Contract Documents for:

Alterations 2022
Piqua High School

PIQUA CITY SCHOOLS
Piqua High School
1 Indian Trail, Piqua, OH 45356

Prepared for:

Piqua City School District
215 Looney Road
Piqua, OH 45356

Prepared by:

RDA GROUP ARCHITECTS LLC
7945 Washington Woods Drive
Dayton, Ohio 45459
937.610.3440

BID SET
January 24, 2022

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DRAWINGS

END OF DOCUMENT

BIDDING REQUIREMENTS

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SECTION 00 21 13 - INSTRUCTIONS TO BIDDERS

PART 1 GENERAL

1.1 DEFINITIONS

A. Bidding Documents include the Bidding Requirements and proposed Contract Documents. The Bidding Requirements consist of the Invitation to Bid, Instructions to Bidders, Bid Form, and other Bidding and Contract Forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract [General, Supplementary and other Conditions], Drawings, Specifications, and all Addenda issued prior to the execution of the Contract.

B. Bidding Documents: Contract Documents supplemented with Invitation to Bid, Instructions to Bidders, Bid Form, and Bid Securities, issued addenda, identified.

C. Contract Documents: Defined in AIA Document A104-2017.

D. Bid: Executed Bid Form and required attachments submitted in accordance with these Instructions to Bidders.

E. Bid Price: Monetary sum identified by the Bidder in the Bid Form.

1.2 BID SUBMISSION

A. **Two [2] copies of the Bids, signed and under seal, executed, and dated will be received by Piqua City Schools, Board of Education Office located at 215 Looney Road, Piqua, OH 45356 until 12:00 PM local time on February 15, 2022.**

B. Bids submitted after the above time may be returned to Bidder unopened.

C. Amendments to submitted Bids will be permitted when received in writing prior to bid closing and when endorsed by the same party or parties who signed and sealed the Bid.

D. Bidders may withdraw their Bid by written request at any time before bid closing.

1.3 INTENT

A. The intent of this Bid request is to obtain an offer to perform work to complete an Alterations Project at Piqua High School for a Stipulated Sum contract, in accordance with Contract Documents. **The project is intended to be accomplished in the summer 2022 [see section 01 00 00 coordination/work schedules].**

1.4 WORK IDENTIFIED IN CONTRACT DOCUMENTS

A. Work of this proposed Contract comprises of general construction – General Construction / Rehabilitation and all interrelated work as outlined on the project documents.

1.5 CONTRACT DOCUMENTS IDENTIFICATION

A. The Contract Documents are identified as **Alterations 2022, Piqua High School, Piqua City Schools** as prepared by RDA Group Architects, 937.610.3440, 7945 Washington Woods Drive Dayton OH 45459

1.6 AVAILABILITY OF DOCUMENTS

A. Bidding Documents may be obtained upon request from Jonathan Schaaf at RDA by emailing **JRS@rda-group.com**.

B. Bidding Documents may be printed at the bidder's expense with no refund. Bidding Documents will be issued in PDF format only.

C. Partial sets of Bidding Documents will not be issued. The Owner and RDA shall not be responsible for errors or misinterpretations resulting from the use of incomplete sets of Bid Documents.

D. Cost of the Bidding Documents is non-refundable.

E. Bidding Documents are made available only for the purpose of obtaining offers for this Project. Their use does not grant a license for other purposes.

1.7 EXAMINATION OF DOCUMENTS

A. Bidding Documents are not on display at the offices of RDA nor at Piqua Board of Education Office but may be on display at other agencies.

B. Upon receipt of Bidding Documents verify documents are complete. Notify RDA if documents are incomplete.

C. Immediately notify RDA upon finding discrepancies or omissions in Bidding Documents.

D. The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and location conditions.

E. Bidders requiring clarification or interpretation of the Bidding Documents shall make a written request at least 5 days prior to the Bid Date

F. Interpretations, corrections and changes to the Bidding Documents will be made by Addendum only.

1.8 DESCRIPTION OF THE BID DOCUMENTS

A. Bid Documents consist of Drawings, Technical Specifications, and General Conditions. All documents are intended to complement the other. It is the Contractor's Responsibility to review all documents, coordinate between applicable documents, interpret the work scope required to provide the finished product as outlined. The Contractor shall coordinate all aspects of the project, including delineation between various trades.
   1. Drawings indicate the general configuration and layout of the work and indicate individual scope of work items.
   2. All units and/or dimensions indicated are approximate and are to be field verified by contractor. It is the contractor's responsibility to field verify the location and dimensions of any work scope item prior to bid.
   3. All work should be referenced with the applicable technical specifications and standards.
   4. Technical Specifications will contain a specification description for each work scope identified on the Drawings and Bid Form.

1.9 INQUIRIES AND ADDENDA

A. Direct questions in writing to Jonathan Schaaf of RDA; email: JRS@rda-group.com.

B. Verbal answers are not binding on any party.

C. Submit questions not less than 5 days before date set for receipt of Bids. Replies will be made by Addenda.

D. Addenda will be issued no later than two days prior to the Bid Date except for an Addendum which changes the Bid Date.

E. Addenda may be issued during bidding period. Addenda will be sent to all known Bidders and plan rooms where Bid Documents are on file. Addenda become part of the Contract Documents. Include resultant costs in the Bid Price. Bidder shall acknowledge receipt of Addenda in the Bid.

1.10 PRODUCT SUBSTITUTIONS

A. Refer to Section 01 25 00 for specific requirements for substitution requests.

B. Approved substitutions will be identified by Addenda.

C. Bidders shall not rely upon approvals made in any other manner.

1.11 SITE EXAMINATION

A. Examine the Project Site before submitting a Bid.

B. Contact Sean Shumaker at 937.423.2238 to arrange date and time to visit Project site.

1.12 PRE-BID CONFERENCE [MANDATORY]

A. **A MANDATORY Bidders conference is scheduled for 3:00 PM on February 1, 2022, meet at the main entrance of Piqua High School, 1 Tomahawk Trail, Piqua, OH 45356.**

B. Representatives of the Owner and RDA will be in attendance.

C. Summarized minutes of this meeting will be circulated to known Bidders if necessary. These minutes will form part of Contract Documents.

D. Information relevant to Bidding Documents will be issued by Addendum.

1.13 BIDDER QUALIFICATIONS

A. To demonstrate qualification for performing the Work of this Contract, Bidders will be required to complete an AIA A305 Document and submit this document with their bids, sample of document provided in the bid documents.

B. In addition, bidder may be requested to submit written evidence of financial position, previous experience, current commitments, and license to perform work, as applicable.

1.14 SUBMISSION PROCEDURE

A. Bidders shall be solely responsible for delivery of Bids in manner and time prescribed. Bids received after the time and date established for the receipt of Bids will be returned unopened. Verbal, telephone, facsimile, or email/electronic bids will not be considered.

B. Submit all 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 Owner and shall identify the Project Name, and the Bidder's Name, address, and contact information. If the Bid is sent via USPS, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face.

C. Improperly completed information, irregularities in Bid, may be cause not to open the Bid Form envelope and declare the Bid invalid or informal.

D. An abstract summary of submitted Bids will be made available to all Bidders present following bid opening.

1.15 BID INELIGIBILITY

A. Bids that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may be declared unacceptable at Owner's discretion.

B. Failure to acknowledge addenda may be cause for disqualification of the bid at the discretion of the Owner.

C. Failure to provide security deposit, bonds or insurance requirements will invalidate the Bid at the discretion of the Owner.

D. Bid Forms, Appendices, and enclosures which are improperly prepared may be declared unacceptable at Owner's discretion.

1.16 BIDDER'S REPRESENTATION

A. The Bidder by submitting a Bid represents that:
   1. The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.
   2. All units expressed in this bid documents are approximate, and it is the contractor's exclusive responsibility to thoroughly review the project site and verify Work prior to submitting a bid. Any variance or discrepancy in work scope must be submitted in writing prior to bid. Submission of bid indicates all Work is agreed upon and all bid documents have been read and understood. Any questions regarding the bid documents have been addressed before submittal. Questions should be submitted in a formal email request to RDA at least seven days before the Bid Due Date. A formal response will be issued via addendum if required. Any discrepancy discovered after award will be decided in the favor of the Owner.
   3. The Bid is made in full compliance with the Bidding Documents.
   4. Compliance with all applicable regulations to the described work will be met.
   5. The Bidder has visited the project site, become familiar with the conditions under which the work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.
   6. The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.
   7. <u>The work can be performed as described, in the time period allotted, for the price provided on the Bid Form</u>.

