic inputs shall activate intercom request and/or preconfigured notification.
 - 2) IP endpoint relay output shall be activated by the SCS user defined priority messaging profile.
 - d. SCS shall include an integral interface for operation of multiple telephone system platforms.
 - 1) Unified Communication / VoIP supported call platforms shall be Cisco, 8x8, Fortinet, Jive, Zoom Phone and Ringcentral.
 - 2) SIP based call platforms shall interface via SIP trunking.
 - 3) Call platform interface shall support standard G.711 and G.722 Codecs, and RTP protocols.
 - 4) Network connected phones shall provide for both direct dial zone paging access as well as voice prompted actions for announcements and messages, and answer internal intercom call-ins.
 - 5) SCS shall support 911 call monitoring for support Cisco and Jive.
 - e. SCS shall include an integral interface for Motorola Two-Way Police/Security Radios.
 - f. SCS shall include an integral interface for Shooter Detection Systems, and PatriotOne Technologies Shot detection system.
 - g. SCS shall supervise all associated IP endpoint devices, report system abnormalities, and log faults.
 - h. Developer: Singlewire InformaCast Advanced or InformaCast Fusion or approved equal
2. IP-addressable Zone Paging Module
- a. Zone paging module shall connect multiple speakers for district all page, all page, zone paging, bells, audio events and, emergency notification.
 - b. Zone Paging Modules shall be rack and wall mountable.
 - c. Zone Paging modules shall be able to belong to one or more of 100 independent zones for live paging, bells, pre-recorded audio and emergency notification
 - d. As a minimum the following zones shall be provided:
 - 1) Outside speakers only
 - 2) Inside speakers only (All Call)
 - 3) Gymnasium
 - 4) Dining Commons
 - 5) Gymnasium
 - 6) Media Center
 - 7) Fitness room
 - 8) Weight room
 - 9) Auditorium
 - 10) Admin spaces only
 - 11) Outdoor loading dock area speakers
 - 12) All call inside and outside speakers

G. IP AUDIO/VISUAL ENDPOINT REQUIREMENTS

1. Equipment and Material:

- a. **Critical Communication System Controller Server**
 - 1) Provide a directory and management server with the following specifications.
 - 2) (2) Quad Core XEON E5640 2.66 GHZ or better
 - 3) Microsoft Windows Server 2012.
 - 4) 16 GB RAM.
 - 5) 500 GB of storage for the operating system, ACS applications, and Microsoft SQL Server 2008.
 - 6) Standard SVGA Video Card
 - 7) 1280x1024 or higher screen resolution
 - 8) 10/100/1000 Ethernet Network Interface Card
 - 9) DVD ROM Drive
 - 10) Four (4) USB ports
- b. Provide Dell R310 series or approved equal. Provide rack mount style.
- c. **Server Software**
 - 1) The software has the ability to sync system time to the Atomic Clock Signal or to the school's or districts network time server
 - 2) The software will provide a web-browser to deliver district wide emergency paging, pre-recorded messages and tones from any authorized computer in the facility or the district. The software must be capable of automatically notifying district personnel via the WAN of an alarm condition.
 - 3) The software can automatically broadcast page emergency instructions via associated system hardware throughout an entire district when an alarm (e.g. lockdown, lockout, security, fire) is initiated via the web-based interface. The emergency instructions are preprogrammed and require no user intervention. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.
 - 4) The software can be installed in cloud, virtual or physical server environments.
 - 5) The web-based user interface supports secure HTTP browsing.
 - 6) The server software supports encryption to ensure secure access.
 - 7) The software shall support any combination of VoIP Telecenter Campus Controllers and Telecenter Page Modules for a minimum of 1000 facilities.
 - 8) The software shall support a minimum of 50,000 IP Speaker modules, district wide.

2. Equipment Racks

- a. All equipment racks shall provide 44 spaces (77 in.) minimum for mounted system equipment.
- b. All equipment racks shall be multi-rack format ("gangable") style, bolted together, and open cavity.
- c. All equipment racks will be provided with lockable rear doors.
- d. Equipment rack(s) shall be located in climate-controlled areas/rooms as shown on drawings.

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- e. All head-end, distribution, and source equipment, including data and power, shall be located in racks configured as approved by the Engineer.
 - f. Rack mounted equipment shall be accessible from front and rear.
 - g. All unused rack spaces will be covered with appropriate blank/vent panels
3. Dedicated Integrated Networked Electronic Communication And Clock Network Core And Edge Poe Network Switch
- a. Manufactures: Subject to compliance with requirements, provide products by one of the following
 - 1) Cisco Systems (Proprietary)
 - b. Provide dedicated network switch equipment to support the transmission of public address and clock system data with the following functions
 - 1) Provide the core switch with fiber GBIC cards as required to support each IDF
 - 2) Provide each edge switch with a minimum of one fiber GBIC card
 - 3) RJ-45 10/100/1000Base-T Auto Sensing/Auto negotiating LAN
 - 4) Connectivity Media: Category 6 Twisted Pair 10/100/1000Base-T
 - 5) Data Transfer Rate: 10Mbps Ethernet, 100MBPS Fast Ethernet, 1Gbps Gigabit Ethernet
 - 6) I/O Expansion: Expansion Slots: (2 Total) SFP (mini-GBIC)
 - 7) Performance: 48Gbps Bandwidth
 - 8) Network & Communication: Layer Support: 2
 - 9) Management & Protocols: SNMP v1, v2, v2c, v3; IEEE 802.1p QoS; IEEE 802.1Q, VLAN; Syslog; RMON
 - 10) Memory: 3Mb Buffer Memory
 - 11) Input Voltage: 100 V AC to 240 V AC Power Supply Universal
 - 12) Power Cord
 - 13) Rack-Mount Kit
 - c. Provide an Interface to owners' LAN as required.
4. Suspended Ceiling Mounted IP Endpoint with Speaker and Microphone
- a. 1' x 2' suspended ceiling mount IP endpoint with speaker. IP endpoint audio system shall fit in suspended ceiling grid using half a standard 2' x 2' ceiling tile space.
 - b. The PoE+ indoor 1' x 2' suspended ceiling mount IP endpoint audio system shall include factory assembled speaker, IP addressable PCB amplifier/control, steel perf grille, metal enclosure and integrated microphone.
 - 1) The speaker shall be an 8" coaxial driver with low-frequency reproducer cone that shall be a full 8" (203mm) in diameter and the high frequency reproducer cone that shall be 3" (76mm) in diameter. The woofer shall have a 10oz. (260g) ceramic magnet and the tweeter shall have a 2.35oz. (67g) ceramic magnet. The two reproducer sections shall be coupled through a built-in crossover network.

The crossover frequency shall be factory configured at 2800Hz. The speaker dispersion shall be 105° and frequency response range shall be 70Hz – 15.5kHz, (±5dB). Sensitivity shall be 98dB at 1-watt/1 meter. Voice coil impedance shall be 8Ω. Low frequency voice coil diameter shall be 1"

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(25mm) and operate in a magnet field of at least 10,600 gauss. The maximum depth of the speaker shall not exceed 2-7/8" (73mm).

- 2) The amplifier/control board shall receive announcements and messages using dynamically routed data on a standard Ethernet network. It shall include a single-channel class D topology amplifier with primary and secondary outputs capable of producing 25-watts RMS when using an IEEE 802.3at compatible PoE+ switch or 24VDC local power supply. Interconnect shall be via female RJ-45 connector mounted to the PCB.

The amplifier/control board shall include two (2) logic inputs, one (1) relay output, one (1) auxiliary balanced line level audio input and one (1) balanced line level audio output. The auxiliary line level input shall include an auto mute function that is activated when a broadcast is sensed from the control application.

The amplifier/control board shall include a Graphical User Interface (GUI) for SIP configuration. The SIP implementation shall support standards G.711, G.722 and RTP protocols. The GUI shall configure and manage logic inputs, relay outputs, and auxiliary audio input.

- 3) The unit shall incorporate an integrated microphone to allow full duplex talkback communication functionality based upon chosen software platform.
- 4) All control functionality shall be determined via software. It shall be compatible with Singlewire's InformaCast® software platforms and SIP standalone operation. The PoE+ Indoor 1' x 2' suspended ceiling mount IP endpoint audio system overall dimensions shall be 11.94" (303mm) x 23.67" (601mm) x 5.06" (128mm). Finish shall be neutral white electrostatic powder coat micro perforated grille.

c. Manufacturer: AtlasIED IP-12SYSM or approved equal.

5. Hard-lid Ceiling or Wall Mounted IP Endpoint with Speaker and Microphone:

- a. Indoor wall/ceiling mount IP endpoint with speaker and microphone. IP endpoint audio system shall mount flush in gypsum ceiling or either surface or flush mount on walls with an enclosure.
- b. The PoE+ indoor IP endpoint audio system shall include factory assembled speaker, IP addressable PCB amplifier/control, plastic baffle, and integrated microphone.

- 1) The speaker shall be an 8" coaxial driver with low-frequency reproducer cone that shall be a full 8" (203mm) in diameter and the high frequency reproducer cone that shall be 3" (76mm) in diameter. The woofer shall have a 10oz. (260g) ceramic magnet and the tweeter shall have a 2.35oz. (67g) ceramic magnet. The two reproducer sections shall be coupled through a built-in crossover network.

The crossover frequency shall be factory configured at 2800Hz. The speaker dispersion shall be 105° and frequency response range shall be 70Hz – 15.5kHz, (±5dB). Sensitivity shall be 98dB at 1-watt/1 meter. Voice coil impedance shall be 8Ω. Low frequency voice coil diameter shall be 1" (25mm) and operate in a magnet field of at least 10,600 gauss. The maximum depth of the speaker shall not exceed 2-7/8" (73mm).

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- 2) The amplifier/control board shall receive announcements and messages using dynamically routed data on a standard Ethernet network. It shall include a single-channel class D topology amplifier with primary and secondary outputs capable of producing 25-watts RMS when using an IEEE 802.3at compatible PoE+ switch or 24VDC local power supply. Interconnect shall be via female RJ-45 connector mounted to the PCB.

The amplifier/control board shall include two (2) logic inputs, one (1) relay output, one (1) auxiliary balanced line level audio input and one (1) balanced line level audio output. The auxiliary line level input shall include an auto mute function that is activated when a broadcast is sensed from the control application.

The amplifier/control board shall include a Graphical User Interface (GUI) for SIP configuration. The SIP implementation shall support standards G.711, G.722 and RTP protocols. The GUI shall configure and manage logic inputs, relay outputs, and auxiliary audio input.
- 3) The unit shall incorporate an integrated microphone to allow full duplex talkback communication functionality based upon chosen software platform. All control functionality shall be determined via software. It shall be compatible with Singlewire's InformaCast® software platforms and SIP standalone operation. The PoE+ indoor IP endpoint audio system overall dimensions shall be 14.37" (365mm) x 12.87" (327mm) x 3.42" (86.99mm). Finish shall be neutral white electrostatic powder coat micro perforated grille with plastic trim ring.
 - c. Manufacturer: AtlasIED IP-SM or approved equal.
 - d. Optional Mounting Hardware Shall Include:
 - 1) Flush Mount Enclosure: AtlasIED IP-FEST-S
 - 2) Surface Mount Enclosure: AtlasIED IP-SEST-SD
 - 3) Angled Wall Mount Enclosure: AtlasIED IP-SEA-SD
 - 4) Tile Bridge: IP-STB
 - 5) Tile Bridge with Enclosure: IP-STBE
6. Hard-lid Ceiling or Wall Mounted IP Endpoint with Speaker, Microphone and Analog Transformer & Switch:
 - a. Indoor wall or ceiling mount IP endpoint with speaker, microphone, and analog transformer with switch. IP endpoint audio system shall mount flush in gypsum ceiling or either surface or flush mount on walls with an enclosure.
 - b. The PoE+ indoor IP endpoint audio system shall include factory assembled speaker, 25V/70.7V transformer & switch, IP addressable PCB amplifier/control, plastic baffle, and integrated microphone.
 - 1) The speaker shall be an 8" coaxial driver with low-frequency reproducer cone that shall be a full 8" (203mm) in diameter and the high frequency reproducer cone that shall be 3" (76mm) in diameter. The woofer shall have a 10oz. (260g) ceramic magnet and the tweeter shall have a 2.35oz. (67g) ceramic magnet. The two reproducer sections shall be coupled through a built-in crossover network.

The crossover frequency shall be factory configured at 2800Hz. The speaker dispersion shall be 105° and frequency response range shall be 70Hz – 15.5kHz, (±5dB). Sensitivity shall be 98dB at 1-watt/1 meter. Voice coil

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impedance shall be 8Ω. Low frequency voice coil diameter shall be 1" (25mm) and operate in a magnet field of at least 10,600 gauss. The maximum depth of the speaker shall not exceed 2-7/8" (73mm).

The unit shall incorporate an integrated interconnect for simultaneous 25V/70.7V analog headend and network notification appliance connectivity. Operating modes shall be selected by front mount switch to accommodate audio source selection during modernization phase.

- 2) The amplifier/control board shall receive announcements and messages using dynamically routed data on a standard Ethernet network. It shall include a single-channel class D topology amplifier with primary and secondary outputs capable of producing 25-watts RMS when using an IEEE 802.3at compatible PoE+ switch or 24VDC local power supply. Interconnect shall be via female RJ-45 connector mounted to the PCB.

The amplifier/control board shall include two (2) logic inputs, one (1) relay output, one (1) auxiliary balanced line level audio input and one (1) balanced line level audio output. The auxiliary line level input shall include an auto mute function that is activated when a broadcast is sensed from the control application.

The amplifier/control board shall include a Graphical User Interface (GUI) for SIP configuration. The SIP implementation shall support standards G.711, G.722 and RTP protocols. The GUI shall configure and manage logic inputs, relay outputs, and auxiliary audio input.

- 3) The unit shall incorporate an integrated microphone to allow full duplex talkback communication functionality based upon chosen software platform.
- 4) All control functionality shall be determined via software. It shall be compatible with Singlewire's InformaCast® software platforms and SIP standalone operation. The PoE+ indoor IP endpoint audio system overall dimensions shall be 14.37" (365mm) x 12.87" (327mm) x 3.42" (86.99mm). Finish shall be neutral white electrostatic powder coat micro perforated grille with plastic trim ring.

c. Manufacturer: AtlasIED IP-SM-72 or approved equal.

d. Optional Mounting Hardware Shall Include:

- 1) Flush Mount Enclosure: AtlasIED IP-FEST-S
- 2) Surface Mount Enclosure: AtlasIED IP-SEST-SD
- 3) Angled Wall Mount Enclosure: AtlasIED IP-SEA-SD
- 4) Tile Bridge: IP-STB
- 5) Tile Bridge with Enclosure: IP-STBE

7. Hard-lid Ceiling or Wall Mounted IP Endpoint with Speaker and Microphone:

- a. Indoor wall/ceiling mount IP endpoint with speaker and microphone. IP endpoint audio system shall mount flush in gypsum ceiling or either surface or flush mount on walls with an enclosure.

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- b. The PoE+ indoor IP endpoint audio system shall include factory assembled speaker, IP addressable PCB amplifier/control, metal baffle, and integrated microphone.
- 1) The speaker shall be an 8" coaxial driver with low-frequency reproducer cone that shall be a full 8" (203mm) in diameter and the high frequency reproducer cone that shall be 3" (76mm) in diameter. The woofer shall have a 10oz. (260g) ceramic magnet and the tweeter shall have a 2.35oz. (67g) ceramic magnet. The two reproducer sections shall be coupled through a built-in crossover network.
The crossover frequency shall be factory configured at 2800Hz. The speaker dispersion shall be 105° and frequency response range shall be 70Hz – 15.5kHz, (±5dB). Sensitivity shall be 98dB at 1-watt/1 meter. Voice coil impedance shall be 8Ω. Low frequency voice coil diameter shall be 1" (25mm) and operate in a magnet field of at least 10,600 gauss. The maximum depth of the speaker shall not exceed 2-7/8" (73mm).
 - 2) The amplifier/control board shall receive announcements and messages using dynamically routed data on a standard Ethernet network. It shall include a single-channel class D topology amplifier with primary and secondary outputs capable of producing 25-watts RMS when using an IEEE 802.3at compatible PoE+ switch or 24VDC local power supply. Interconnect shall be via female RJ-45 connector mounted to the PCB.
The amplifier/control board shall include two (2) logic inputs, one (1) relay output, one (1) auxiliary balanced line level audio input and one (1) balanced line level audio output. The auxiliary line level input shall include an auto mute function that is activated when a broadcast is sensed from the control application.
The amplifier/control board shall include a Graphical User Interface (GUI) for SIP configuration. The SIP implementation shall support standards G.711, G.722 and RTP protocols. The GUI shall configure and manage logic inputs, relay outputs, and auxiliary audio input.
 - 3) The unit shall incorporate an integrated microphone to allow full duplex talkback communication functionality based upon chosen software platform.
 - 4) All control functionality shall be determined via software. It shall be compatible with Singlewire's InformaCast® software platforms and SIP standalone operation. The PoE+ indoor IP endpoint audio system overall dimensions shall be 11.5" (292mm) x 11.5" (292mm) x 2.84" (72.14mm). Finish shall be neutral white electrostatic powder coat metal baffle.
- c. Manufacturer: AtlasIED IP-8SM or approved equal.
- d. Optional Mounting Hardware Shall Include:
- 1) Flush Mount Enclosure: AtlasIED IP-FEST-S
 - 2) Surface Mount Enclosure: AtlasIED IP-SEST-S
 - 3) Angled Wall Mount Enclosure: AtlasIED IP-SEA-S
 - 4) Tile Bridge: IP-STB
 - 5) Tile Bridge with Enclosure: IP-STBE
8. Exterior Wall Mounted IP Endpoint with High- Output Horn:
- a. Vandal proof, weather resistant, wall mount IP endpoint with high- output horn.

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- b. The PoE+ vandal-proof outdoor IP endpoint audio system shall include factory assembled horn, IP addressable PCB amplifier/control, and cast aluminum alloy baffle.
- 1) The horn shall be a double re-entrant type with a 3.8" high-output compression driver mounted within a weather-resistant housing. The impedance shall be 8Ω with a voice coil diameter of 1.25" (31.75mm). Frequency response shall be 600-14,000 Hz (nominal), 700-5500 Hz (± 5 dB). Sound pressure level shall be 114dB (15W/1m), 104dB (1W/1m), and max peak output at 1W/1m shall be 120dB SPL. Sound dispersion angle shall be 95° . The Horn dimensions shall be diameter 5-5/8" x D 3-7/16" x diameter flange 6-15/16".
 - 2) The amplifier/control board shall receive announcements and messages using dynamically routed data on a standard Ethernet network. It shall include a single-channel class D topology amplifier with primary and secondary outputs capable of producing 25-watts RMS when using an IEEE 802.3at compatible PoE+ switch or 24VDC local power supply. Interconnect shall be via female RJ-45 connector mounted to the PCB.

The amplifier/control board shall include two (2) logic inputs, one (1) relay output, one (1) auxiliary balanced line level audio input and one (1) balanced line level audio output. The auxiliary line level input shall include an auto mute function that is activated when a broadcast is sensed from the control application.

The amplifier/control board shall include a Graphical User Interface (GUI) for SIP configuration. The SIP implementation shall support standards G.711, G.722 and RTP protocols. The GUI shall configure and manage logic inputs, relay outputs, and auxiliary audio input.
 - 3) All control functionality shall be determined via software. It shall be compatible with Singlewire's InformaCast[®] software platforms and SIP standalone operation. The PoE+ outdoor IP endpoint audio system overall dimensions shall be 10.75" (273mm) x 10.75" (273mm) x 4.49" (114mm). The vandal-proof grill shall be cast from self-aging aluminum alloy with a tensile strength of 44,000 P.S.I. with a textured white epoxy finish and fastened to enclosure with supplied security screws.
- c. Manufacturer: AtlasIED IP-HVP or approved equal.
- d. Optional Mounting Hardware Shall Include:
- 1) Flush Mount Enclosure: AtlasIED IP-FEST-IH
 - 2) Surface Mount Enclosure: AtlasIED IP-SEST-IH

H. IP – TO – ANALOG GATEWAY REQUIRMENTS

1. IP to Analog Gateway with Integrated Amplifier:

a. The PoE+ zone controller shall be an IP-to-Analog network gateway with balanced line level outputs allow for connection to analog power amplifiers or 3rd party audio systems. The unit shall incorporate an 8Ω, 70.7V amplified output to drive analog speaker zones. It shall include two (2) general purpose inputs and one (1) relay output. The unit shall incorporate a line level and microphone input.

1) The amplifier/control board shall receive announcements and messages using dynamically routed data on a standard Ethernet network. It shall include a single-channel class D topology amplifier with primary and secondary outputs capable of producing 25-watts RMS when using an IEEE 802.3at compatible PoE+ switch or 24VDC local power supply. Interconnect shall be via female RJ-45 connector mounted to the PCB.

The amplifier/control board shall include two (2) general purpose inputs, one (1) relay output, one (1) auxiliary unbalanced line level audio input and one (1) balanced mic level input. The auxiliary line level input shall include an auto mute function that is activated when a broadcast is sensed from the control application.

The amplifier/control board shall include a Graphical User Interface (GUI) for SIP configuration. The SIP implementation shall support standards G.711, G.722 and RTP protocols. The GUI shall configure and manage logic inputs, relay outputs, and auxiliary audio input.

2) All control functionality shall be determined via software. It shall be compatible with Singlewire's InformaCast[®] software platforms and SIP standalone operation. The IP-to-Analog network gateway overall dimensions shall be 1.72" (44mm) x 8.5" (216mm) x 8.85" (224.8mm). Finish shall be neutral black electrostatic powder coat.

b. Manufacturer: AtlasIED IP-ZCM or approved equal.

c. Optional Single or Dual Zone with Mounting Hardware Shall Include:

1) Single Zone with Rack Mount Kit: AtlasIED IP-ZCM1RMK

2) Two Zone with Rack Mount Kit: AtlasIED IP-ZCM2RMK

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I. IP ADMINISTRATIVE COMMUNICATION CONSOLE / IP MASTER PAGING STATION / IP ADMINISTRATIVE DISPLAY PHONE REQUIREMENTS

1. IP Console with Gooseneck Mic and Handset: (Provide two in General Office)

a. The PoE Voice over IP (VOIP) communication Administrative Control Console (subsequently referred to as Console) shall be a programmable 10.1" diagonal capacitive touch technology color screen interface with a 1280x480 resolution.

1) The Console shall provide 112 programmable virtual Direct Station Selection (DSS) keys and allow for a custom color and naming scheme for each key.

Each of the Console's programmable 112 virtual DSS keys shall be capable of matching Singlewire's InformaCast® Fusion Command Center button architecture.

The Console's 10.1" diagonal capacitive touch technology color screen interface shall allow the operator to launch Singlewire's InformaCast® Fusion programed color-coded critical alerts, manual bells, pre-recorded, scheduled events, and two-way communication.

When there are no active calls, the display shall show the Console name and dial number. If a time server is connected to the network, the display shall also show the time and date.

2) The Console shall have a gooseneck microphone and built-in speaker that supports hands-free wideband audio (HD Audio) for maximum intelligibility, as well as a corded handset.

The Console's gooseneck microphone, built-in speaker and graphical user interface shall allow the operator to select any or all zones for live day-to-day announcements or a single zone for two-way communication. The Console shall also allow the operator to select a single zone and use the handset for private intercom sessions.

3) The Console shall be equipped with an internal Gigabit Ethernet switch and include 1 RJ45 port for IEEE 802.3 10/100/1000 Base-T Ethernet network connection and 1 RJ45 port for IEEE 802.3 10/100/1000 Base-T Ethernet co-located PC connection. The Console shall allow connectivity to a 2.4GHz (802.11 b/g/n) and 5GHz (802.11 a/n/ac) Wi-Fi access-point infrastructure as an alternative to wired Ethernet.

The Console shall be PoE IEEE Power over Ethernet class 4 and compatible with both IEEE 802.3af and 802.3at switch blades and support Link Layer Discovery Protocol - Power over Ethernet (LLDP-PoE).

4) The Console shall support telephony integration and be compatible with most major call platforms.

The Console shall be capable of registering as a SIP phone directly to a SIP Server, VoIP Communications Manager, or call service including on-premise and hosted infrastructure call platforms and supports 20 SIP lines for making calls to external and internal phones, two-way intercom, monitoring, and broadcasting.

The Console SIP implementation shall support standards G.711 a-law and u-law, G.722 and SIP2.0 over UDP, TCP, TLS, and RTP protocols

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- 5) The Console shall provide Bluetooth 5.0 Enhanced Data Rate (EDR) Class 1 technology support for Hands-Free Profile (HFP) untethered headset connections and voice communications.
 - 6) The AtlasIED IP-CONSOLE-GH shall natively register with Singlewire's InformaCast® notification application or register as a SIP phone with AtlasIED's GCK to serve as the systems network Administrative Display Phone or Master Paging Station.
 - 7) The Console shall be Molded of Dark Grey Polycarbonate Acrylonitrile Butadiene Styrene (ABS) Textured Plastic. It shall offer the ability to mount flat on top of a surface, or free-standing on a desktop using included adjustable stand with 40 and 50 degree angles. The overall dimensions shall be 12.71" x 11.85" x 2.80" (323 x 301 x 71mm).
- b. Manufacturer: AtlasIED IP-CONSOLE-GH.

J. OTHER EQUIPMENT REQUIREMENTS

1. Provide other equipment as necessary to connect non-IP speakers to create a single system.
 - a. Analog Power Amplifier: AtlasIED PA60G
 - b. Analog Speakers: AtlasIED SD72W

K. SPEAKER CABLE AND JACKS:

1. Analog Speaker Cable: Plenum rated, 18AWG, 70V speaker cable.
2. UTP Speaker Cable: Cable shall match horizontal UTP cable called out in Division 27 Section "Work Station Cable".
3. Termination Jack: Surface mounted jack shall match 'biscuit' jack and modular connector called out in Division 27 Section "Work Station Cable".
4. Patch Cable: Cable assembly shall match the patch cord called out in Division 27 Section "Main Distribution Facility".

L. INSTALLATION

1. General
 - a. Execute work in accordance with state and local codes, regulations, and ordinances.
 - b. Install work neatly, plumb, and square and in a manner consistent with standard industry practice. Coordinate on-site installation with the Owner and carefully protect work from dust, paint and moisture as dictated by Owner requirements. The Contractor will be fully responsible for protection of his work during the construction phase up until final acceptance by the Owner.
 - c. Install equipment according to manufacturer's recommendations. Provide any hardware, adaptors, brackets, rack mount kits or other accessories recommended by manufacturer for correct assembly and installation.
 - 1) Secure equipment firmly in place, including speakers, shelves, cables, etc.
 - 2) All supports, mounts, fasteners, attachments, and attachment points shall support their loads with a safety factor of at least 5:1 for static loads.
 - 3) Do not impose the weight of equipment or fixtures on supports provided for other systems.
 - 4) Any suspended equipment or associated hardware must be certified by the manufacturer for overhead suspension.