B. Submission of a bid shall be considered the Contractor's Certification that the bid is based upon equipment and/or materials that meet or exceed the standards set forth by specification or equipment and/or materials identification. Should a Contractor's product be determined not equal to that specified, the Contractor shall be required to provide and install a product acceptable as equal by the Architect at no additional cost to the Owner.

C. The submission of a bid shall indicate that the Contractor has visited the project site and is familiar with the conditions as they exist, and the modifications that may be necessary to provide a complete and professional finished project.

1.17 PREPARATION OF BIDS / DOCUMENTS

A. Bids shall be submitted on the Bid Form included with the Bidding Documents.

B. All blanks on the Bid Form shall be legibly executed in ink.

C. Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

D. Interlineations and alterations must be initialed by the Signer of the Bid.

E. All requested Alternates shall be Bid. If no change in Base Bid is required, enter "NO CHANGE".

F. 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 make no additional stipulations on the Bid Form nor qualify the Bid in any other manner.

G. Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a Corporation shall further give 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.

H. Bidder has the option not to submit a bid on any one of items of the Bid Form, in this case the words "NO BID" shall be noted on the Bid Form corresponding to that Item.

I. The following documents must be provided as part of the bid submittal:
   1. Bid form [2 copies]
   2. Bid Guaranty/Contract Bond or Check or Bond.
   3. Affidavit regarding bidder's property taxes.
   4. Completed AIA A305 Form.

1.18 BID SECURITY / CONTRACT BOND

A. Each Bid shall be accompanied as follows and other requirements as noted in the contract documents:
   1. Bid Security for 10% of the highest amount quoted, written on a cashier's check, certified check or surety company bond pursuant to Chapter 1305 and section 153.54 of the revised code in the amount of a sum no less than 10 percent of the Bid Price drawn in favor of the Owner.
   2. If a bid security is only submitted with the bid, each successful bidder is required to furnish a Performance Bond and Labor and Material Bond [AIA Form A312] in the amount of 100% of the full contract amount.
   3. If a bid guaranty and contract bond [Form Enclosed] in the amount of 100% of the highest amount quoted is submitted with the bid, no additional bonds are required.

B. Endorse Bid Bond in name of the Owner as obligee, signed and sealed by the principal [Contractor] and surety.

C. Endorse certified check in name of the Owner.

D. Security deposit of accepted Bidder will be returned after delivery to the Owner of the required Performance and Payment Bonds by the accepted Bidder.

E. Include the cost of security deposit in the Bid Price.

F. After a Bid has been accepted, security deposits will be returned to the respective Bidders. The Owner shall have the right to retain the bid security of Bidders whom an award is being considered until either the Contract has been executed and the bonds have been furnished or the specified time has elapsed so the Bids may be withdrawn or all Bids have been rejected.

G. If no contract is awarded, security deposits will be returned.

1.19 SELECTION AND AWARD OF ALTERNATES

A. Indicate variation of Bid Price for alternates listed in the Bid Documents. This form requests a "difference" in Bid Price by adding to or deducting from base Bid Price.

B. Bids will be evaluated on total of base Bid Price with any accepted alternates as applicable. Alternates can be selected in any order and/or combination as chosen by the Owner.

1.20 BID OPENING

A. Bids will be opened immediately after time for receipt of Bids.

B. Bidders may be notified within three days if they are the low bidder.

C. Piqua City Schools Board of Education will provide approval of the lowest responsive bid.

1.21 MODIFICATION OF BID

A. Bids shall remain open to acceptance and shall be irrevocable for a period of 90 days after bid closing date. No bidder shall modify, withdraw or cancel the Bid or any part for the period of 90 days.

B. Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing and include the signature of the owner. Confirmation shall be received and time/date stamped by the receiving party. Any change shall be worded such not to reveal the amount of the Bid. Bid Security shall be in the amount sufficient for the Bid resubmitted.

1.22 ACCEPTANCE OF OFFER

A. The Owner reserves the right to accept or reject any or all offers for any reason.

B. It is the intent of the Owner to award a Contract to the lowest qualified Bidder for each bid item provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available and the Board approves the project. 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 own best interests.

C. Award will be as outlined in Article below.
   1. The Bid must be submitted by a qualified bidder as determined by the Owner. In determining whether a bidder is qualified, the following factors will be considered:
      a. Demonstrated ability to successfully complete previous projects of a similar size, scale, and complexity on a compressed time schedule.
      b. Clear indication of due diligence by the Bidder to outline the project schedule to meet the compressed construction schedule requirements.
      c. Past experience of the Bidder,
      d. Financial Condition of the Bidder,
      e. Conduct and performance of Bidder on previous contracts [includes workmanship, meeting deadlines, available sufficient skilled manpower, safety record, and overall project commitment]
      f. Any past or pending litigation involving the Bidder.
   2. If the lowest Bidder is not determined to be qualified by the Owner, the next lowest Bidder qualifications will be reviewed. The review will continue until a qualified Bidder is obtained.
   3. The Owner may choose to inquire as to RDA's knowledge with any Bidder under consideration for the project. RDA and all its employees shall be indemnified and held harmless for any effect such information may have on the decision of the Owner as to the Bidder's qualifications.
   4. It is the Intent of the Owner to award the project, regardless of the award, phasing, etc. to [1] qualified contractor. It is not intended to enter into contracts with multiple contractors for each building / major component / alternate.

D. Public Bid Opening Evaluation: Initial evaluation of the bids received for the project will be as follows:
   1. Bid Amount[s] submitted, including alternates.
      a. Bids will be evaluated on the total bid amount with any accepted alternates as applicable.
   2. Submission of the appropriate bid bond, affivadits, and other requested forms / documents.

E. Post-Bid Evaluation: Subsequent evaluation of the bids received for the project will be as follows:

1. Piqua City Schools and RDA will be engaging in post-bid interviews with the lowest qualified bidder[s] of the project from of the public bid opening to determine the lowest and best qualified bidder.
2. Piqua City Schools may elect to engage interviews with multiple bidders at their discretion as time is of the essence to provide a formal recommendation to the Board of Education at their February board meeting.
3. RDA will contact the bidders proposed to be interviewed within [1] day after the public bid opening.
4. These post bid interviews will be conducted within [3] days after the bid opening at an undisclosed time.
5. At the time of the post-bid interview, the Contractor shall provide the following documentation for consideration:
    a. Demonstrated performance history / references for projects of similar size, scale, and complexity accomplished on a compressed construction schedule.
    b. Demonstrated performance of the Critical Path Construction / Project Schedule, including multiple shift work, critical path items, potential problems in the schedule
    c. Availability of in-house Contractor manpower and staffing of the project
    d. Proposed project manager and project superintendent[s]
    e. A full list of Proposed Sub-Contractors
    f. Confirmation of Sub-Contractor manpower availability
6. Piqua City Schools and RDA plan to use the post-bid interviews as a confirmation by the Contractor that they understand the intended scope, deliverable product to the Owner, project schedule, etc.

F. The Owner shall have the right to accept the Bids and Alternates in any order or combination and to determine the low Bidder on the basis of the sum of the Bid and Alternates accepted.

G. The Owner reserves the right to evaluate on any other criteria deemed necessary including non-monetary criteria such as past performance, references, schedule, manpower availability, etc. These criteria are at the sole discretion of RDA and the Owner.

H. The Owner reserves the right to further negotiate with the bidders at their discretion for additional cost savings and/or value engineering alternatives if desired to meet funding limitations, budgets, or phasing opportunities.

1.23 OWNER'S FINANCIAL CAPABILITY

A. The Owner shall, as the request of the Bidder under award of a contract, furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Unless such reasonable evidence is furnished, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

1.24 SUBMITTALS

A. The Bidder shall, after the notification of award, furnish to RDA in writing:
1. Designation of Work to be performed with the Bidder's own forces.
2. Names of manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work as outlined herein.
3. Names of persons or entities proposed for the principal portions of Work.