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- 5) The Contractor is responsible for means and methods in the design, fabrication, installation and certification of any supports, mounts, shelves, fasteners and attachments.
 - d. Locate overhead ceiling-mounted speakers as shown on drawings, with minor changes not to exceed 12" in any direction for hard ceiling or one (1) tile space for drop ceiling spaces.
 - 1) Mount and adjust as needed to securely support speaker assembly.
 - 2) Speaker back boxes shall be completely filled with fiberglass insulation or as recommended by the manufacturer.
 - 3) Seal cone speakers to their enclosures to prevent air passing from one side of the speaker to the other.
 - e. Finishes for any exposed work such as plates, shelves, panels, speakers, etc. shall be approved by the Owner.
 - f. Coordinate cover plates with field conditions. Size and install cover plates as necessary to hide joints between back boxes and surrounding wall. Where cover plates are not fitted with connectors, provide grommeted holes in size and quantity required. Do not allow cable to leave or enter boxes without cover plates installed.
 - g. Mount all equipment in telecommunications rooms on the T-series drawings. Coordinate equipment installation with other trades and other equipment in rooms.
2. Cabling Practice
- a. Execute all cabling in strict adherence to the National Electrical Code, applicable local building codes and standard industry practices.
 - b. Do not splice cabling anywhere along the entire length of the run.
 - c. Make sure cables are fully insulated from each other and from the raceway for the entire length of the run.
 - d. Do not pull cable through any enclosure where a change of raceway alignment or direction occurs. Do not bend cables to less than radius recommended by manufacturer.
 - e. Replace the entire length of the run of any cable that is damaged or abraded during installation. There are no acceptable methods of repairing damaged or abraded cabling.
 - f. Use cable pulling lubricants and pulling tensions as recommended by the manufacturer.
 - g. Use grommets around cut-outs and knockouts where conduit or chase nipples are not installed.
 - h. Do not use tape-based or glue-based cable anchors.
 - i. Provide ample service loops at harness breakouts and at plates, panels and equipment. Loops should be sufficient to allow removal of plates, panels and equipment for service and inspection.
 - j. Utilize permanent strain relief for any cable with an outside diameter of 1-inch or greater.

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3. Dress non-UTP cables as follows:
 - a. Cover the end of the overall jacket with a 1-inch (minimum) length of transparent heat-shrink tubing. Cut unused insulated conductors 2-inches (minimum) past the heat-shrink, fold back over jacket and secure with cable-tie. Cut unused shield/drain wires 2-inches (minimum) past the heat-shrink.
 - b. Cover shield/drain wires with heat-shrink tubing extending back to the overall jacket. Extend tubing 1/4-inch past the end of unused cables, fold back over jacket and secure with cable-tie.
 - c. For each solder-type connection, cover the bare wire and solder connection with heat-shrink tubing.
4. Labeling
 - a. Clearly, consistently, logically, and permanently mark cables, connectors, and electronics and other equipment.
 - b. For backboard/shelf-mounted equipment, use engraved Lamacoid labels with white 1/8" (minimum) high lettering on black background.
 - c. Where multiple pieces of equipment reside in the same group, clearly and logically label each indicating to which room, channel, receptacle location, etc. they correspond.
 - d. Permanently label cables at each end, including intra-room connections. Labels shall be covered by the same, transparent heat-shrink tubing covering the end of the overall jacket. Alternatively, computer generated labels of the type which include a clear protective wrap may be used.
 - e. Contractor's name shall appear no more than once within a given equipment room. The Contractor's name shall not appear on wall plates, emergency phones or speakers.
5. Test Equipment
 - a. The Contractor shall furnish all test and computer equipment required for all testing and adjustments as well as any site visits by the Consultant.
6. Test and Measurements:
 - a. Required audio system tests and measurements:
 - 1) Impedance measurements of all speaker lines at 50hz, 500Hz, and 5KHz with speakers installed and operating in their specified configuration.
 - 2) Polarity testing of all speaker lines.
 - 3) Overall hum & noise testing of each audio reinforcement system. Perform sweep frequency testing of speakers to check for rattles, buzzing, and/or functional problems. Sweeps shall not exceed the manufacturers rated bandwidth or one-quarter rated power for the device under test.
 - 4) Verification testing to ensure that systems are free from spurious oscillation, Radio Frequency Interference (RFI) or Electromagnetic Interference (EMI).
 - 5) Tests for audible clicks or pops caused by normal operation.
7. Instruction
 - a. Contractor shall provide a qualified individual to provide a minimum of eight (8) hours of instruction to the Owner regarding the design, features and proper operation of the systems.

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8. Final Cleaning
 - a. At completion of work, remove all rubbish, tools, scaffolding, and surplus materials from the site. Site shall meet Owner's requirements for cleanliness.
 - b. At completion of work, thoroughly vacuum floors and flat surfaces such as shelves, counters and windowsills in the areas affected by the work.
 - c. Coordinate removal or storage of packing materials with the Owner. Contractor shall remove all packing materials from the site unless otherwise directed.
 - d. In the event the Contractor fails to perform final cleaning, Owner may do so and charge any associated costs back to the Contractor.
9. Project Close-Out
 - a. Punch list:
 - 1) Once notice of Substantial Completion is received, the Consultant shall visit the site to review the work, and shall prepare a punch list of items determined to be incomplete, deficient or otherwise not in compliance with the intent of the Contract Documents.
 - a) During the review of the work, if the Consultant finds that the known exceptions/deviations list provided by the Contractor was insufficiently thorough, that the work is not substantially complete, or that deficiencies in the work are excessive, the Consultant will cease review and inform the Contractor that the work is not substantially complete. The Contractor shall be responsible for fees incurred by the Consultant for this partial review.
 - 2) The Contractor shall perform corrective action for each item noted in the punch list. When complete, the Contractor shall submit the original punch list with each item initialed attesting to the fact that the item was corrected.
 - a) If necessary, the Consultant will perform a subsequent review after receipt of the Contractor initialed punch list.
 - 3) Should additional reviews beyond the original punch list review be required of the Consultant due to the Contractor's failure to correct all incomplete, deficient, or non-compliant work, the Contractor shall be responsible for fees incurred by the Consultant for the additional reviews.
 - 4) Provide Operating & Maintenance (O&M) Manuals per the requirements of Part 1 – General: Operating & Maintenance (O&M) Manuals.
10. FOLLOW UP
 - a. After the system(s) and facility have been placed in operation and are in use by the Owner, provide technical assistance for the first two weeks of operation on a standby basis for troubleshooting, education, and problem solving.

M. SUBMITTALS:

1. Product data for each component.

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2. Shop Drawings: Prior to proceeding with the work: Provide detailed equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, and location of each field connection, and a complete schedule of all equipment and materials with associated manufacturers cuts sheets which are to be used.
 - a. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Identify terminals to facilitate installation, operation, and maintenance. Include a single-line diagram showing cabling interconnection of components and levels throughout system and impedances.
 - b. Artwork drawings and lists indicating proposed nameplate nomenclature and arrangements for control panels and plug panels prior to fabrication reflecting equipment used.
 - c. Each drawing shall have a descriptive title and all sub-parts of each drawing shall be labeled. All drawings shall have the name and locations of the project, Systems Contractor's name in the title block.
 - d. Details and descriptions of any other aspect of the system, which must differ from the contract documents due to field conditions or equipment, furnished.
3. FCC Approval: The system shall be approved for direct interconnection to the telephone utility under Part 68 of FCC rules and regulations. Systems, which are not FCC approved or utilize an intermediary device for connection, will not be considered. Provide the FCC registration number of the system being proposed as part of the submittal process.
4. Product Certificates: Signed by manufacturers of equipment certifying that products furnished comply with specified requirements.
5. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements at time of bid.
6. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements.
7. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Include record of final matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.
8. Maintenance Data: For equipment to be included in maintenance manuals specified in Division 01.
 - a. Record of Owners equipment-programming option decisions.
 - b. All instructions necessary for proper operation and manufacturer's instructions.
 - c. "Proof of Performance" information.
 - d. Manufacturer's maintenance information.
 - e. Copies of non-proprietary computer programs and system set up disks documenting all programmable features of the installed system.
9. Record Drawings: Prior to final acceptance, provide three (3) complete sets of drawings indicating all cable numbers and construction details in accordance with the actual system installation. Revise all shop drawings to represent actual installation conditions. These Record Drawings will be used during "Final Acceptance Testing".

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10. System Training: Submit the following information describing the training programs and system trainers as outlined in paragraph 1.6 of this specification and in accordance with Division 01 specifications.
 - a. Include with the submittal a preliminary staff development training program in outline form for review and approval by the owner's representative.
 - b. Include with the submittal a current copy of the trainer's certification from the manufacturer that certifies and identifies the trainer(s) who are eligible to provide training and support for the project.
 - c. Include with the submittal a current copy of trainer's need's assessment form which will be reviewed with the owner's designated representative for the system's preliminary system programming and configuration.
 - d. Include with the submittal copies of all documentation used to identify for the owner those participants attending and completing the training programs.
11. A copy of the manufacturer's standard statement of warranty proving all equipment provided for the school communications network is covered with the required five-year warranty shall be included with the project submittal. This statement of warranty shall be provided on the manufacturer's stationary.

N. EXTRA MATERIALS:

1. Furnish extra materials and match product installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - a. Two-Way Ceiling Speakers: Four
 - b. One-Way Ceiling Speakers: Four
 - c. Horn-Type Loud Speakers: Two
 - d. Ip audio

2.12 MISCELLANEOUS CABLING SYSTEM

- A. Provide and terminate all speaker, clock, microphone, antenna, cabling per manufacturer's recommendations for a completely operational system as specified.
- B. Sound/Speaker cabling shall be home run and looped directly to applicable headend termination board, as specified. All cable runs shall be free from in-line splices. Insulate all cable shields (at field device end) from field grounds by cutting and taping shields.
 1. Classroom speakers, office speakers, conference room speakers, work room speakers, exterior horn speakers and others areas that have only one (1) public address speaker shall each be individually home run, without splices, back to their respective sound or master clock headend. Provide 22 AWG solid shielded speaker cables.
 2. Hallways and other areas that have multiple speakers, may have a maximum of eight (8) speakers per speaker loop home run, without splices, back to their respective sound headend. Provide 18 AWG stranded speaker cables.
 3. Horn Speakers areas that have multiple speakers, may have a maximum of four (4) speakers per speaker loop home run, without splices, back to their respective sound headend. Provide 18 AWG stranded speaker cables.

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- C. Roof mounted Antenna, provide a RG-6U coax cable between the roof mounted antenna location and the AM/FM tuner location.
 - 1. Cables shall be left coiled in backbox with minimum of 48 in. slack.

PART 3 - EXECUTION

3.1 GENERAL

- A. Do not install equipment and materials which have not been reviewed by the Architect. Equipment and materials which are installed without the Architect's review or without complying to comments issued with the review shall be removed from the project when so instructed by the Architect. No payment will be made for unapproved or removal if it is ordered removed. The Installer shall be responsible for any ancillary costs incurred because of its removal and the installation of the correct equipment and materials.
- B. Obtain detailed information on installation requirements from the manufacturers of all equipment to be furnished, installed or provided. At the start of construction, check all Contract Documents, including all Drawings and all sections of the specifications for equipment requiring electrical connections and service and verify electrical characteristics of equipment prior to roughing.
- C. Equipment and systems shall not be installed without first coordinating the location and installation of equipment and systems with the General Contractor and all other Trades.
- D. Any and all material installed or work performed in violation of above requirements shall be re-adjusted and corrected by the Installer without charge.
- E. Refer to all Drawings associated with the project, prior to the installation or roughing-in of the electrical outlets, conduit and equipment, to determine the exact location of all outlets.
- F. After installation, equipment shall be protected to prevent damage during the construction period. Openings in conduits and boxes shall be closed to prevent the entrance of foreign materials.
- G. Home runs indicated are not to be combined or reduced without written consent from the Architect.
- H. All connections to equipment shall be made in accordance with the approved submittal and setting drawings.
- I. Delivery, Storage and Handling:
 - 1. Deliver, store, protect and handle products in accordance with recommended practices listed in Manufacturer's Installation and Maintenance Manuals.
 - 2. Deliver equipment in individual shipping splits for ease of handling, mount on shipping skids and wrap for protection.
 - 3. Inspect and report concealed damage to carrier within specified time.
 - 4. Store in a clean, dry space. Maintain factory protection or cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. Heat enclosures to prevent condensation. Meet the requirements and recommendations of NFPA 70B and the Manufacturer. Location shall be protected to prevent moisture from entering enclosures and material.

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5. Handle in accordance with NEMA and the Manufacturer's recommendations and instructions to avoid damaging equipment, installed devices and finish.
6. The equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the Manufacturer shall be required to brace the equipment suitably to insure that the tilting does not impair the functional integrity of the equipment.

J. Site Observation:

1. Site observation visits will be performed randomly during the project by the Architect. Reports will be generated noting observations. Deficiencies noted on the site visit reports shall be corrected. All work shall comply with the Contract Documents, applicable Codes, regulations and local Authorities whether or not a particular deficiency has been noted in a site visit report.
2. Be responsible to notify the Architect ten working days prior to closing in work behind walls, raised access floors, ceilings, so that installed work can be observed prior to being concealed.
3. Areas shall stay accessible until deficiencies are corrected and accepted. Notify the Architect when all deficiencies are corrected. Return reports with items indicated as corrected prior to re-observation by the Architect.

K. Project Open House:

1. If the Owner elects to have an open house at the end of the project, provide assistance to the Owner. Cooperate and provide manpower to operate and demonstrate systems during the open house as requested by the Owner.

3.2 EQUIPMENT RACKS, CABINETS AND BRACKETS

- A. Securely mount equipment racks, cabinets and wall mounted relay brackets to the building structure. Proper supports such as 3/8 in. lag screws and expansion anchors shall be used. Proper quantity of supports shall be utilized. Drywall screws and other types of supports not specifically approved to support equipment are specifically prohibited. Submit mounting supports for approval before installation.
- B. Position racks, cabinets, and wall mounted relay brackets in order to have minimum 3 foot clearance for easy access. Equipment racks, cabinets and relay brackets mounted on or against walls shall have 3 foot clearance in front of deepest component. Free standing equipment racks and cabinets shall have 3 foot clearance in front and rear of deepest components. Provide 3 foot clearance between free standing equipment racks or cabinets and any other obstruction to allow access from front to rear of rack or cabinet for maintenance.
- C. The Electrical Contractor shall provide cable tray over each rack and cabinet to facilitate a neat and orderly installation of cables and to secure the top of the racks to the structure. Cables shall drop straight down to equipment racks. Cable trays shall be secured at both ends to the structure and connected together for a complete contiguous installation. Utilize proper supports to support the cable tray to the building structure as well as the equipment rack and cabinet. Submit mounting supports for approval before installation.

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- D. Cable Management: All cables shall enter the wiring closet to within the equipment racks and/or brackets. Secure the bundle(s) to the rack strain relief and wire management behind the patch panels and cross connect block panels. Install horizontal and side-mounted vertical cable management panels and brackets for routing and management of patch cables. Maintain EIA/TIA and BICSI standards on bundling, supporting and bend radii.
- E. Once the cabling system has been installed and terminated, install all active components and surge protected power strips into the racks, cabinets and wall mounted relay brackets.
- F. Surge Protected Outlet Strips: Mount UPS and surge protected outlet strips per Manufacturer's directions. Refer to details on the Drawings for mounting location.

3.3 TERMINATIONS

- A. All copper conductors of every cable shall be completely terminated at both ends.

3.4 CABLE PATHWAYS

- A. Install cables in pathways provided by the Electrical Subcontractor or required under execution part of this section.
- B. Provide all equipment and cabling for a complete installed operating system. In general, pathways, outlet boxes and grounding are provided by the Electrical Subcontractor.
- C. All pathways provided under this section shall comply with fill capacities as per Code, EIA/TIA 569 and BICSI.
- D. Cable bending radius shall not be less than minimum required by EIA/TIA and BICSI.
- E. Cabling installed concealed shall be supported from the building structure (e.g. cable trays, J-Hooks).
- F. Cables shall be installed no closer than 12 inches (305mm) to electrical equipment and wiring. When cables are required to cross power wiring, they shall only do so perpendicular to the power wiring. Telecommunications cabling and power wiring shall only cross each other at minimal number of times and only due to building design limitations.
- G. Clearances: Clearances between cabling and other building systems listed by EIA/TIA 569 and BICSI shall be maintained throughout the building.
- H. All cables shall be installed in a neat and workman-like manner. Cables shall be installed parallel and perpendicular to building elements.
- I. Provide expansion fittings and adequate cable slack at all building expansion joints.
- J. Fire/smoke seal all conduits, raceways, sleeves, and slots where cables pass from one location to another.

3.5 SEALING OF PENETRATIONS AND OPENINGS

- A. Environmental Seals
 - 1. Provide seals on raceways exposed to widely different temperatures, as in refrigerated or cold storage areas. Install seal to prevent circulation of air from warmer to colder sections through the raceway.
 - 2. Provide seals under device plates for outlets on walls between conditioned and non-conditioned spaces.
 - 3. Provide outlet plate gasket seals at all work area outlets on interior and exterior walls.

3.6 SEISMIC SUPPORTS, SUPPLEMENTARY STEEL AND CHANNELS

- A. Provide all supports, supplementary steel and channels required for the proper Seismic installation, mounting and support of all work installed under this section.
- B. All supports, supplementary steel and channels shall be furnished, installed and secured with all fittings, support rods and appurtenances required for a complete support or mounting system.
- C. Supplementary steel and channels shall be firmly connected to the building construction in a manner approved by the Architect prior to the installation of same. Submit to the Architect, via the General Contractor, the locations proposed for using supplementary steel and channels for the support of equipment, fixtures and raceways. The submittal shall indicate the mounting methods, size and details of the supports, channels and steel; it shall indicate also that weight which the supports, channels and supplementary steel is to carry.
- D. The type and size of the supporting channels and supplementary steel shall be of sufficient strength and size for seismic restraint and to allow only a minimum deflection in conformance with the channel and supplementary steel manufacturer's requirements for loading.
- E. All supplementary steel and channels shall be installed in a neat and workmanlike manner parallel to the walls, floor and ceiling construction. All turns shall be made with 90 degrees and 45 degrees fittings to suit the construction and installation conditions.
- F. All supplementary steel, channels, supports, and fittings, shall be Underwriters' Laboratories, Incorporated, approved, be galvanized steel and be manufactured by Steel City, Unistrut, Power-Strut, T. J. Cope, Chalfant or approved equal.
- G. Provide supports to meet the required Seismic rating as indicated under "Part One" of this Specification.
- H. Provide beam clamps with set screws (C-clamp type).
- I. Work under this section shall be held in place by seismic rated methods.
- J. Supporting from the roof decking will not be acceptable.
- K. Provide expansion anchors on masonry units or brick work. Power actuated supports will not be accepted.
- L. Provide stainless steel or corrosion resistant supports in corrosive areas on wet or damp areas.

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- M. Support work from the building structure, independent of suspended ceilings, roof deck or other trades work. Where duct work, pipes, pipe racks, type of building construction materials or structural framing members provide obstruction or difficult support means, hanger rods shall be used in association with horizontal sections of steel support channels, in an approved manner.
- N. All work shall be installed in a rigid and satisfactory manner and shall be supported by bar hangers in frame construction or shall be fastened directly with wood screws on wood, bolts with expansion shields on concrete or brick toggle bolts on hollow masonry units, and machine screws or welded threaded studs on metal. Threaded studs of the proper type and holding capacity driven in by a power charge and provided with lock washers and nuts are acceptable for mounting of equipment on solid concrete walls or slabs.
- O. Obtain written permission from the General Contractor allowing use of power activated charges. Use only properly trained and licensed operators.
- P. Do not use power charge driven supports for any work that is to be hung from a horizontal surface without written permission from the Architect.
- Q. Preset inserts of the proper type and holding capacity shall be used in overhead slab construction wherever possible.
- R. Provide lateral supports for work to prevent excessive movement during a seismic event using rods, braces or galvanized or stainless steel cables.
- S. Pendants, supports or hanging rods longer than 12 inches (300mm) shall be laterally braced.
- T. Where installed in damp, wet and areas requiring wash down, all surface mounted panels, boxes, junction boxes, and conduit shall be supported by spacers to provide a clearance between wall and equipment.

3.7 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 260000 "Identification for Electrical Systems."
 - 1. Confirm labeling scheme with the Owner prior to final labeling.
 - 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Using cable management system software specified in Part 2, develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions.
- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

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- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.
- E. Cable and Wire Identification:
1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
 4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
 - b. Label each unit and field within distribution racks and frames.
 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- F. Provide preprinted or computer-printed type labels with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:
1. Cable Labels: Use flexible vinyl or polyester that flexes as cables are bent.

3.8 CABLE SUPPORTS

- A. Provide strain relief hardware for backbone cables at each floor level as they pass from one floor to the next.
- B. Provide hook and loop (Velcro) cable wraps at all panels, equipment racks and cabinets. Cable ties are specifically prohibited.
- C. Cable ties for horizontal cables shall be secured with minimum required compression in order to secure the cables properly without impeding the signal transmission rating (geometry) of the cable. Hook and loop (Velcro) cable wraps may be used in lieu of cable ties for copper cables only. Cable-ties are specifically prohibited for fiber optic cables.
- D. When pathways are not provided or specified, provide J-Hook supports from the building structure for cable runs to the cable drop location. Maximum distance between supports shall be five feet depending on the structural elements of the building. Maximum number of cables per support shall be thirty. Provide additional supports when cable quantities exceed thirty and to maintain required bending radius of cables. Cables installed exposed or in areas subject to abuse (below 10 feet (3m) above finished floor) or in accessible areas shall be installed in conduit.

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- E. All cables shall be supported directly from building structure. Under no circumstance shall cable be installed using cross bracing, plumbing/sprinkler pipes, ceiling systems or any other system that is not a specifically approved method to independently support cables. Cables shall not be allowed to rest on ceiling tiles, duct work, and piping. Supports shall be provided in order for cables to avoid contact with any other building system. Bundle cables in groups by Room.

3.9 CABLE PROTECTION

- A. Provide bushings in all metal studs and the like where cables will pass through. Bushings shall be of two piece construction with one piece inserted through the opening and the second piece locking it into place. Single piece bushings with locking tabs or friction fit are specifically prohibited.
- B. Cables to be installed in existing enclosed open bays or furred spaces where conduit stubs are not provided shall be protected from chafing or any damage. The Installer shall verify that the warranty shall not be violated before installing any cabling in these locations.
- C. Provide cutting, coring, sleeves and bushings and seal at all penetrations.
- D. Fiber optic backbone cables shall be installed in inner duct.
- E. Cables damaged during installation shall not be repaired. They shall be completely replaced with new cable.

3.10 INSTALLATION

- A. All cabling shall be installed in conduit where indicated on plans, or shall be installed open using other methods, approved by architect, such as J-Hooks.
 - 1. Install wiring, per manufacturers recommendations. Use UL listed plenum cable in environmental air spaces including plenum ceilings.
- B. All wiring shall be new and concealed in pipe where exposed.
- C. All conduits and raceways shall have pull strings remaining after cable is pulled.
- D. Impedance and Level Matching:
- E. Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.
- F. Control Circuit Wiring:
 - 1. Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated or specified.
 - 2. Make installation in strict accordance with approved manufacturer's drawings and instructions.
 - 3. The Installer shall provide necessary transient protection on the AC power feed, all station lines leaving or entering the building, and all central office trunks. All protection shall be as recommended by the equipment supplier and referenced to earth ground.

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- G. Weatherproofing:
1. Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.
- H. Typical Layouts and requirements of the specified systems:
1. Typical layout:
 - a. Equipment racks and cabinets
 - b. Backbone cabling
 - c. Headend equipment
 2. Typical layout of telecommunications equipment racks and cabinets.
 - a. Each equipment rack and cabinet shall contain the following equipment:
 - 1) Fiber optic patch panel
 - 2) Fiber optic cable management
 - 3) Surge protector power strip
 - 4) Patch panels - Horizontal distribution
 - 5) Horizontal distribution cable management
 - 6) Vertical cable management
 - 7) Patch cords
 - b. Provide space for the installation of network electronics equipment in the equipment racks.
 - c. Furnish and install horizontal cable management between each patch panel (fiber optics, Hub distribution, Horizontal distribution, and telephone distribution).
 - d. Furnish and install horizontal distribution patch panels in each wire center with sufficient ports to terminate all modular jacks shown on the drawings plus twenty percent spares. The exact number of modular jacks and horizontal distribution patch panels shall be obtained from the drawings.
 - e. Furnish and install all equipment racks and cabinets required to support the aforementioned equipment.
 - f. The MDF room shall contain fiber optic patch panel quantities which correspond to the total number of fiber optic patch panels located in the IDF rooms.
 - g. Grounding bars shall be installed under Section 260000. Furnish and install the required grounding to ensure that all of the aforementioned equipment is grounded and bonded.
 3. Headend
 - a. The headend consists of connecting hardware for the following:
 - 1) Video System
 - 2) Sound System
 - 3) Paging System
 - 4) Master Clock System
 - b. Final terminations from IDC cross connect block panels to telephone equipment and PBX by -Telephone Company and Equipment Installer. Coordinate with Telephone Company and Equipment Installer for final terminations.
 - c. Final terminations from the IDC cross connect block panels to the headend equipment shall be provided by the headend equipment installer.

- d. Coordinate with the headend equipment installer and the electrical contractor for:
 - 1) The installation of all the IDC cross connect block panels at the headend equipment. Installation shall be neat in appearance.
 - 2) The final terminations at the headend.

3.11 TRAINING

- A. As a minimum, training sessions shall consist of the following:
 - 1. General project information and review shall be by the General Foreman or Superintendent of the Trade.
 - 2. Specific system training shall be by a Factory Trained Representative.
 - 3. Provide a complete review of the project and systems including, but not limited to, the following:
 - a. In a classroom environment review each Record Drawing (use of typicals is acceptable).
 - b. Note equipment layouts, locations and control points.
 - c. Review each system.
 - d. Review system design operation and philosophy.
 - e. Review alarms and necessary responses.
 - f. Review standard troubleshooting techniques for each system.
 - g. Review areas served by equipment.
 - h. Identify color codes used.
 - i. Review features and special functions.
 - j. Review maintenance requirements.
 - k. Review operation and maintenance manuals.
 - l. Respond to questions (record questions and answers).
 - 4. After classroom training, walk the entire project, review each equipment room and typical locations. Explain equipment and proper operation.
- B. During the instruction period the Owner and Maintenance Manual shall be used and explained.
- C. The Owner and Maintenance Manual material shall be bound in 3-ring binders and indexed. On the edge of the binder provide a clear see-through plastic holder with a typed card indicating the Project name, the Architect's name, the installer's name and the Volume number (e.g., Vol. No. 1 of 2).
- D. Provide name, address and telephone number of the manufacturer's representative and Service Company for all items supplied so that the source of replacement parts and service can be readily obtained.
 - 1. Include copies of manufacturers and installer's warranties and maintenance contracts and performance bonds properly executed and signed by an authorized representative.
 - 2. Include copies of all test reports and certifications.

3.12 ACCEPTANCE DEMONSTRATIONS

- A. Systems installed under this Section shall be demonstrated to the Owner and Architect. Demonstrations are in addition to necessary testing and training sessions. Notify all parties at least 7 days prior to the scheduled demonstration. Schedule demonstrations, in cooperation with and at times convenient to all parties, so as to not disturb ongoing activities.
- B. Systems shall be tested prior to the demonstrations and each system shall be fully operational and tested prior to arranging the Acceptance Demonstration. Final payments will be withheld until a satisfactory demonstration is provided for all systems indicated or requested.
- C. If the demonstration is not totally complete, performing all functions, features and connections or interfaces with other systems, or if there is a failure during the demonstration, additional demonstrations shall be arranged. Provide and pay for all costs, labor and expenses incurred for all attendees for each additional demonstration required for acceptance and demonstration of complete system operation.
- D. Demonstrations shall be scheduled in ample time to complete all activities prior to final acceptance and Owner occupancy. Demonstrations shall take place at least 30 days prior to the scheduled project completion date and 30 days prior to owner's use and occupancy.
- E. As a minimum, provide demonstrations for systems indicated under "Work Included" under Part One of the Specifications. Provide demonstrations of additional systems as requested by the Owner, or Architect.