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

C. Prior to the execution of the Contract, RDA will notify the Bidder in writing of either the Owner or RDA, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or RDA has reasonable objection to a person or entity,

the Bidder may submit an acceptable substitute person or entity. No adjustment shall be made to the Base Bid.

D. Persons and entities proposed by the Bidder and accepted by RDA and Owner 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 RDA.

1.25 PERFORMANCE AND PAYMENT BOND

A. This contract shall require a Performance Bond in the amount of 100% of the contract amount, sample form provided. Surety shall be a corporation authorized to do business in the State of Ohio. The bond shall remain in force for a period of one [1] year after completion of the work.

B. The cost for Performance Bond shall be included in the Bid.

C. The Bidder shall deliver the required bonds to the Owner not later than three days following the date of the execution of the Contract, if the Bid Guaranty and contract Bond converts into a Performance and Payment Bond, the bidder shall notify the owner in writing. If the work is to be commenced prior thereto 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.

1.26 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

A. AIA Document A104 “Standard Abbreviated Form of Agreement between Owner and Contractor”, 2017 Edition will be used for this project.
   1. RDA will draft the AIA Agreement and distribute for review and signature by the Contractor and Owner.
   2. A fully executed, signed copy of the agreement will be provided to the Contractor by the Owner or RDA.

END OF SECTION

BID GUARANTY AND CONTRACT BOND

(153.571 Ohio Revised Code)

KNOW ALL PERSONS BY THESE PRESENTS**,** that we, the undersigned _____ as principal and _____ as sureties, are hereby held and firmly bound unto _____ as obligee in the penal sum of the dollar amount of the bid submitted by the principal to the obligee on _____, 2022 to undertake the project known as : _____ (Project Name)

The penal sum referred to herein shall be the dollar amount of the principal's bid to the obligee, incorporating any additives or deductive alternative proposals made by the principal on the date referred to above to the obligee, which are accepted by the obligee, in no case shall the penal sum exceed the amount of _____Dollars.
(If the above line is left blank, the penal sum will be the full amount of the principal's bid, including alternative. Alternatively, if complete, the amount stated must not be less than the full amount of the bid including alternates, in dollars and cents. A percentage is not acceptable.) For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas the above named principal has submitted a bid for _____.

NOW, THERFORE, if the obligee accepts the bid of the principal and the principal fails to enter into a proper contract in accordance with the bid, plans, details, specifications and bills of material; and in the event the principal pays to the obligee the difference not to exceed ten per cent of the penalty hereof between the amount specified in the bid and such larger amount for which the obligee may in good faith contract with the next lowest bidder to perform the work covered by the bid; or in the event obligee does not award the contract to the next lowest bidder and resubmits the project for bidding, the principal pays to the obligee the difference not to exceed ten percent of the penalty hereof between the amount specified in the bid, or the costs, in connection with the resubmission, of printing new contract documents, required advertising, and printing and mailing notices to prospective bidders, whichever is less, then this obligation shall be null and void, otherwise to remain in full force and effect; if the obligee accepts the bid of the principal and the principal within ten days after the awarding of the contract enters into a proper contract in accordance with the bid, plans, details, specifications and bills of material, which said contract is made a part of this bond the same as though set forth herein;

NOW ALSO, if the said _____ shall well and faithfully do and perform the things agreed by _____ to be done and performed according to the terms of said contract; and shall pay all lawful claims of the subcontractors, materials suppliers and laborers, for labor perform and materials furnished in carrying forward, performing, or completing of said contract; we agreeing and assenting that this undertaking shall be for the benefit of any materials suppliers or laborer having a just claim, as well as for the oblige hereon; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

THE SAID surety hereby stipulates and agrees that no modification, omissions, or additions, in or to the terms of the said contract or in or to the plans or specifications therefore shall in any wise affect the obligations of said surety on its bond.

SIGNED AND SEALED This _____ day of _____, 20____.

PRINCIPAL:

_____
BY: _____
TITLE:_____
SURETY: _____ SURETY COMPANY ADDRESS:
_____ _____
SURETY AGENT ADDRESS:
BY: _____ _____
Attorney-in-Fact

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AFFIDAVIT ON DISCLOSURE OF DELIQUENT PERSONAL PROPERTY TAXES

(5719.042 Ohio Revised Code)

State of Ohio) SS
)
County of Miami

The undersigned being duly authorized officer(s) or owner(s) of _____ (Company) Do solemnly swear or affirm that charges of personal property taxes on the general tax list of personal property taxes of any county in which the Piqua City School District has territory (have) (have not) been made against _____ (Company).

The following is a true and accurate listing of all due and unpaid delinquent taxes and any due and unpaid penalties and interest thereon.

_____
Signature of Officer or Owner

Sworn or affirmed to before me and subscribed in my presence this _____ day of _____, 20___

_____
Notary Public

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AIA® Document A305™ – 1986

Contractor's Qualification Statement

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

SUBMITTED TO:

ADDRESS:

SUBMITTED BY:

NAME:

ADDRESS:

PRINCIPAL OFFICE:

- ☐ Corporation
- ☐ Partnership
- ☐ Individual
- ☐ Joint Venture
- ☐ Other

NAME OF PROJECT: *(If applicable)*

TYPE OF WORK: *(File a separate form for each Classification of Work.)*

- ☐ General Construction
- ☐ HVAC
- ☐ Electrical
- ☐ Plumbing
- ☐ Other: *(Specify)*

This form is approved and recommended by the American Institute of Architects (AIA) and The Associated General Contractors of America (AGC) for use in evaluating the qualifications of contractors. No endorsement of the submitting party or verification of the information is made by AIA or AGC.

§ 1.0 ORGANIZATION

§ 1.1 How many years has your organization been in business as a Contractor?

§ 1.2 How many years has your organization been in business under its present business name?

§ 1.2.1 Under what other or former names has your organization operated?

§ 1.3 If your organization is a corporation, answer the following:

§ 1.3.1 Date of incorporation:

§ 1.3.2 State of incorporation:

§ 1.3.3 President's name:

§ 1.3.4 Vice-president's name(s):

§ 1.3.5 Secretary's name:

§ 1.3.6 Treasurer's name:

§ 1.4 If your organization is a partnership, answer the following:

§ 1.4.1 Date of organization:

§ 1.4.2 Type of partnership, if applicable:

§ 1.4.3 Name(s) of general partner(s):

§ 1.5 If your organization is individually owned, answer the following:

§ 1.5.1 Date of organization:

§ 1.5.2 Name of owner:

§ 1.6 If the form of your organization is other than those listed above, describe it and name the principals:

§ 2.0 LICENSING

§ 2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.

§ 2.2 List jurisdictions in which your organization's partnership or trade name is filed.

§ 3.0 EXPERIENCE

§ 3.1 List the categories of work that your organization normally performs with its own forces.

§ 3.2 Claims and Suits

(If the answer to any of the questions below is yes, attach details.)

§ 3.2.1 Has your organization ever failed to complete any work awarded to it?

§ 3.2.2 Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?

§ 3.2.3 Has your organization filed any law suits or requested arbitration with regard to construction contracts within the last five years?

§ 3.3 Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract?
(If the answer is yes, attach details.)

§ 3.4 On a separate sheet, list major construction projects your organization has in progress, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.

§ 3.4.1 State total worth of work in progress and under contract:

§ 3.5 On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces.

§ 3.5.1 State average annual amount of construction work performed during the past five years:

§ 3.6 On a separate sheet, list the construction experience and present commitments of the key individuals of your organization.

§ 4.0 REFERENCES

§ 4.1 Trade references:

§ 4.2 Bank references:

§ 4.3 Surety

§ 4.3.1 Name of bonding company:

§ 4.3.2 Name and address of agent:

§ 5.0 FINANCING

§ 5.1 Financial Statement

§ 5.1.1 Attach a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items:

.1 Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses);

.2 Net Fixed Assets;

.3 Other Assets;

.4 Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes); and

.5 Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).

§ 5.1.2 Name and address of firm preparing attached financial statement, and date thereof:

§ 5.1.3 Is the attached financial statement for the identical organization named on page one?