3.13 PROJECT OWNER COORDINATION

- A. Prior to Substantial Completion of the project and in ample time to address and resolve any coordination issues, request and arrange meetings between the Owner, Owner's Vendors and Consultants, Architect and General Contractor to discuss the Scope of Work for each system being provided and the interface required for a fully functional and operational system upon project completion. Initial meetings shall be scheduled three months prior to the scheduled Substantial Completion date or as soon as Submittals are submitted and reviewed for projects with shorter schedules.
- B. At these meetings the required interface with the Owner shall be reviewed, requests for information required to complete programming or for coordination shall be presented and system operation and philosophy shall be discussed.
- C. Additional meetings shall be held as requested by any party so that all issues are resolved and with the goal and intent being that all systems are fully operational and functional upon project Substantial Completion and that the responsibility for all components required is clearly established.

3.14 CLEANING UP

- A. Upon completion of all work, and testing, thoroughly inspect all exposed portions of the installation and completely remove all exposed labels, markings, and foreign material.
- B. The interior of all boxes and cabinets shall be left clean; exposed surfaces shall be cleaned and plated surfaces polished.
- C. Repair damage to finish surfaces resulting from work under this section.

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- D. Remove material and equipment from areas of work and storage areas.
- E. All equipment shall be clean from dirt, dust, and fingerprints prior to final acceptance.
- F. Touch up all damaged pre-finished equipment using materials and methods recommended by the Manufacturer.

3.15 PROJECT CLOSEOUT

- A. Provide close out submittals as specified herein and in SECTION 017700 - CLOSEOUT PROCEDURES including the following close out submittals.
 - 1. Operation and Maintenance Manuals
 - 2. Record Drawings.
 - 3. Test Reports.
 - 4. Extra Materials.
- B. Obtain written receipts of acceptance close out submittals submitted. Receipts shall specifically detail what is being delivered (description, quantity and specification section) and shall be dated and signed by firm delivering materials and by the Owner's Representative.
- C. Telecommunications:
 - 1. Provide record drawings indicating actual cable routing and cable terminations and all required identifiers. Provide copy mounted in each telecommunications closet and the main cross connect.
 - 2. All sketches, drawings, and charts herein are for the purpose of providing for specifications in a simplified format. Errors and omissions in such does not relieve the Contractor of the responsibility for providing a fully complete, secure and properly operating integrated instructional technology network system suitable for the intended use. Bidders must obtain a complete set of Project Drawings and Specifications to determine the full scope of work. In case of conflict the Project Drawings and Specifications shall prevail.
- D. Construction Waste Management
- E. Comply with Division 01 requirements for construction waste management and recycling.

END OF SECTION

SECTION 311000

SITE PREPARATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Provide all labor, materials, equipment, services and accessories necessary to furnish and install the work of this Section, complete and functional, as indicated in the Contract Documents and as specified herein.
- B. The principal work of this Section includes, but may not be limited to, the following:
 - 1. Removal of existing pavements, curbs, sidewalks, steps, signage and posts, fencing and all other site improvements that interfere with construction as indicated on the drawings. Pavement shall be properly disposed of at an off-site landfill.
 - 2. Installation and relocation of construction fencing during construction.

1.3 RELATED WORK

- A. Carefully examine all of the Contract Document for requirements which affect the work of this Section. Other specifications which directly relate to the work of this Section include, but are not limited to, the following:
 - 1. Section 312000 – EARTH MOVING
 - 2. Section 321216 – ASPHALT PAVING

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION

3.1 PERFORMANCE

- A. Any existing abandoned/unused foundation members, cesspools, septic tanks, or similar subsurface facilities encountered within the project area are to be destroyed and removed in their entirety.

3.2 UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
 - 1. Arrange with utility companies to shut off indicated utilities. The Contractor is responsible for coordinating and scheduling with the authorities having jurisdiction the removal and/or abandonment of existing utilities as required to complete the work.

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- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Owner's Representative or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify the Owner's Representative not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without the Owner's Representative's written permission.
- C. Utility pipes designated to be abandoned in place shall be plugged at their ends with watertight brick masonry or cement mortar with a minimum thickness of 8 inches.
- D. Utility pipes designated to be removed shall consist of the complete removal and disposal of the entire length of pipe and backfill and compaction of the void with ordinary borrow. When the void is within the footprint of the new building, gravel borrow shall be used to backfill the void.
- E. Utility structures designated to be abandoned in place shall have their cast iron castings removed and disposed, inlet and outlet pipes plugged, the bottom of the structures shall be broken, the void of the structure shall be backfilled and compacted with ordinary borrow, and the top of the structure shall be removed so that it is at least 36 inches below finished grade.
- F. Utility structures designated to be removed shall consist of the removal and disposal of cast iron castings, plugging of inlet and outlet pipes, removal of the structure, and backfill and compaction of the void with ordinary borrow. When the void is within the footprint of the new building, gravel borrow shall be used to backfill the void.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

- A. This Section includes the following:
1. Site excavating, grading, filling, backfilling, compacting, and preparing sub-grades to the lines and grades shown herein or as indicated on the Drawings for the entire project (whichever is deeper) including but not limited to: foundations, footings, slab-on-grade components, site utility lines and structures, walks, and pavements.
 2. Excavating all types of materials to limits indicated or required, including soil, rock, and other materials for new, below-grade construction and other site improvements as shown on the Drawings. All organic soil, existing fill, and other deleterious matter should be entirely removed from within the proposed areas of excavation. All topsoil, subsoil, organic material, root balls, and other deleterious material shall be entirely removed.
 3. Compacted structural fill where indicated on the Drawings or where required below building areas.
 4. Processed aggregate for pavements and other improvements.
 5. Crushed Stone and porous fill for pavements, under building slabs and footings.
 6. General fill for establishing project sub-grades under paved areas and where shown on the Drawings.
 7. Excavation of rock and/or boulders, including replacement with suitable earthwork materials.
 8. Removal of encountered unsatisfactory soils, including lawful off-site disposal and replacement with suitable earthwork fill material.
 9. Securing trenching permit
 10. Protecting existing buildings, utilities, roads, pavements, lawns, plantings and other improvements from damage due to construction.
 11. Excavation & Backfill within the building for all underground Plumbing, subsoil drainage, conduits, and the like.
 12. Excavation for any new subsurface equipment, structure, footing, slab, or light pole base or any other excavation which is required to accomplish the Work described in the Drawings or Specifications.

1.3 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements that affect the work of this Section. Other specifications that directly relate to the work of this section include, but are not limited to, the following:
1. Section 003100 – Available Project Information
 2. Section 220000 – Plumbing

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3. Section 260000 – Electrical
4. Section 311000 – Site Preparation
5. Section 312500 – Erosion and Sedimentation Controls
6. Section 321216 – Asphalt Paving
7. Section 330000 – Site Utilities

- B. Excavation shall comprise and include the satisfactory removal and disposal of all materials encountered within the lines and grades shown in the drawings and in the specifications regardless of the nature of the materials, and shall be understood to include but not limited to, earth, topsoil, subsoil, hardpan, fill, foundations, pavements, curbs, piping, footings, bricks, concrete, abandoned drainage and utility structures, debris, and materials classified as unsuitable materials. All excavations and associated backfill within the lines and grades shown in the drawings and in the specifications, except in rock as defined below, shall be included in the base bid.

1.4 SUBSURFACE CONDITIONS

- A. Protect all pipe lines, sewers, drains, poles, wiring, and the like that interfere in any way with the work whether or not they are specifically shown on the Drawings. Notify the proper authorities that items are protected, supported, and/or relocated as necessary to adjust them to the new work.
- B. Verify inverts and locations of all existing utilities having a direct bearing on the work of this Section prior to installation of any work of this Section. Transmit the above information to the Architect who shall make any alterations to the Contract Drawings as required by the existing conditions.
- C. No extra compensation will be made for compliance with the above.
- D. Notify public utilities companies, in writing, at least 72 hours before excavating in accordance with the provision of the Rhode Island General Laws, § 39-1.2-5 in order to prevent accidental damage.

1.5 INTERPRETATION OF SITE CONDITIONS

- A. During the course of construction, all interpretations of soil conditions, classification of materials and soil suitability, determine acceptability of methods and soil suitability, determining acceptability of methods and equipment to carry out the intent of the Specifications, shall be made by the Architect and/or Soils Laboratory. The decision of the Architect shall be final and binding on the Contractor.
- B. This project is Unclassified –
1. Unclassified excavation shall comprise and include the satisfactory removal and disposal of all materials encountered within the lines and grades shown in the drawings and in the specifications regardless of the nature of the materials, and shall be understood to include but not limited to, earth, topsoil, subsoil, hardpan, fill, foundations, pavements, curbs, piping, footings, bricks, concrete, abandoned drainage and utility structures, debris, and materials classified as unsuitable materials. All excavations and associated backfill within the lines and grades shown in the drawings and in the specifications, except in rock as defined below, shall be included in the base bid.

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2. The Contractor will be paid for excavations beyond the lines and grades shown in the drawings and specifications using the Unit Prices found under Division 01 “Unit Prices” and following the method of measurement and verification of quantities as defined in this specification.

1.6 DEFINITIONS

- A. Backfill: Soil materials used to fill an excavation.
 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Layer placed between the subbase course and proposed improvements.
- C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow: Satisfactory soil or earthwork products imported from off-site for use as fill or backfill.
- E. Excavation: Removal of material encountered above subgrade elevations.
 1. Additional Excavation: Excavation below subgrade elevations as directed by Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 2. Mass Excavation: Excavations more than 8 feet in width and pits more than 30 feet in either length or width.
 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- F. Fill: Soil materials used to raise existing grades.
- G. Mass Rock or Earth: Excavated material that is greater than 8’ in both length and width.
- H. Rock: Excavated rock material in beds, ledges, unstratified masses, and conglomerate deposits that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
 1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; Caterpillar 330 or equal, equipped with a 42-inch wide, short-tip-radius rock bucket.
 2. Mass Excavation: Late-model, track-mounted loader; Caterpillar 963C or equal; or Late-model, track-mounted hydraulic excavator; Caterpillar 330 or equal, equipped with a 42-inch wide, short-tip-radius rock bucket.
- I. Boulder: An excavated, individual rock fragment or natural stone with a volume of less than 1 c.y. in trenches and less than 3 c.y. in mass earth excavations. All boulders exceeding these definitions shall be classified as “rock” and shall fall within “mass” or “trench” subcategory based on definitions in this section. Material classified as “Rock” and excavated and paid for shall not be eligible to be classified as “boulder” for additional payment purposes. All excavated boulder

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material, to be disposed of on-site, or processed for re-use on-site, is not eligible for compensation under allowance and is part of base bid.

- J. 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.
- K. Subbase Course: Layer placed between the subgrade and base course for pavement or other site improvements.
- L. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- M. Trench Rock or Earth: An excavation of any length where the width is less than twice the depth and where the shortest distance between the excavation sides does not exceed eight (8') feet. All other excavations shall be defined as open excavations.
- N. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- O. SSHB: "Standard Specifications for Highways and Bridges", Commonwealth of Massachusetts, Massachusetts Highway Department, 1988 edition, including all supplements to date.
- P. Unsatisfactory/Unsuitable Soils: Any material generated, excavated and/or collected by earth moving activities or other contract work that does not meet any of the product specifications contained in contract documents.

1.7 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specifications Sections.
- B. Product Data: For the following:
 - 1. Each type of plastic warning tape.
 - 2. Separation fabric.
- C. Samples: For the following:
 - 1. 50-lb samples, sealed in airtight containers, of each proposed soil material from on-site or borrow sources, for Owner's independent laboratory testing agency. Samples shall be delivered to the site seven (7) calendar days in advance or time planned on incorporating them into the work. The owner's testing lab will confirm submitted test results and compaction curve data. Submit the name of each material supplier and specific type and source of each material. Any change in source throughout the job requires approval of the Architect and the Geotechnical Engineer
 - 2. 5-lb sample to Architect's office for visual conformance confirmation.
 - 3. 12-by-12-inch sample of drainage fabric.
 - 4. 12-by-12-inch sample of separation fabric.
 - 5. 4-foot strip of each type of warning tape.

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- D. Material Test Reports: From an approved qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
1. Complete mechanical/sieve analysis classification according to SSHB and ASTM D 2487 for every 400 cubic yards of on-site or borrow soil material proposed for fill and backfill. Washed sieve shall be performed for 200 sieve on all materials.
 2. Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.
 3. Report of actual unconfined compressive strength and/or results of bearing tests of each stratum tested.
 4. Test sampling shall conform to the requirements of ASTM D-75, and ASTM D-3665.
- E. All installation of materials prior to testing and/or review and response by Architect is at Contractor's risk.
- F. Submit a dewatering plan for review by the Geotechnical Engineer at least two weeks before the start of construction.
- G. Submit a temporary earth support system layout and design at least two weeks before the start of construction.

1.8 QUALITY ASSURANCE

- A. Comply with applicable requirements of NFPA 495, "Explosive Materials Code" and SSHB, Section 120 and State Fire Codes.
- B. The Owner may retain the services of a Geotechnical Engineer to periodically observe the earthwork operations including observing the subgrade of footings, slabs, parking lots, and roadways.
- C. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- D. Testing: Compaction tests will be required by the Owner and will be paid for by the Owner. No specific testing schedule has been established at this time. If tests indicate that density requirements have not been achieved, the Contractor shall continue compacting.

All retesting in these areas shall be paid for by the Contractor. See Division 1, Section "Quality Control Services". The contractor is required to compensate testing laboratory, directly, for all material test reports.

- E. Density and Compaction Testing: The Contractor is responsible for scheduling compaction tests and to allow adequate time for the proper execution of said tests.
- F. Protect all benchmarks, monuments, and property boundary pins. Replace if destroyed by Contractor's operations.
- G. The presence of the independent testing and inspection firm and/or the Geotechnical Engineer does not include supervision or direction of the actual work of the Contractor, his employees or

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agents. Neither the presence of the independent testing and inspection firm and/or the Geotechnical Engineer, nor any observations and testing performed by them, nor failure to give notice of defects shall excuse the Contractor from defects discovered in his work.

- H. Costs related to retesting due to unacceptable quality of work and failures discovered by testing shall be paid for by the Contractor at no additional expense to Owner.