§ 5.1.4 If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsidiary).

§ 5.2 Will the organization whose financial statement is attached act as guarantor of the contract for construction?

§ 6.0 SIGNATURE

§ 6.1 Dated this day of 20

Name of organization:

By:

Title:

§ 6.2

M being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this day of 20

Notary Public:

My commission expires:

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

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Bid Form

To: Piqua City School District
215 Looney Road
Piqua, OH 45356

Having carefully read and examined the "Scope of Work", "Specifications", "Plans", and any addendum for:

Alterations 2022

Piqua High School
PIQUA CITY SCHOOLS
215 S. Looney Road, Piqua, OH 45356

As prepared by:
RDA Group Architects, LLC.
7945 Washington Woods Drive
Dayton, OH 45459
Phone: 937.610.3440
Fax: 937.610.3441

And having inspected the premises and all conditions affecting the work, the undersigned proposes to furnish all materials and perform all labor necessary for the performance and completion of the work indicated below, all in compliance with the documents named above, and further agrees that each separate item of trade or employment further agrees that, if any or all of said bids are accepted, he will enter into a Contract according to the form required by the Owner for the faithful performance of the labor and the furnishing of all materials included in such bid or bids so accepted.

Submitted by: _____
Contracting Firm

Having read and examined the Contract Documents, prepared by the Associate for the above-referenced Project, and the following Addenda:

Addendum No.	Date of Receipt
_____	_____
_____	_____
_____	_____

The undersigned Bidder having full knowledge of the site and the requirements of the Project proposes to perform all Work in accordance with the Contract Documents for the Sums as indicated on this Bid Form:

BID ITEM #1: PIQUA HIGH SCHOOL ALTERATIONS 2022: ALL LABOR, MATERIALS, EQUIPMENT and PERMIT FEES for the sum of

Base Bid Amount	$_____
Contingency Allowance –	$200,000
Permit Allowance –	$10,000
Door Hardware / Cores Allowance –	$35,000

Total Bid Amount including All Allowances

$_____ $_____
[FIGURES] [WORDS]

ALTERNATES:

None

UNIT PRICE SCHEDULE

UP-1	Remove and replace sealant joint, per linear foot	$_____/LF
UP-2	Prep and paint existing CMU wall, per square foot	$_____/SF
UP-3	Remove existing, re-point mortar joint in existing masonry, per linear foot	$_____/LF
UP-4	Remove existing, install new 6” CMU block, each	$_____/EA
UP-5	Remove existing, install new 8” CMU block, each	$_____/EA
UP-6	Install thru-penetration fire stop for electrical conduit / MC cable/ EMT penetration thru rated CMU wall assembly, each	$_____/EA
UP-7	Install thru-penetration fire stop for data cabling penetration thru rated CMU wall assembly, each	$_____/EA
UP-8	Install thru-penetration fire stop for plumbing supply piping penetration thru rated CMU wall assembly, each	$_____/EA
UP-9	Install thru-penetration fire stop for plumbing drain / waste / vent penetration thru rated CMU wall assembly, each	$_____/EA
UP-10	Install / repair existing spray applied firesafing at roof deck and roof structural framing members, per square foot	$_____/SF

Unit costs provided will be used as the basis for adjustments of project allowances in accordance with the actual work required / accomplished. Owner reserves the right to negotiate the unit costs at project award or during construction once conditions, scope, and or intent of work for any additional work related to the units costs are known.

PROJECT SCHEDULE

Bidder acknowledges the project schedule as stated in the Bid Documents and agrees to complete the work within the contract period scheduled. Failure to complete the work by the dates in the Bid Documents will be cause for enforcement of liquidated damages.

_____
[Bidder Initials]

The full name and address of all persons and parties interested in the foregoing proposals as principals are as follows:

Company_____

Name_____

Address_____

Phone_____Fax_____

Bidder's Signature_____

Typed Name_____

Title_____

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CONTRACT

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AIA® Document A104™ – 2017

Standard Abbreviated Form of Agreement Between Owner and Contractor

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

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

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

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

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

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

The Owner and Contractor agree as follows.

TABLE OF ARTICLES

ARTICLE 1 THE WORK OF THIS CONTRACT

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

ARTICLE 2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 2.1 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.

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

§ 2.3 Substantial Completion

§ 2.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check the appropriate box and complete the necessary information.)

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

☐ By the following date:

§ 2.3.2 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

§ 2.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 2.3, liquidated damages, if any, shall be assessed as set forth in Section 3.5.

ARTICLE 3 CONTRACT SUM

§ 3.1 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 one of the following:
(Check the appropriate box.)

☐ Stipulated Sum, in accordance with Section 3.2 below

☐ Cost of the Work plus the Contractor's Fee, in accordance with Section 3.3 below

☐ Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 3.4 below

(Based on the selection above, complete Section 3.2, 3.3 or 3.4 below.)

§ 3.2 The Stipulated Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 3.2.1 The Stipulated Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

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

Item	Units and Limitations	Price per Unit ($0.00)

§ 3.2.3 Allowances, if any, included in the stipulated sum:
(Identify each allowance.)

Item	Price

§ 3.3 Cost of the Work Plus Contractor's Fee
§ 3.3.1 The Cost of the Work is as defined in Exhibit A, Determination of the Cost of the Work.

§ 3.3.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee and the method of adjustment to the Fee for changes in the Work.)

§ 3.4 Cost of the Work Plus Contractor's Fee With a Guaranteed Maximum Price
§ 3.4.1 The Cost of the Work is as defined in Exhibit A, Determination of the Cost of the Work.

§ 3.4.2 The Contractor's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee and the method of adjustment to the Fee for changes in the Work.)

§ 3.4.3 Guaranteed Maximum Price
§ 3.4.3.1 The sum of the Cost of the Work and the Contractor's Fee is guaranteed by the Contractor not to exceed ($), subject to additions and deductions by changes in the Work as provided in the Contract Documents. This maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.
(Insert specific provisions if the Contractor is to participate in any savings.)

§ 3.4.3.2 The Guaranteed Maximum Price is based on the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

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

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

Item	Units and Limitations	Price per Unit ($0.00)

§ 3.4.3.4 Allowances, if any, included in the Guaranteed Maximum Price:
(Identify each allowance.)

Item	Price

§ 3.4.3.5 Assumptions, if any, on which the Guaranteed Maximum Price is based:

§ 3.4.3.6 To the extent that the Contract Documents are anticipated to require further development, the Guaranteed Maximum Price includes the costs attributable to such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include changes in scope, systems, kinds and quality of materials, finishes or equipment, all of which, if required, shall be incorporated by Change Order.

§ 3.4.3.7 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in Section 3.4.3.5. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the agreed-upon assumptions contained in Section 3.4.3.5 and the revised Contract Documents.

§ 3.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

ARTICLE 4 PAYMENT

§ 4.1 Progress Payments

§ 4.1.1 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.

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

§ 4.1.3 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 certified amount to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the date fixed above, payment 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.)

§ 4.1.4 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold retainage from the payment otherwise due as follows:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment and any terms for reduction of retainage during the course of the Work. The amount of retainage may be limited by governing law.)

§ 4.1.5 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.)

%

§ 4.2 Final Payment

§ 4.2.1 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 Section 18.2, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Contractor has submitted a final accounting for the Cost of the Work, where payment is on the basis of the Cost of the Work with or without a Guaranteed Maximum Price; and

.3 a final Certificate for Payment has been issued by the Architect in accordance with Section 15.7.1.

§ 4.2.2 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:

ARTICLE 5 DISPUTE RESOLUTION

§ 5.1 Binding Dispute Resolution

For any claim subject to, but not resolved by, mediation pursuant to Section 21.5, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

☐ Arbitration pursuant to Section 21.6 of this Agreement

☐ 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 in a court of competent jurisdiction.

ARTICLE 6 ENUMERATION OF CONTRACT DOCUMENTS

§ 6.1 The Contract Documents are defined in Article 7 and, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 6.1.1 The Agreement is this executed AIA Document A104™–2017, Standard Abbreviated Form of Agreement Between Owner and Contractor.

§ 6.1.2 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.)