1.9 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated. Note that school operations must be maintained throughout construction.
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
 - 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active. Contact Digsafe (811) prior to any earthwork or demolition operations.
- C. Contractor is responsible to properly obtain a trenching permit per 520 CMR 14.00 from appropriate local or state agency.

1.10 UNIT PRICES

- A. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following:
 - 1. 12 inches outside of concrete forms at footings.
 - 2. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - 3. The outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - 4. 12 inches outside width and bottom of drainage structures, including catch basins and manholes.
 - 5. Pavements: bottom elevation of the specified subbase course.
 - 6. 6 inches beneath pipe in trenches, and 24 inches wider than inside diameter of the pipe.
 - 7. Planting Areas: 48" below proposed finish elevations area as specified for typical planting installation.
 - 8. Lawn Areas: 18" below indicated finish grades.
- B. Boulder Measurement: Volume of all boulders excavated and slated for removal from site. Individual boulders to be measured by method mutually agreed upon by the Contractor and Owner.
- C. Limits and measurements do not represent dimensions of excavation requirements mandated by safety and other regulatory agencies. Rock required to be removed to conform to safety regulations will not be measured for payment.

1.11 COORDINATION

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- A. Prior to start of earthwork, the Contractor shall arrange an onsite meeting with the Architect, Engineer, the Geotechnical Engineer, and the independent testing firm for the purpose of establishing the Contractor's schedule of operations, and scheduling observation and testing procedures and requirements
- B. As construction proceeds, the Contractor shall be responsible for notifying the Geotechnical Engineer and the independent testing firm prior to the start of earthwork operations requiring observation and/or testing.
- C. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to ensure the steady progress of all work of the Contract.

1.12 SUBSURFACE SOIL DATA

- A. Contractor may, at his own expense, conduct additional subsurface testing as required for his own information after approval by the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Fill material shall be free from frost/ice and snow, rocks with a diameter greater than 2/3 of the loose lift thickness as specified herein, and foreign matter, such as construction debris, asphalt, trash, wood, roots, leaves, sod, and organic matter. All fill material shall be maintained by the contractor at suitable moisture contents for proper placement and compaction as specified herein.
- C. Offsite pulverized pavement and crushed concrete are not acceptable for fill material.
- D. Obtain off-site material as herein specified consisting of clean granular material from off-site Borrow Pits as approved by the Soils Laboratory prior to trucking to the site.
 - 1. Maintain borrow source material in a clean condition, uncontaminated by organic soils or other deleterious materials. If borrow material from the cut sectors is stockpiled, such stockpiles shall be suitable protected, drained, and maintained to insure full availability of the materials.
 - 2. Material weighing less than 100 lbs. per cubic foot (maximum laboratory dry weight) is not acceptable as fill material. Placed material shall be free of all objectionable material such as leaves, grass, and roots.

2.2 PROCESSED GRAVEL FOR SUB-BASE

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- A. Processed gravel for sub-base, where called for on the Drawings and Specifications shall be from off-site sources and shall conform to the following gradation requirements of RIDOT M.01.09, Table 1, Column 1:

<u>Sieve Size</u>	<u>% finer of weight</u>
3"	60-100
1/2"	50-85
3/8"	45-80
No. 4	40-75
No. 40	0-45
No. 200	0-10

2.3 GENERAL FILL (ORDINARY FILL)

- A. Ordinary Fill should have a plasticity index of less than 6, and should meet the gradation requirements shown below. Ordinary Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within ± 2 percentage points of optimum moisture content and conform to the following gradation:

<u>Sieve Size</u>	<u>% finer by weight</u>
6 Inch	100
1 Inch	50-100
No. 4	20-100
No. 20	10-70
No. 60	5-45
No. 200	0-20

2.4 PERVIOUS FILL

- A. Wherever pervious (granular) fill is called for in the Drawings or Specifications, the material shall be brought from off-site sources and shall be free of ice, snow, sod, rubbish, or other deleterious material and conform to the following gradation:

<u>Sieve Size</u>	<u>% finer by weight</u>
3 Inch	100
No. 4	30-100
No. 200	0-8

2.5 STRUCTURAL FILL

- A. The Structural Fill should have a plasticity index of less than 6, and should meet the gradation requirements shown below. Structural Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within ± 2 percentage points of optimum moisture content.
- B. Fill placed within buildings and within an area extending 5 feet beyond the limits of buildings, including within utility trenches inside buildings, shall consist of Structural Fill.

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- C. Structural Fill for fill and backfill within building areas (under footings and slabs) and adjacent to foundation walls except where other materials are specified or detailed. Materials shall be clean bank-run or processed gravel free from recycled material, foreign substances (bricks, concrete, asphalt, etc), frozen material, lumps of clay, loam or vegetable matter, be obtained from a single source and shall meet the following grain size gradation:

<u>Sieve Size</u>	<u>% finer by weight</u>
3 Inch	100
1-1/2 Inch	80-100
½ Inch	50-100
No. 4	30-85
No. 20	15-60
No. 60	5-35
No. 200*	0-10
	*0-5% Under sidewalks.

2.6 DENSE GRADED CRUSHED STONE FOR SUBBASE

- A. Dense graded Crushed Stone for subbase shall be imported material conforming to the following gradation requirements. This material shall be used as an alternate to Processed Gravel for Subbase in the top 12 inches immediately beneath paved areas.

<u>Sieve Size</u>	<u>% finer of weight</u>
2"	100
1-1/2"	70-100
3/4"	50-85
No. 4	30-55
No. 50	8-24
No. 200	3-10

- B. Crushed concrete cannot be used as Dense Graded Crushed Stone for Subbase.

2.7 CRUSHED STONE

- A. Where designated on the Drawings and Specifications as crushed stone, the material shall consist of processed stone and shall conform to the following gradations:

1. 1-1/2" to 2" Crushed Stone:

<u>Sieve Size</u>	<u>% finer of weight</u>
1-1/2" to 2"	100
1-1/4"	85-100
3/4"	10-40
1/2"	0-8
No. 200	<1

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2. 3/4" Crushed Stone:

<u>Sieve Size</u>	<u>% finer of weight</u>
1"	100
3/4"	90-100
1/2"	10-50
3/8"	0-20
No. 4	0-5

2.8 WASHED STONE

- A. Crushed stone not to exceed 3".

2.9 SAND FILL

- A. To be used as bedding and backfill. It shall be hard, durable sand free from ice, snow, roots, sod and other deleterious matter conforming to the material and gradation requirements. The Sand Fill shall be used as backfilling material around banks of pipes. The Sand Fill shall be graded within the following limits:

<u>Sieve Size</u>	<u>% finer of weight</u>
3/8"	100
No. 200	0-10

2.10 GEOTEXTILES

- A. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Survivability: Class 1; AASHTO M 288.
 2. Elongation: 15% maximum; ASTM D 4632
 3. Grab Tensile Strength: 315 lbs; ASTM D 4632.
 4. Trapezoidal Tear Strength: 120 lbs; ASTM D 4533.
 5. Puncture Strength: 1,000 lbs; ASTM D 6241.
 6. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
 7. Permittivity: 0.05 sec-1 minimum; ASTM D 4491.
 8. UV Stability: 70% after 500 hours' exposure; ASTM D 4355.

2.11 UNSUITABLE SOILS

- A. Unsuitable material shall be material having at least one of the following properties:
1. Material with a maximum unit dry weight per cubic foot less than 100 lbs., as determined by ASTM D1557.
 2. Material containing greater than 3% organic matter by weight, topsoil, organic silt, peat, construction debris, roots and stumps.
 3. Material which has a Liquid Limit greater than 55 when tested in accordance with ASTM D 4318.
 4. Materials that do not meet one of the gradation specifications in this section.
 5. Material classified as unsuitable by the Geotechnical Engineer.
 6. Unsuitable material shall be disposed of off-site as directed by the Architect.
 7. Materials that are unstable as a result of inadequate construction dewatering, excessive subgrade disturbance, or other means and methods used by the Contractor are not considered unsuitable materials.

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8. Onsite processed material that is not well graded and that exhibits honeycombing during placement and compaction.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL CONTROLS

- A. Prior to commencement of any work, provide the Architect with detailed drawings, reports, etc., as required to adequately define proposed methods to protect the environment of the project and the surrounding area in accordance with local, state, and federal regulations and as herein described. Conform to the Order of Conditions.
- B. All proposed drainage systems, as shown on the project plans, or which may be required during the course of the work, shall be maintained functional at all times. The exposed areas of subgrade in both cut and fill sectors shall be graded to positively drain. In impounded surface water areas, no additional fill material shall be placed. Failure to maintain positive drainage of the subgrade shall be adequate cause for the Architect to order temporary suspension of the work.
- C. Provide and maintain, for the entire course of the operations of the project, erosion and silt control measures to prevent the intrusion of any silt, oil, chemical, or other pollutants to any downstream drainage way, conduit, stream, etc., or abutting property beyond the project limit lines. In the event of failure to comply, the Contractor assumes the cost of all damages resultant there from.
- D. Provide for the control of dust to the satisfaction of the Architect.

3.2 REFERENCE POINTS

- A. Locate and maintain bench marks, monuments, and other reference points. If destroyed or disturbed, place as directed by the Architect and/or local and state authorities.

3.3 EQUIPMENT

- A. All Earth Work under this Section shall be performed with earth moving equipment capable of efficiently completing the scope of the work and subject to the approval of the Soils Laboratory and/or the Architect.

3.4 MOISTURE CONTROL (All Soils)

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
- B. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- C. Remove and replace, or scarify and air-dry, all soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.
 1. Stockpile or spread and dry removed wet satisfactory soil material.

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- D. The Contractor is alerted that the nature of native materials at this site is such that they are sensitive to moisture. On-site materials are difficult to handle and compact and are easily disturbed when wet. The Contractor shall plan and conduct his excavation and filling operations considering the nature of the on-site materials.

3.5 PROTECTION OF SUBGRADE

- A. The Contractor shall employ special measures as herein specified and/or as directed in the field by the Architect to avoid disturbing the strength of the natural subgrade in an approved manner shall be made during the course of the construction.
- B. Provide and operate pumps or other equipment as necessary, to keep excavation free from water at all times, until succeeding operations are begun.
- C. As original ground surface is worked and fill is added, daily provisions shall be made for drainage of surface water away from the exposed subgrade.
- D. No heavy equipment shall be allowed to travel over wet areas of the subgrade. Notify the Architect if trafficking by equipment not under control of this Section occurs.
- E. Properly compact layers of subgrade fill as soon as they are placed.
- F. As soon as subgrade or general fill is placed, compacted, and approved by the Soil Laboratory, place and compact the granular fill sub-grade material.

3.6 TEMPORARY SHEETING, SHORING & BRACING

- A. The Contractor shall provide shoring systems adequately anchored and braced to resist earth and hydrostatic pressures at locations as needed to support excavations during construction. The sheeting/shoring systems shall be designed by a Massachusetts Professional Engineer.
- B. Shop drawings and calculations shall be submitted for review and approval prior to start of any work for temporary excavation support. All shop drawings, details & calculations submitted shall bear the Professional Engineer stamp of the Engineer responsible for the design.
- C. The General Contractor shall install, maintain and monitor (1 day before and each day excavation is open) 3 (minimum) settlement monitoring points on the building footing or foundation wall. Location of monitoring points to be determined by shoring design engineer.
- D. The Contractor shall locate required bracing to clear all permanent Work.
- E. Bracing which must be relocated shall be installed prior to the removal of original bracing.
- F. The Contractor shall remove shoring and bracing in stages to avoid disturbances to adjacent and underlying soils and damage to structures, pavements, facilities and utilities. The contractor shall repair or replace adjacent work damaged or displayed through the installation or removal of shoring and bracing work.

3.7 FILLING AND COMPACTION

- A. Fill shall not be placed upon frozen subgrade within building limits or below pavements where raise in grade is less than 3 feet. Overnight frost, not more than 2 inches thick, shall be broken up by cleats or crawler or other acceptable means prior to placing fill.

- B. The following are minimum procedures to be utilized in the placing and compaction of all fill. The final compaction methods shall be subject to the approval of the Soils Laboratory. Critical areas are defined as all fill below building limit lines and the upper most 12 inches of subgrade under parking lot, bank-run gravel under paving, and base course under paving. Less critical areas are those under landscaped areas and below 12 inches under the paved areas.
 - 1. Compaction Method: Hand operated vibratory plate or light roller (in confined areas only)

Maximum Stone Size: 2"

Maximum Loose Lift Thickness: Critical areas - 4", less critical areas - 6"
Minimum # of Passes: Critical Areas – 4, less critical areas - 4

 - 2. Compaction Method: Hand operated vibratory drum rollers weighing at least 1000#, or light crawler tractor (in confined areas only)

Maximum Stone Size: 4"

Maximum Loose Lift Thickness: Critical Areas - 6", less critical areas - 8"
Minimum # of Passes: Critical areas – 4, less critical areas - 4

 - 3. Compaction Method: Loaded 10-wheel dump truck

Maximum Stone Size: 6"

Maximum Loose Lift Thickness: Critical Areas - 10", less critical areas - 10"
Minimum # of Passes: Critical areas – 4, less critical areas - 4

 - 4. Compaction Method: Heavy crawler tractor (Cat D8 minimum)

Maximum Stone Size: 8"

Maximum Loose Lift Thickness: Critical areas - 12", less critical areas - 12"
Minimum # of Passes: Critical areas – 4, less critical areas - 2

 - 5. Compaction Method: Light vibratory drum roller min. wt. @ drum: 3000#; min. dynamic force: 10,000#

Maximum Stone Size: 6"

Maximum Loose Lift Thickness: Critical areas - 12", less critical areas - 12"
Minimum # of Passes: Critical areas - 4, less critical areas - 2.