§ 6.1.3 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

§ 6.1.4 The Specifications:
(Either list the Specifications here or refer to an exhibit attached to this Agreement.)

Section	Title	Date	Pages

§ 6.1.5 The Drawings:
(Either list the Drawings here or refer to an exhibit attached to this Agreement.)

Number	Title	Date

§ 6.1.6 The 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 enumerated in this Article 6.

§ 6.1.7 Additional documents, if any, forming part of the Contract Documents:

.1 Other Exhibits:
(Check all boxes that apply.)

☐ Exhibit A, Determination of the Cost of the Work.

☐ 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

.2 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents.)

ARTICLE 7 GENERAL PROVISIONS

§ 7.1 The Contract Documents

The Contract Documents are enumerated in Article 6 and consist of this Agreement (including, if applicable, Supplementary and other Conditions of the Contract), Drawings, Specifications, Addenda issued prior to the execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement. 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. 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 to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 7.2 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 between any persons or entities other than the Owner and the Contractor.

§ 7.3 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.

§ 7.4 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.

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

§ 7.5.1 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 will 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.

§ 7.5.2 The Contractor, Subcontractors, Sub-subcontractors and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to the protocols established pursuant to Sections 7.6 and 7.7, 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 this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 7.6 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.

§ 7.7 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.

§ 7.8 Severability

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.

§ 7.9 Notice

§ 7.9.1 Except as otherwise provided in Section 7.9.2, 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 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.)

§ 7.9.2 Notice of Claims 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.

§ 7.10 Relationship of the Parties

Where the Contract is based on the Cost of the Work plus the Contractor's Fee, with or without a Guaranteed Maximum Price, the Contractor accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Contractor's skill and judgment in furthering the interests of the Owner; to furnish efficient business administration and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish and approve, in a timely manner, information required by the Contractor and to make payments to the Contractor in accordance with the requirements of the Contract Documents.

ARTICLE 8 OWNER

§ 8.1 Information and Services Required of the Owner

§ 8.1.1 Prior to commencement of the Work, at the 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 8.1.1, the Contract Time shall be extended appropriately.

§ 8.1.2 The Owner shall furnish all necessary surveys and a legal description of the site.

§ 8.1.3 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.

§ 8.1.4 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 9.6.1, the Owner shall secure and pay for other necessary approvals, easements, assessments, and charges required for the construction, use, or occupancy of permanent structures or for permanent changes in existing facilities.

§ 8.2 Owner's Right to Stop the Work

If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents, or repeatedly fails to carry out the 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 is 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.

§ 8.3 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, and fails within a 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 any 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 15.4.3, 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 the Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. 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 21.

ARTICLE 9 CONTRACTOR

§ 9.1 Review of Contract Documents and Field Conditions by Contractor

§ 9.1.1 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.

§ 9.1.2 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 8.1.2, 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.

§ 9.1.3 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.

§ 9.2 Supervision and Construction Procedures

§ 9.2.1 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, unless the Contract Documents give other specific instructions concerning these matters.

§ 9.2.2 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.

§ 9.3 Labor and Materials

§ 9.3.1 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.

§ 9.3.2 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 skilled in tasks assigned to them.

§ 9.3.3 The Contractor may make a substitution only with the consent of the Owner, after evaluation by the Architect and in accordance with a Modification.

§ 9.4 Warranty

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 under normal usage. All other 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 15.6.3.

§ 9.5 Taxes

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

§ 9.6 Permits, Fees, Notices, and Compliance with Laws

§ 9.6.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as 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.

§ 9.6.2 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. 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.

§ 9.7 Allowances

The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. The Owner shall select materials and equipment under allowances with reasonable promptness. Allowance amounts shall include the costs to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts. Contractor's costs for unloading and handling at the site, labor, installation, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowance.

§ 9.8 Contractor's Construction Schedules

§ 9.8.1 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 not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

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

§ 9.9 Submittals

§ 9.9.1 The Contractor shall review for compliance with the Contract Documents and submit to the Architect Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents in coordination with the Contractor's construction schedule and in such sequence as to allow the Architect reasonable time for review. 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. The Work shall be in accordance with approved submittals.

§ 9.9.2 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents.

§ 9.9.3 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 or unless the Contractor needs to provide such services in order to carry out the Contractor's own responsibilities. If professional design services or certifications by a design professional are specifically required, the Owner and the Architect will specify the performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional. If no criteria are specified, the design

shall comply with applicable codes and ordinances. Each Party shall be entitled to rely upon the information provided by the other Party. The Architect will review and approve or take other appropriate action on submittals for the limited purpose of checking for conformance with information provided and the design concept expressed in the Contract Documents. The Architect's review of Shop Drawings, Product Data, Samples, and similar submittals shall be for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. In performing such review, the Architect will approve, or take other appropriate action upon, the Contractor's Shop Drawings, Product Data, Samples, and similar submittals.

§ 9.10 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.

§ 9.11 Cutting and Patching

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

§ 9.12 Cleaning Up

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 material from and about the Project.

§ 9.13 Access to Work

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

§ 9.14 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.

§ 9.15 Indemnification

§ 9.15.1 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 which would otherwise exist as to a party or person described in this Section 9.15.1.

§ 9.15.2 In claims against any person or entity indemnified under this Section 9.15 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 9.15.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 10 ARCHITECT

§ 10.1 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, unless otherwise modified in writing in accordance with other provisions of the Contract.

§ 10.2 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.

§ 10.3 The Architect will visit the site at intervals appropriate to the stage of the construction 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 safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 10.4 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.

§ 10.5 Based on the Architect's evaluations of the Work and 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.

§ 10.6 The Architect has authority to reject Work that does not conform to the Contract Documents and to require inspection or testing of the Work.

§ 10.7 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.

§ 10.8 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 will make initial decisions on all claims, disputes, and other matters in question between the Owner and Contractor but will not be liable for results of any interpretations or decisions rendered in good faith.

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

ARTICLE 11 SUBCONTRACTORS

§ 11.1 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.

§ 11.2 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 Subcontractors or suppliers proposed for each of the principal portions of the Work. The Contractor shall not contract with any Subcontractor or supplier to whom the Owner or Architect has made reasonable written objection within ten days after receipt of the Contractor's list of Subcontractors and suppliers. 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. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 11.3 Contracts between the Contractor and Subcontractors shall (1) require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the 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, which the Contractor, by the Contract Documents, assumes toward the Owner and Architect, and (2) allow the Subcontractor the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Contract Documents, has against the Owner.

ARTICLE 12 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 12.1 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.

§ 12.2 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 activities with theirs as required by the Contract Documents.

§ 12.3 The Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a Separate Contractor because of delays, improperly timed activities, or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work, or defective construction of a Separate Contractor.

ARTICLE 13 CHANGES IN THE WORK

§ 13.1 By appropriate Modification, changes in the Work may be accomplished after execution of the Contract. The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, with the Contract Sum and Contract Time being adjusted accordingly. Such changes in the Work shall be authorized by written Change Order signed by the Owner, Contractor, and Architect, or by written Construction Change Directive signed by the Owner and Architect. Upon issuance of the Change Order or Construction Change Directive, the Contractor shall proceed promptly with such changes in the Work, unless otherwise provided in the Change Order or Construction Change Directive.

§ 13.2 Adjustments in the Contract Sum and Contract Time resulting from a change in the Work shall be determined by mutual agreement of the parties or, in the case of a Construction Change Directive signed only by the Owner and Architect, by the Contractor's cost of labor, material, equipment, and reasonable overhead and profit, unless the parties agree on another method for determining the cost or credit. Pending final determination of the total cost of a Construction Change Directive, the Contractor may request payment for Work completed pursuant to the Construction Change Directive. The Architect will make an interim determination of the amount of payment due for purposes of certifying the Contractor's monthly Application for Payment. When the Owner and Contractor agree on adjustments to the Contract Sum and Contract Time arising from a Construction Change Directive, the Architect will prepare a Change Order.

§ 13.3 The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly. 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.

§ 13.4 If concealed or unknown physical conditions are encountered at the site that differ materially from those indicated in the Contract Documents or from those conditions ordinarily found to exist, the Contract Sum and Contract Time shall be equitably adjusted as mutually agreed between the Owner and Contractor; provided that the Contractor provides notice to the Owner and Architect promptly and before conditions are disturbed.

ARTICLE 14 TIME

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

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

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

§ 14.4 The date of Substantial Completion is the date certified by the Architect in accordance with Section 15.6.3.

§ 14.5 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) changes ordered in the Work; (2) by labor disputes, fire, unusual delay in deliveries, abnormal adverse weather conditions not reasonably

anticipatable, unavoidable casualties, or any causes beyond the Contractor's control; or (3) 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, subject to the provisions of Article 21.

ARTICLE 15 PAYMENTS AND COMPLETION

§ 15.1 Schedule of Values

§ 15.1.1 Where the Contract is based on a Stipulated Sum or the Cost of the Work with a Guaranteed Maximum Price pursuant to Section 3.2 or 3.4, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Stipulated Sum or Guaranteed Maximum Price 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 of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 15.1.2 The allocation of the Stipulated Sum or Guaranteed Maximum Price under this Section 15.1 shall not constitute a separate stipulated sum or guaranteed maximum price for each individual line item in the schedule of values.

§ 15.2 Control Estimate

§ 15.2.1 Where the Contract Sum is the Cost of the Work, plus the Contractor's Fee without a Guaranteed Maximum Price pursuant to Section 3.3, the Contractor shall prepare and submit to the Owner a Control Estimate within 14 days of executing this Agreement. The Control Estimate shall include the estimated Cost of the Work plus the Contractor's Fee.

§ 15.2.2 The Control Estimate shall include:

.1 the documents enumerated in Article 6, including all Modifications thereto;

.2 a list of the assumptions made by the Contractor in the preparation of the Control Estimate to supplement the information provided by the Owner and contained in the Contract Documents;

.3 a statement of the estimated Cost of the Work organized by trade categories or systems and the Contractor's Fee;

.4 a project schedule upon which the Control Estimate is based, indicating proposed Subcontractors, activity sequences and durations, milestone dates for receipt and approval of pertinent information, schedule of shop drawings and samples, procurement and delivery of materials or equipment the Owner's occupancy requirements, and the date of Substantial Completion; and

.5 a list of any contingency amounts included in the Control Estimate for further development of design and construction.

§ 15.2.3 When the Control Estimate is acceptable to the Owner and Architect, the Owner shall acknowledge it in writing. The Owner's acceptance of the Control Estimate does not imply that the Control Estimate constitutes a Guaranteed Maximum Price.

§ 15.2.4 The Contractor shall develop and implement a detailed system of cost control that will provide the Owner and Architect with timely information as to the anticipated total Cost of the Work. The cost control system shall compare the Control Estimate with the actual cost for activities in progress and estimates for uncompleted tasks and proposed changes. This information shall be reported to the Owner, in writing, no later than the Contractor's first Application for Payment and shall be revised and submitted with each Application for Payment.

§ 15.2.5 The Owner shall authorize preparation of revisions to the Contract Documents that incorporate the agreed-upon assumptions contained in the Control Estimate. The Owner shall promptly furnish such revised Contract Documents to the Contractor. The Contractor shall notify the Owner and Architect of any inconsistencies between the Control Estimate and the revised Contract Documents.

§ 15.3 Applications for Payment

§ 15.3.1 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 15.1, for completed portions of the Work. The application shall be notarized, if required; be supported by all data substantiating the Contractor's right to payment that the Owner or Architect require; shall reflect retainage if provided for in the Contract Documents; and include any revised cost control information required by Section 15.2.4. 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.

§ 15.3.2 With each Application for Payment where the Contract Sum is based upon the Cost of the Work, or the Cost of the Work with a Guaranteed Maximum Price, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner to demonstrate that cash disbursements already made by the Contractor on account of the Cost of the Work equal or exceed progress payments already received by the Contractor plus payrolls for the period covered by the present Application for Payment, less that portion of the progress payments attributable to the Contractor's Fee.

§ 15.3.3 Payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment stored, and protected from damage, off the site at a location agreed upon in writing.

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

§ 15.4 Certificates for Payment

§ 15.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner of the Architect's reasons for withholding certification in whole or in part as provided in Section 15.4.3.

§ 15.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluations 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 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.

§ 15.4.3 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 15.4.2 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 15.4.1. If the Contractor and the 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 9.2.2, 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.

§ 15.4.4 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 15.4.3, in whole or in part, that party may submit a Claim in accordance with Article 21.

§ 15.5 Progress Payments

§ 15.5.1 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.

§ 15.5.2 Neither the Owner nor Architect shall have an obligation to pay or see to the payment of money to a Subcontractor or supplier except as may otherwise be required by law.

§ 15.5.3 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.

§ 15.5.4 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.

§ 15.6 Substantial Completion

§ 15.6.1 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.

§ 15.6.2 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.

§ 15.6.3 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. When the Architect determines that the Work or designated portion thereof is substantially complete, the Architect will issue a Certificate of Substantial Completion which 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.

§ 15.6.4 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.

§ 15.7 Final Completion and Final Payment

§ 15.7.1 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 and, 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 stated in Section 15.7.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 15.7.2 Final payment shall not become due until the Contractor has delivered to the Owner a complete release of all liens arising out of this Contract or receipts in full covering all labor, materials and equipment for which a lien could be filed, or a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien 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 such lien, including costs and reasonable attorneys' fees.

§ 15.7.3 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.

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

ARTICLE 16 PROTECTION OF PERSONS AND PROPERTY

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

.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.

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 and property and their protection from damage, injury, or loss. The Contractor shall promptly remedy damage and loss to property 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 16.1.2 and 16.1.3. 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 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 9.15.

§ 16.2 Hazardous Materials and Substances

§ 16.2.1 The Contractor is responsible for compliance with the requirements of 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. 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 in the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 16.2.2 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 16.2.1 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.

§ 16.2.3 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 indemnify the Contractor for all cost and expense thereby incurred.

ARTICLE 17 INSURANCE AND BONDS

§ 17.1 Contractor's Insurance

§ 17.1.1 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 this Section 17.1 or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the insurance required by this Agreement from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 18.4, unless a different duration is stated below:

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

- **.1** damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- **.2** personal and advertising injury;
- **.3** damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
- **.4** bodily injury or property damage arising out of completed operations; and
- **.5** the Contractor's indemnity obligations under Section 9.15.

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

§ 17.1.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as those required under Section 17.1.2 and 17.1.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ 17.1.5 Workers' Compensation at statutory limits.

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

§ 17.1.7 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ 17.1.8 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than ($) per claim and ($) in the aggregate.

§ 17.1.9 Coverage under Sections 17.1.7 and 17.1.8 may be procured through a Combined Professional Liability and Pollution Liability insuranee policy, with combined policy limits of not less than ($) per claim and ($) in the aggregate.

§ 17.1.10 The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Section 17.1 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the period required by Section 17.1.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy.

§ 17.1.11 The Contractor shall disclose to the Owner any deductible or self- insured retentions applicable to any insurance required to be provided by the Contractor.

§ 17.1.12 To the fullest extent permitted by law, the Contractor shall cause the commercial liability coverage required by this Section 17.1 to include (1) the Owner, the Architect, and the Architect's Consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's Consultants, CG 20 32 07 04.

§ 17.1.13 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 this Section 17.1, 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.

§ 17.1.14 Other Insurance Provided by the Contractor
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ 17.2 Owner's Insurance
§ 17.2.1 Owner's Liability Insurance
The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 17.2.2 Property Insurance
§ 17.2.2.1 The Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed or materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section 17.2.2.2, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ 17.2.2.2 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section 17.2.2.1 or, if necessary, replace the insurance policy required under Section 17.2.2.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 18.4.

§ 17.2.2.3 If the insurance required by this Section 17.2.2 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ 17.2.2.4 If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 18.4, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ 17.2.2.5 Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Section 17.2.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by this Section 17.2.2. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ 17.2.2.6 Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any insurance required by this Section 17.2.2, 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.

§ 17.2.2.7 Waiver of Subrogation

§ 17.2.2.7.1 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 this 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 17.2.2.7 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.