- C. The following compaction requirements shall apply, in each case expressed as percentage of maximum dry density achieved by laboratory ASTM Modified Proctor Method D1557:

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Below Foundations	95%
Top 12" of subgrade underlying granular fill below pavement	95%
Below floor slabs, but above foundation	95%
Deeper than 12" from top of subgrade underlying gravel below pavement	95%
Landscaping areas	90%

- D. The moisture content of placed material shall not deviate from the optimum by more than 2 percent. Moisture content of any material which displays pronounced deformation under construction equipment shall not exceed the optimum. Drying of wet soil shall be expedited by the use of plows, discs, harrows, or other approved methods. If additional water is required, it should be uniformly distributed through the use of approved water wagons and shall be thoroughly incorporated into the material by means of discs or other suitable mixing equipment. Care shall be taken to avoid trapping water within the fill.
- E. The fill and borrow areas should be maintained in a freely draining conditions at all times. Proper drainage shall be provided for any water or springs which may be encountered.
- F. Frozen fill shall not be placed nor shall any acceptable fill be placed on frozen or snow covered surface except as outlined in (D) above.

3.8 SUBGRADE PREPARATION

- A. After the subgrade is compacted to the specified requirements, the subgrade shall be fine graded to within 1/10 of a foot of the required elevations. Proof roll the entire subgrade in the presence of the Soils Laboratory.
- B. Any suspect areas revealed by proof rolling shall be investigated by backhoe excavation. Deficiencies shall be corrected as directed by the Soils Laboratory.

3.9 GRANULAR FILL

- A. Immediately upon completion of subgrade under areas to be paved and after approval by Soils Laboratory, place, compact, and grade the granular fill as specified to within 1 inch of the required elevations as shown on the plans.
- B. At the time the site is ready for pavement base material, place additional granular fill as required to meet the elevations shown.
- C. Take precautions to protect granular fill during subsequent operations so as to keep it clean and free draining and segregated from other deleterious materials.

3.10 EXCAVATION

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- A. Unclassified excavation shall comprise and include the satisfactory excavation, removal, and disposal of all materials encountered within the lines and grades shown in the Drawings or limits specified herein, whichever is deeper, regardless of the nature of the materials, and shall be understood to include, but not be limited to, earth, topsoil, subsoil, hardpan, fill, foundations, pavements, curbs, piping, railroad track and ties, cobblestones, footings, bricks, concrete, abandoned drainage and utility structures, debris, and materials classified as unsuitable materials. All excavation and replacement, if applicable, with structural fill material within the lines and grades shown in the Drawings or the limits specified herein, whichever is deeper, will be considered and bid as unclassified and shall be included in the Contractor's lump sum (i.e., shall not be paid for using Unit Prices).
- B. Excavate properly to provide sufficient work space to permit the placing, inspection, and completion of the work embraced in the completion of the Project. Excavations shall be made to elevations and dimensions indicated on the drawings, and shall include the removal of unusable earth and debris. All pumping, drainage, bailing, and shoring where such is required, shall be included.
- C. All space beneath foundations, resulting from unauthorized excavations or from slides or cave-ins shall be refilled with approved concrete and foundations shall be laid at the excavated level as directed, or other methods acceptable to the Soils Laboratory.
- D. After completion and approval of the subgrade within the building area, excavate for footings and foundations carrying all excavations so that all bearing area will be either on virgin soil or on controlled compacted fill.
- E. Excavated materials not required or not suitable for backfilling and rough grading, and debris, shall be removed from the site at no additional cost to the Owner.

3.11 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. Lean concrete fill may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

3.12 BACKFILLING

- A. Backfill as soon as permanent work has been completed and walls have attained sufficient set and strength.
- B. Except where otherwise specified, backfilling shall be done with granular fill and done promptly so as to protect the foundation from frost. Place backfill in layers as noted. Compact before placing succeeding layer. When sheeting, bracing, or shoring is removed, fill voids.
- C. Exercise extreme care in backfilling against newly placed walls. Walls with fill on one side shall be properly supported laterally, either with the designed structure or by temporary means. Walls with fill on both sides shall have fill placed in alternate layers on each side of the wall. Place no more than one (1) foot at a time, compacted each list as herein specified.

3.13 EXCAVATION AND BACKFILLING FOR UTILITIES

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- A. Excavate and backfill for all underground utilities and structures.
- B. Utilities shall not be laid directly on ledge or boulders or remains of old foundation or structure. This material shall be removed to a minimum of 6 inches below the utilities and backfilled and compacted as hereinafter specified.
- C. In general, the width of trenches shall be kept to a minimum and in the case of piping shall not exceed the sum of the pipe o.d. plus 2' - 0" to at least 12 inches above the pipe. Trench walls may be cut back from 12 inches above the pipe to subgrade.
- D. Excavation shall be carried to 6 inches below utility or structure and to the required line or grade. Machine excavation will be permitted. Immediately upon excavation of trench in the case of piping or excavation for manholes or other structures, place and compact 6 inches of 3/4" inch processed stone as herein specified in paragraph 2.06 at the proper line and grade, digging bell holes to insure bearing throughout the pipe barrel in the case of piping.
- E. Backfilling within the area of the utility work shall be carried to the lines and levels required for the grades shown on the drawings and as specified. Backfilling shall not be started until conditions have been inspected and approved by the Architect, nor any fill placed until structural members involved have sufficient strength to withstand the pressure to be imposed.
- F. Fill material shall be as detailed on the drawings, placed in the dry horizontal layers and approved of each layer shall be obtained from the Soils Laboratory before proceeding with the next. Each layer shall be compacted to 95% of maximum dry density and at a water content equal to optimum water content plus-or-minus 2%. The maximum dry density and optimum water content shall be determined by the Soils Laboratory.
- G. Backfill trenches only after pipe has been inspected, tested, and locations of pipes and appurtenances have been recorded. Backfill by hand around pipe and for a depth of 2 feet above the pipe and tamp firmly in lifts not exceeding 6 inches in thickness, taking care not to disturb the pipe. Compact the remainder of the backfill, in maximum 9-inch layers, thoroughly with a rammer of suitable weight, or approved mechanical tampers to a minimum relative density of 95%. Trenches shall not be left open overnight.
- H. Backfill material for utility structure shall be placed symmetrically on all sides, in 9-inch layers. Each layer shall be compacted with mechanical or hand tampers to a minimum relative density of 95%. Excavated areas for structures shall not be left open overnight.
- I. With prior approval of the Architect, the water line may be partially backfilled leaving all joints exposed prior to testing. As the entire is backfilled furnish and install plastic tracer line labeled "Water main" approximately 18" below finished grade.

3.14 GRAVEL BASE COURSE FOR PAVEMENTS

- A. Furnish, place, compact, and fine grade the gravel base for all pavement, to the thicknesses shown on the plans and to the satisfaction of the Soils Laboratory.
- B. Finished grading of base course shall be evenly graded, sloped to drain, and within 1/10 foot tolerance of required final grade.

3.15 BASE FOR SLABS ON GRADE

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- A. Furnish, place, compact, and fine grade the crushed stone base for all slabs on grade to the thickness shown on the plans.

3.16 LOCATION OF POROUS FILL (CRUSHED STONE)

- A. At the slab on ground level - a 6” minimum layer between the structural fill and the vapor retarder which is located directly under the interior slabs on grade as indicated on the Structural Drawings.
- B. At bottom of footing in cut locations – a 6” minimum layer beneath the bottom of footing elevation.

3.17 PROTECTION

- A. Protecting Graded Areas: The contractor is cautioned that the onsite soils are high in fines and will be susceptible to disturbance when wet and will be frost susceptible.
- B. Protect newly graded areas from traffic, softening, freezing, and erosion. Keep free of trash and debris.
- C. Work area shall be protected from surface runoff flowing from areas upslope of the site. The contractor shall divert such runoff so as it does not interfere with earthwork operations.
- D. 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 the Architect; reshape and re-compact at optimum moisture content to the required density.
- E. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove waste material, including trash, and debris, and legally dispose of it off Owner's property. Surplus satisfactory soil and unsatisfactory soil shall be legally disposed of off Owner's property.

END OF SECTION 31 20 00

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SECTION 312500 EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the Contract and General Conditions and all Sections within Division 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.
- B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including, but not limited to, the following:
 - 1. The work to be performed is shown on the Drawings listed on the contract form. The work shall be performed in accordance with City of East Providence Specifications, Rhode Island Soil Erosion and Sediment Control Handbook and Rhode Island Department of Transportation Standard Specifications for Road & Bridge Construction (RIDOT Specifications), Latest Edition. Said documents are by reference made a part of the contract.
 - 2. Furnish and install all slope protection, sedimentation and erosion control measures as necessary to retain all erosion and sediments within the construction area, as shown on the Drawings and/or as specified herein, including, but not limited to:
 - a. Provide and maintain straw wattles and erosion control silt fence for control of soil runoff on exposed slopes, drainage structures and temporary stockpiles.
 - b. Cleaning of adjacent roadway surfaces of all accumulated sediment and debris as required or a minimum of once per week.
 - c. Erosion Control Blankets (ECB) on all required slopes.
 - d. Temporary seeding and lawn stabilization of disturbed areas.
 - e. Dust control.
 - f. Provide and maintain sediment control bags at all existing catch basins and curb inlets.
- B. The following Related Work is specified under the designated Sections:
 - 1. Section 312000 – EARTH MOVING

1.3 QUALITY ASSURANCE

- A. Material Standards and Standards of Workmanship: Equal to state and local town requirements.
- B. Requirements specified and noted on drawings are minimum. Provide additional measures as required by the local, State or Federal authorities as a result of Contractor's specific scheduling and Work sequencing, or weather conditions at no additional cost to the Owner.
- C. Qualifications: Engaged firm shall be able to demonstrate experience in the installation of the erosion and sedimentation controls described in the Contract Documents.

1.4 SUBMITTALS

- A. Product data for the following:
 - 1. Straw Wattles
 - 2. Sediment control bags.
 - 3. Fertilizers, seed.
 - 4. Limestone.
 - 5. Chemical preservatives and controls – also confirm that each of the materials proposed to be applied are permitted within the State of Rhode Island and the City of Providence.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Seed, Fertilizer and Lime: Deliver in original sealed, labeled, and undamaged containers, showing weights, analysis, and name of manufacturer.
- B. Protect materials from deterioration during delivery and while stored at site.

1.6 COORDINATION AND SCHEDULING

- A. General: Sow lawn seed and install all stabilization measures as soon as possible in accordance with the Contractor's schedule.
- B. Weather Limitations: Proceed with lawn development only when existing and forecast weather conditions are suitable for work.

1.7 MAINTENANCE

- A. Begin maintenance of stabilized areas immediately after each area is stabilized and continue until project is accepted.
- B. Maintain and establish all disturbed areas by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
 - 1. Replant bare areas.

2. Add new mulch and tackifier in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.

1.8 JOB CONDITIONS

- A. Existing Conditions: The contractor shall examine all work that the work of this Section is contingent upon, and report any deficiencies to the Architect. Commencement of the work will be construed to mean complete acceptance by the Contractor of the preparatory work of others. No adjustment will be made for discrepancies brought to the Architect's attention after work has begun.
- B. Protection of Adjacent Lands:
 1. The Contractor shall be totally responsible for protection of any lands or properties as may be subject to any effect or by-product of his demolition/construction effort. Special care shall be taken to avoid erosion of fill or cut slopes onto adjacent properties or downstream siltation of diversion of existing surface drainage. Any damage is to be corrected immediately.
 2. Erosions control measures in the locations shown and as detailed and described in the Contract Documents shall be considered minimum requirements and the Contractor shall take whatever other erosion and sedimentation controls steps necessary to accommodate his particular construction procedures.
- C. Schedule Procedure:
 1. Erosion control construction shall be done prior to the commencement of demolition, site preparation or earthwork operations. The initial method outlined herein is intended to route all practicable surface water from the excavation area into erosion control facilities. The Contractor shall install any additional protective measures as may be required to control siltation from the site.
 2. The following sequence of construction shall be followed: Revisions shall be only with the approval of the Architect and the responsible municipal governing agency.
 - a. Place sedimentation control measures along the limit of work, at catch basins and drainage curb inlets as shown on the Drawings, and where directed by the Architect.
 - b. Proceed with construction of the remaining items of work in accordance with the approved project sequence and schedule. The contractor shall be responsible for maintaining the integrity of all sediment and erosion control measures for the duration of the Contract.
 - c. Clean and maintain all sedimentation control components to achieve the intended purpose of both temporary and permanent erosion and sediment control facilities.

PART 2 - PRODUCTS

2.1 EROSION-CONTROL MATERIALS

- A. Compost Wattles
 - 1. Compost wattles shall consist of compost consisting of 25%-100% organic matter with a pH of 5.0-8.5, a moisture content less than 60% and 99% passing a 2" sieve and 30% to 50% passing a 3/8" sieve inside of a biodegradable sock/netting. Compost wattles shall measure at least twelve (12) inches in diameter.
 - 2. Stakes for wattles shall be one of the following materials. Lengths shall be approximately two feet (2').
 - a. Wood stakes of sound hardwood, one inch by one inch (1" x 1") in size.
 - b. Steel reinforcing bars of at least No. 4 size.
- B. Temporary Mulch: Straw hydromulch or other approved product.
- C. Fiber Mesh: Biodegradable twisted jute or spun-coir mesh, 0.92 lb. Per sq. yd. (0.5 kg per sq. m) minimum, with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150mm) long.

2.2 CRUSHED STONE: CONFORM TO RI DOT, M.01.09 TYPE II

PART 3 - EXECUTION

3.1 MAINTENANCE

- A. Maintain basins and Erosion control devices by restaking and replacing as required. Remove buildup of silt as necessary or as directed by the Architect. Maintain operations until all lawn/planted areas are stabilized and all paving is completed.

3.2 DUST CONTROL

- A. Dust Control: Contractor shall furnish and apply water and/or calcium chloride to reduce dust nuisance and hazard within project limits per the requirements of Rhode Island Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition, Section 907. Contractor shall submit a Health and Safety Plan including measures to be taken for dust control.

3.3 CLEAN UP

- A. Upon stabilization of all disturbed areas and the completing of construction activity, remove all erosion control devices including stone construction entrances and restore surrounding areas to acceptable conditions.