§ 17.2.2.7.2 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 17.2.2.7.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 17.2.2.8 A loss insured under the Owner's property insurance 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. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements, written where legally required for validity, the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 17.2.3 Other Insurance Provided by the Owner

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

Coverage	Limits

§ 17.3 Performance Bond and Payment Bond

§ 17.3.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in the Contract Documents on the date of execution of the Contract.

§ 17.3.2 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.

ARTICLE 18 CORRECTION OF WORK

§ 18.1 The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after 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, unless compensable under Section A.1.7.3 in Exhibit A, Determination of the Cost of the Work.

§ 18.2 In addition to the Contractor's obligations under Section 9.4, 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 15.6.3, or by terms of an 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.

§ 18.3 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Section 8.3.

§ 18.4 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.

§ 18.5 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Article 18.

ARTICLE 19 MISCELLANEOUS PROVISIONS

§ 19.1 Assignment of Contract

Neither party to the Contract shall assign the Contract without written consent of the other, except that 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 such assignment.

§ 19.2 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 21.6.

§ 19.3 Tests and Inspections

Tests, inspections, and approvals of portions of the Work required by the Contract Documents or by applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities shall be made at an appropriate time. 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.

§ 19.4 The Owner's representative:
(Name, address, email address and other information)

§ 19.5 The Contractor's representative:
(Name, address, email address and other information)

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

ARTICLE 20 TERMINATION OF THE CONTRACT

§ 20.1 Termination by the Contractor

If the Architect fails to certify payment as provided in Section 15.4.1 for a period of 30 days through no fault of the Contractor, or if the Owner fails to make payment as provided in Section 4.1.3 for a period of 30 days, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 20.2 Termination by the Owner for Cause

§ 20.2.1 The Owner may terminate the Contract if the Contractor

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

§ 20.2.2 When any of the reasons described in Section 20.2.1 exists, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may, without prejudice to any other remedy the Owner may have and after giving the Contractor seven days' notice, terminate the Contract and take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor and may finish the Work by whatever reasonable method the Owner may deem expedient. Upon 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.

§ 20.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 20.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 20.2.4 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 Architect, upon application, and this obligation for payment shall survive termination of the Contract.

§ 20.3 Termination by the Owner for Convenience

The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. The Owner shall pay the Contractor for Work executed; and costs incurred by reason of such termination, including costs attributable to termination of Subcontracts; and a termination fee, if any, as follows:
(Insert the amount of or method for determining the fee payable to the Contractor by the Owner following a termination for the Owner's convenience, if any.)

ARTICLE 21 CLAIMS AND DISPUTES

§ 21.1 Claims, disputes, and other matters in question arising out of or relating to this Contract, including those alleging an error or omission by the Architect but excluding those arising under Section 16.2, shall be referred initially to the Architect for decision. Such matters, except those waived as provided for in Section 21.11 and Sections 15.7.3 and 15.7.4, shall, after initial decision by the Architect or 30 days after submission of the matter to the Architect, be subject to mediation as a condition precedent to binding dispute resolution.

§ 21.2 Notice of Claims

§ 21.2.1 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 18.2, shall be initiated by notice to the Architect 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.

§ 21.2.2 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 18.2, shall be initiated by notice to the other party.

§ 21.3 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 in accordance with the requirements of the final dispute resolution method selected in this Agreement, whether in contract, tort, breach of warranty, or otherwise, 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 21.3.

§ 21.4 If a claim, dispute or other matter in question relates to or is the subject of a mechanic's lien, the party asserting such matter may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 21.5 The parties shall endeavor to resolve their disputes by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with their Construction Industry Mediation Procedures in effect on the date of this Agreement. A request for mediation shall be made in writing, delivered to the other party to this Agreement, and filed with the person or entity administering the mediation. The request may be made concurrently with the binding dispute resolution 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, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 21.6 If the parties have selected arbitration as the method for binding dispute resolution in this 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 the Construction Industry Arbitration Rules in effect on the date of this Agreement. 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 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.

§ 21.7 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party, at its sole discretion, 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).

§ 21.8 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, any party to an arbitration 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 a Claim not described in the written Consent.

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

§ 21.10 Continuing Contract Performance

Pending final resolution of a Claim, except as otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 21.11 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 20. Nothing contained in this Section 21.11 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

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

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

TECHNICAL SPECIFICATIONS

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SECTION 01 00 00 - GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 DESCRIPTION OF THE PROJECT DOCUMENTS

A. The work covered by these specifications consists of furnishing all labor, equipment and materials necessary in connection with an Alterations Project at Piqua High School for Piqua City Schools. Work includes items as shown, subject to the terms and conditions of the contract, specifications and the drawings as listed.

1.2 CONTRACT DESCRIPTION

A. Project Identification: **Alterations 2022**
Piqua High School
Piqua City Schools

B. Project Location: PIQUA HIGH SCHOOL
1 Indian Trail, Piqua, OH 45356

C. Owner: Piqua City Schools
215 Looney Road
Piqua, OH 45356

D. Architect: RDA Group Architects, LLC
7945 Washington Woods Drive
Dayton, OH 45459
937.610.3440 phone

E. Perform Work of Contract under a stipulated sum contract with Owner in accordance with Conditions of Contract.

1.3 CONTRACTOR'S USE OF PREMISES

A. Owner will vacate this portion of Piqua High School over the summer break. In general, Piqua High School will substantially be vacant. There will be some continued summer activities during the summer in other portions of the building which will need to be coordinated by the Contractor, specifically any activities which would affect life safety.

B. The Owner will coordinate relocation of loose furnishings, equipment, etc. out of the work area as necessary to facilitate work.

C. The Contractor shall coordinate with the Owner and Owner's staff to ensure that adequate time is provided to set up the school prior to the start of the new school year in the fall.

D. Work schedules from May 31, 2022 until June 6, 2022 [end of school]
1. Owner will be relocating furniture, equipment, etc. from the work areas.
2. Abatement of asbestos containing materials by Others outside of this contract.
3. Contractor will have access to the project site to start operations and demolition activities where feasible, however full access is not guaranteed. Contractor shall coordinate with Owner and Abatement Team to coordinate possibility of work during this week.

E. Work schedules from May 31, 2022 until August 19, 2022 [school is out of session / summer break]:
1. <u>It is the intent of the project to be accomplished completely over summer break. See Supplementary Conditions and information herein for additional requirements / dates.</u>
2. <u>There are no limits on work hours. It is anticipated and expected that overtime and a second / third shift will be required to meet the schedule.</u>
    a. All costs for overtime and/or a second / third shift crew, weekend work, etc. shall be included in the bid amount.

b. The burden for scheduling and coordinating work efforts of multiple shifts shall be on the General Contractor.
c. It is the Contractor's responsibility to determine how the various disciplines work together and are scheduled to permit the work as outlined. RDA nor the Owner are dictating which trades may need to work off shifts to facilitate work of other trades.
1) As an example it may make sense to have the flooring trades or painters work second or third shift to allow mechanical, electrical trades to work during the day in the same area.

3. Contractor shall coordinate with Owner for Owner provided equipment installation as applicable.
4. Additional weekend and overtime work, supplementation of the Crews, etc. may be required by the Owner at no additional cost if the Contractor fails to meet milestone dates as prescribed in the contract.

F. Work Schedule from August 19, 2022 until September 5, 2022 [school is out of session / Owner turnover period]
1. There are no limits on work hours, however, all work shall be coordinated with the Owner to allow Owner to prep for the upcoming school session and also allow reinstallation of Owner furnishings and equipment.

G. Work schedules on/after September 6, 2022 while school is in session [punchlist / project wrap up in the fall 2022]:
1. Monday through Friday 3:00 PM to 11:00 PM, unless otherwise arranged with Owner.
2. Saturday and Sunday work can take place but must be coordinated and approved by Owner.

H. Coordinate work of this contract with other work that will be occurring by the Owner. Coordinate work schedules to minimize impact to the extent possible.

1.4 CONTRACT PERIOD

A. Date of Commencement: May 31, 2022, as outlined in Supplementary Conditions.

B. Date of Substantial Completion: August 19, 2022

C. A contract will be issued in February 2022.
1. The Contractor will be responsible to execute the project to allow shop drawings and product submittals to be prepared as quickly as possible such that the materials can be ordered with sufficient lead time to permit the work to be executed as scheduled prior to the date of substantial completion.