END OF SECTION

SECTION 321216

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. The work to be performed is shown on the Drawings listed on the contract form. The work shall be performed in accordance with the East Providence Department of Public Works Specifications, and Rhode Island Department of Transportation Standard Specifications for Road & Bridge Construction (RIDOT Specifications), Latest Edition. Said documents are by reference made a part of the contract.
- B. The Work to be performed under this Section shall include furnishing all labor, materials and equipment required to do all the Bituminous Concrete Paving and related work as shown on the Drawings or herein specified. The Work shall further include all appurtenant items not specifically shown or itemized but which are implied or required to complete the Work in accordance with the reasonable intent of the Contract Documents.
- C. The principal work of this Section includes, but may not be limited to the following:
 - 1. New Bituminous Concrete Paving for Walks, Parking Areas, and other areas as shown.
 - 2. Paving to consist of a two (2) course hot placed and compacted pavement of mineral aggregate, mineral filler, and bituminous material, to the various depths and cross sections shown on the documents.
 - 3. Fine grading of the gravel base course.

1.3 RELATED WORK

- A. Carefully examine all of the Contract Documents for requirements that affect the work of this Section. Other specifications that directly relate to the work of this section include, but are not limited to, the following:
 - 1. Section 312000 – EARTH MOVING

1.4 QUALITY ASSURANCE

- A. The following Specifications and all related items and methods shall the Rhode Island Department of Transportation Standard Specifications for Road & Bridge Construction (RIDOT Specifications), Latest Edition. Method of payment part of each Section is deleted and shall not be included.

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1.5 ADA AND STATE OF RHODE ISLAND GOVERNOR'S COMMISSION ON DISABILITIES
(GCD) COMPLIANCE

- A. Special attention is to be given to compliance with the Americans with Disabilities Act (ADA) and the requirements of the State of Rhode Island Governor's Commission on Disabilities (GCD)
 - 1. All walkways shall be graded to a 4.5 percent running slope, with a maximum allowed running slope of 5 percent.
 - 2. The cross slope (perpendicular to travel) for all walkways and paths shall be constructed at 1.5 percent with a maximum cross slope of 2 percent.
 - 3. The slope of all ramps and side slopes of handicap curb cuts shall be constructed at 7.5 percent, with a maximum of 8.3 percent. Ramps shall be constructed to a maximum slope of 8.3 percent.
 - 4. Accessible parking spaces and loading zones shall be level with a surface slope not exceeding 2 percent in all directions.
 - 5. A 5 ft. minimum level (1.9 percent max pitch) area shall be provided at all flush entrances to buildings. Puddling of water at the entrances shall not be allowed.
 - 6. The Contractor shall assume that all grades in pedestrian paths of travel shall be verified/checked with a 2 ft. electronic "Smart Level".
- B. The above requirements shall supersede the grades shown on the plans. If these requirements cannot be met with the grades shown on the plans, the Designer shall be notified immediately for direction.
- C. Areas installed which do not meet the above requirements shall be removed and replaced at the Contractor's expense.

PART 2 - PRODUCTS

2.1 GRAVEL SUB-BASE

- A. Material for aggregate subbase shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation.
- B. Material for aggregate base shall conform to RIDOT Standard Specifications and EARTH MOVING specification.

2.2 DENSE GRADED CRUSHED STONE FOR SUB-BASE

- A. Material for aggregate subbase shall consist of crusher-run coarse aggregates of crushed stone or gravel and fine aggregates of natural sand or stone screenings uniformly premixed and placed on the subgrade or subbase in close conformity with the lines and grades shown on the Drawings.
- B. Material shall conform to RIDOT Standard Specifications Section and EARTH MOVING specification.

2.3 RECLAIMED BASE COURSE

- A. The work shall consist of scarifying and pulverizing the in-place pavement and underlying material, mixing and/or blending the materials, and spreading and compacting resultants mixture to the lines and grades shown on the plans and details.
- B. All scarified and pulverized material shall pass the 3-inch sieve. Material for blending shall conform to RIDOT Standard Specification and EARTH MOVING specification.

2.4 GRAVEL BASE COURSE

- A. Material for aggregate base course shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation. Material for aggregate base shall conform to RIDOT Standard Specification and EARTH MOVING specification.

2.5 BITUMINOUS CONCRETE

- A. Bituminous concrete shall be a standard plant-mixed, hot-laid paving material for road work, consisting of clean, mineral aggregate, mineral filler (if required), and bituminous material conforming to RIDOT Standard Specifications Section Bituminous Concrete.
- B. Reclaimed asphalt pavement (RAP) shall be used at the Contractor's option, unless otherwise indicated, provided that the end product is in conformance with the designated job-mix formula. The use of RAP shall be permitted for base, binder, or dense binder courses only. RAP shall comply with RIDOT Standard Specifications.
- C. Job-mix formula shall comply with Table A Mixes, as specified in RIDOT Standard Specifications.
- D. Base, or bottom course, paving for roadways and parking lots shall have maximum aggregate size passing 2 in. sieve and bitumen content of 4.5 percent (plus or minus 1/2 percent by weight).
- E. Binder course paving for roadways and parking lots shall have maximum aggregate size passing 1 in. sieve and bitumen content of five percent (plus or minus 1/2 percent by weight).
- F. Top, or wearing course, paving for roadways and parking lots shall have maximum aggregate size passing 5/8 in. sieve and bitumen content of 6.5 percent (plus or minus 1/2 percent by weight).
- G. Surface, or wearing course, paving for sidewalks shall conform to composition for "Dense Mix."

2.6 AGGREGATE

- A. Coarse Aggregate: Clean, crushed rock consisting of the angular fragments obtained by breaking and crushing shattered natural rock, free from a detrimental quantity of thin or elongated pieces, free from dirt or other objectionable materials, and complying with ASTM D692 and RIDOT Standard Specifications Section Borrow and Aggregates.

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- B. Fine Aggregate: Sharp-edged, natural sand, sand prepared from stone, or combinations thereof complying with ASTM D1073 and RIDOT Standard Fine Aggregate.
- C. Filler: Portland Cement, limestone dust, hydrated lime, stone float, or stone dust complying with ASTM D242 and RIDOT Standard Specifications.

2.7 BITUMINOUS MATERIALS

- A. Bituminous material for tack coat shall be one of the following:
 - 1. Cut-back asphalt (rapid-curing type) conforming to AASHTO M81, Grade RC-70.
 - 2. Emulsified asphalt (rapid-setting type) conforming to AASHTO M140, Grade RS-1.
- B. Bitumen shall be a rapid-setting type emulsified asphalt conforming to AASHTO M140, Grade RS-1.
- C. Bituminous crack sealer shall be a hot-applied bituminous sealer conforming to Fed. Spec. SS-S-1401C.
- D. For any bituminous mixture containing RAP, the Contractor shall submit, in addition to the Job-Mix formula, the amount and type of asphalt modifier to be added to the mixture to restore the asphalt properties of the RAP to a level that is reasonably consistent with the requirements for new asphalt.

PART 3 - EXECUTION

3.1 PAVEMENT FOUNDATION CONDITIONS

- A. Subgrade materials and preparation are specified in Section 312000. Gravel base material, thickness, and compaction is detailed on the Drawings. Fine grading is specified herein.

3.2 ESTABLISHMENT OF GRADES

- A. Establish grade stakes from the Contract Drawings Site Grading Plan. The grade stakes shall be set to desired section and elevation and due allowances shall be made for existing improvements, proper drainage and adjoining property rights.

3.3 PROTECTION OF WORK BY OTHERS

- A. Protect all work previously installed such as manholes, catch basins, sewer cleanouts, lighting posts, bases, curbs, sidewalks, etc. Repair any damage to this work caused by work of this Section.

3.4 PAVEMENT TRIMMING

- A. Only sawcutting (without overcuts) shall be allowed as a means of creating the final (permanent) edge between existing and new hot-mix asphalt. All overcuts shall be filled with bituminous joint sealer. The standard cutback for all permanent pavement patches shall be 24" beyond the original pavement cuts made to perform the Contractor's work.

3.5 PAVEMENT APPLICATION

- A. The gravel base course shall be fine graded in accordance with the Drawings and the maximum allowable deviation shall be 1/2 inch in ten (10) feet. Spread additional screening into any area showing segregation and roll into the surface until all voids in the base course have been completely filled. Rolling of the entire base shall be performed in the presence of the Soils Laboratory.
- B. The bituminous prime coat shall be applied to the base course at the rate of 0.05 gallons per square yard. The base course shall be relatively dry at the time the primer is applied. The prime coat shall be allowed to cure for a minimum of twenty-four (24) hours.
- C. Bituminous concrete shall be installed to the minimum thickness as specified. The compacted thickness shall be equal to or greater than the thickness specified. No skin patching will be accepted. Compaction of the bituminous concrete shall be equal to 97% of that obtained in the Laboratory. Bituminous concrete shall be rolled with a ten-ton roller as soon after placing as is practical.
- D. Provide a slope for drainage as indicated on the Drawings. Slope to catch basins as provided.
- E. The surface of the finished pavement shall be free of roller depressions. When tested with water, the surface shall not contain any irregularities which will impede water flow.
- F. Bituminous concrete paving shall abut concrete curbs and walls making a smooth, even, clean joint as indicated on the Drawings.

3.6 FIELD QUALITY CONTROL

- A. As directed by the Architect, the Owner will furnish the services of a testing laboratory to perform compaction and thickness testing. All testing is to be performed in accordance with ASTM or AASHTO recommended procedures.

END OF SECTION

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SECTION 321723

PAVEMENT MARKING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 WORK INCLUDED

- A. Provide all additional equipment and materials not otherwise specified, and do all work necessary for pavement marking, as indicated on the Drawings including but not limited to parking space striping, painted parking islands, fire lane markings, handicap parking symbols, loading areas, stop lines, painted crosswalks, and painted lettering.

1.3 RELATED WORK UNDER OTHER SECTIONS

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. Other Specifications which directly relate to the work of this Section include, but are not limited to, the following:
 - 1. Section 321216 – ASPHALT PAVING

1.4 REFERENCES

- A. Work shall conform to codes and standards of the following:
 - 1. Rhode Island Department of Transportation Standard Specifications for Road & Bridge Construction (RIDOT Specifications), Latest Edition.

1.5 TRAFFIC CONTROL

- A. Place traffic cones along newly painted lines to control traffic and prevent damage to newly painted surfaces. Remove when paint has dried fully.
- B. Painting equipment shall be marked with large warning signs indicating slow moving painting equipment in operation.

PART 2 - PRODUCTS

2.1 PAVEMENT STRIPING

- A. Materials for pavement markings shall conform to RIDOT Specification M17.02 – Waterborne Pavement Markings.

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- B. Paint shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, formulation number and directions, all of which shall be plainly legible at time of use.
- C. Paint shall be homogeneous, easily mixed to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of six months.

2.2 MARKING EQUIPMENT

- A. Machines, tools and equipment used in the application of pavement markings shall conform to RIDOT Specifications Section T20 – Pavement Markings and shall be approved and maintained in satisfactory operating condition.
- B. Push-type machines of a type commonly used for application of paint to pavement surfaces shall be acceptable for marking roadway and parking areas. Applicator machine shall have the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. New pavement surfaces shall be allowed to cure for a period of not less than 48 hours before application of marking materials.
- B. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods, as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed using scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion, as directed.

3.2 PAVEMENT MARKING

- A. Marking materials shall be applied to clean, dry surfaces in accordance with the requirements of RIDOT Specifications Section T20 – Pavement Markings.
- B. Paint shall be applied pneumatically with approved equipment.
- C. Pavement marking materials shall be applied evenly to the pavement surface to be coated at a rate specified by the manufacturer.
- D. Edges of markings shall be sharply outlined.
- E. Maximum drying time requirements of the paint manufacturer shall be enforced to prevent undue softening of bitumen, and pickup, displacement or discoloration by vehicle tires.
- F. If markings require more drying time than stated by the paint manufacturer, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

3.3 PROTECTION OF MARKINGS

- A. Markings shall remain protected until the paint has dried.

END OF SECTION

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SECTION 323000

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

- A. Work Included: Providing and installing all site improvements shown on the Drawings and as specified herein, including:
1. Project Signage and Posts
 2. Steel Bollards
 3. Player Benches
 4. Native Stone Walls
 5. Bike Racks
 6. Flagpoles
 7. Native Boulder Embankments
 8. Ornamental Benches
 9. Baseball Equipment
 10. Collapsible Bollards
 11. Timber Amphitheatre Seating

1.3 RELATED WORK DESCRIBED ELSEWHERE

- A. Carefully examine all of the Contract Document for requirements which affect the work of this Section. Other specifications which directly relate to the work of this Section include, but are not limited to, the following:
1. Section 099000 – PAINTING
 2. Section 033000 – CAST-IN-PLACE CONCRETE
 3. Section 312000 – EARTH MOVING
 4. Section 321216 – ASPHALT PAVING
 5. Section 321313 – CONCRETE PAVING
 6. Section 321600 – CURBS
 7. Section 329200 – TURF & GRASSES

1.4 SUBMITTALS

- A. Shop Drawings: Contractor shall provide fully dimensioned shop drawings and manufacturer's technical literature for all improvements and confirm fabrication, reinforcing, and anchoring systems for approval.

PART 2 - PRODUCTS

2.1 METAL BOLLARDS

- A. Schedule 40 galvanized seamless pipe including concrete core and schedule 40 galvanized steel dome welded to pipe and ground smooth. Install as per detail.
- B. Bollards shall be tightly fitted with a high density polyethylene post guard similar to Standard Bumper Post by Stor-Quip Systems, Inc., Bollardgard by Innoplast, Post Guard by Encore Commercial Products, Inc., or approved equal.

2.2 CONCRETE

- A. 4,000 psi as specified in Sections 033000.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

- A. Confirm completion of pavements and other improvements are properly sequenced prior to installation of specified improvements.

3.2 BOLLARDS:

- A. Fabricate and finish bollards as detailed. Install bollards where and as detailed. Hold bollards at a constant alignment.

3.3 PROTECTION/CLEAN UP

- A. Protect: until acceptance of the project. Replace or refinish the surfaces if damaged prior to acceptance.
- B. Clean up all debris from installation procedures.

END OF SECTION 32300