D. Coordinate schedule / activities so as not to inconvenience the Owner unnecessarily.

1.5 PROJECT ALLOWANCES

A. Contingency Allowance: include **$200,000 [two hundred thousand dollars]** in the base bid amount of the project for use as a project contingency allowance.

B. Building Permit Allowance: include **$10,000 [ten thousand dollars]** in the base bid amount of the project for use in obtaining required building permits. All trade permits shall be included by the trade contractor. Unused funds shall be credited back to the Owner.

C. Door Hardware / Core Allowance: include **$35,000 [thirty five thousand dollars]** in the base bid amount of the project for use in providing and installing cores for the door hardware.

D. Contingency funds shall only be used at the approval of RDA and Owner.

E. Actual expenditures shall be tracked over the duration of the project with any unused funds deducted from the contract at the end of the project.

F. All expenditures shall be identified and documented as they occur, not afterward. Work commenced without the approval of the Owner shall be at the Contractor's risk.

1.6 INSTRUCTIONS/RESPONSBILITIES OF THE CONTRACTOR

A. Protect all finishes and equipment scheduled to remain.

B. Contractor shall commence and complete work as noted in the contract.

C. Contractor shall furnish labor, materials, equipment, and management required to complete the project.

D. Contractor shall furnish all required logistics required to accomplish the work – including lifts, scaffolding, ladders, trash chutes, safety equipment, etc.
   1. All Contractor staging areas and layout areas, etc. shall be coordinated and approved by the Owner prior to the start of the project.
   2. Provide protection of all existing pavement, turf, etc. from lifts, lulls, etc. which may be utilized on the project.

E. Contractor shall visit the site to become thoroughly familiar with all working conditions, check and verify all dimensions, and site conditions. Any dimensions given or referred to in the specification or drawing is to be used purely as approximate and not as a basis for exact amounts for bidding. Contractor shall promptly advise the Architect of any discrepancies, errors with the specifications and drawings before bidding the work.

F. Contractor to provide a valid Certificate of Insurance, follow all Workman's Compensation requirements and regulations, and conduct all work according to OSHA recognized safe work practices.

G. All bonds, payment schedule, insurance shall be as noted in the contract documents.

H. The plans and specifications are intended to depict the general scope, layout and quality of workmanship required, they are not intended to show or describe in detail every item necessary for the proper installation of the work.

I. Special care shall be taken not to allow dust and debris to fall onto any equipment, material, personnel, or any room below the deck.

J. The contractor shall provide Safety Data Sheets (SDS) on all products used.
   1. Submit directly to Owner. RDA does not review nor approve SDS.

K. The term 'Architect' as referenced in these contract documents is RDA Group Architects.

L. The term 'Owner' as referenced in this specification is Piqua City Schools.

1.7 WORK BY THE OWNER

A. Owner will clear all loose furnishings, equipment, and other materials from the work area prior to the start of the project.

B. Refer to the project phasing schedule to outline dates and specific requirements.

C. Owner will make all applicable data connections to existing systems at existing data / technology closets. Contractor will make applicable connections at the device unless directed otherwise.

D. Owner will separately contract for the following work *[unless specifically noted to be within the scope of this project]*:
   1. Abatement of Asbestos Containing Materials
   2. Data cabling [refer to Telecom drawings]
   3. Audio/visual equipment and accessories
   4. Lockers
   5. Loose Furnishings [seating, desks, work tables, etc.]
   6. Interior Signage
   7. Tack Strips [purchase of material only, installation by Contractor]

E. Contractor shall coordinate all aspects of Work by Owner as they interface with Work.

1.8 APPLICABLE REFERENCES, CODES, AND PERMITS

A. References will be found in each section that applies to that section. In addition, contractor shall comply with the Ohio Building Code requirements as they relate to the work.

B. Contractor shall procure at his own expense all necessary permits from municipal or other agencies and give all notices required. Fines levied due to non-compliance shall be paid by the contractor.
   1. RDA will apply for the applicable building permits with Miami County.

1.9 WAGES

A. This project is <u>not subject</u> to prevailing wage and/or reporting requirements.

1.10 TAXES

A. Any taxes paid by the contractor will be considered their expense for which no compensation will be made by the owner. [Tax Exempt Project]. Tax Exempt forms can be provided upon request.

1.11 SMOKING

A. Smoking is not permitted on school grounds – inside or outside of any facility.

B. Contractor or crewmembers found to be smoking on school property will be subject to a $500 fine per occurrence. Any habitual offenders will be dismissed from the project site.

1.12 CONTRACTOR / GENERAL REQUIREMENTS

A. Visit the project sites to verify general and pertinent conditions and take measurements necessary for bidding purposes.

B. Failure to show or mention petty details shall not be warranted for the omission of anything necessary for the proper completion of the work.

C. Contractor shall not take advantage of any clerical errors, omissions, contradictions, or conflicts that may develop in plans, specifications, or details. Such errors, ambiguities and discrepancies shall be reported to the Architect immediately for clarification, revision, or correction prior to the submission of bids. If no notification is given, it shall be assumed that all specifications and conditions will be met.

D. Remain in compliance with all OSHA STANDARD 1926 – REGULATIONS FOR CONSTRUCTION at all times during project. Comply with all applicable Safe Work Practices.

E. Contract Period
   1. If an extension of time is necessary, a request in writing must be submitted to the Owner at least [14] days prior to the contract completion date.
   2. Notify the Architect, in writing, upon determination of any delay in material delivery.

F. Security: Contractor's Liability for Vandalism
   1. Contractor shall be responsible at the Contractor's cost and expense, for the securing and protection of the project which is under the control of the Contractor, and for the repair and replacement of the work until that portion of the work is accepted as completed by the Owner. The Contractor shall take the measures necessary to provide such security.

G. Qualifying Contractors and Sub-Contractors: The Owner may require the contractor/sub-contractor to provide references of similar projects, past performance, financial disclosures, etc. in the interest of selection of the lowest and best bidder for the project.
   1. The Contractor is responsible for all work performed by Sub-Contractors.

2. The Owner has the final authority to request a particular sub-contract not be engaged in the project. If this occurs, The Owner and Contractor shall determine if there is an impact to the Contract amount, and negotiate, if necessary, to an adjustment in the Contract amount.
   a. No change to the Contract amount will be permitted if there is a change to the sub-contractor due to them utilizing alternate manufacturers or products that were not approved substitution requests.

1.13 SPECIFICATION CONVENTIONS

A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words “shall be” are included by inference where a colon (:) is used within sentences or phrases.

1.14 APPLICATIONS FOR PAYMENT

A. Refer to Section 01 29 00.

1.15 CHANGE PROCEDURES

A. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed price quotation.

B. Change Order Forms: AIA G701.

C. Unit Price Change Order: For pre-determined unit prices and quantities, Change Order will be executed on fixed unit price basis. For unit costs or quantities of units of work which are not pre-determined, execute Work under Construction Change Directive. Changes in Contract Sum/Price or Contract Time will be computed as specified for Time and Material Change Order.

D. Maximum mark up for overhead and profit on change orders shall be 15%.

1.16 UNIT PRICES

A. Owner will take measurements and compute quantities accordingly. Provide and assist in taking of measurements.

B. Unit Price Schedule:
   1. UP-1: Remove and replace sealant joint, per linear foot.
   2. UP-2: Prep and paint existing CMU wall, per square foot
   3. UP-3: Remove existing, re-point mortar joint in existing masonry, per linear foot
   4. UP-4: Remove existing, install new 6” CMU block, each
   5. UP-5: Remove existing, install new 8” CMU block, each
   6. UP-6: Install thru-penetration fire stop for electrical conduit / MC cable / EMT penetration thru rated CMU wall assembly, each.
   7. UP-7: Install thru-penetration fire stop for data cabling penetration thru rated CMU wall assembly, each.
   8. UP-8: Install thru-penetration fire stop for plumbing supply piping penetration thru rated CMU wall assembly, each.
   9. UP-9: Install thru-penetration fire stop for plumbing drain / waste / vent penetration thru rated CMU wall assembly, each.
   10. UP-10: Install / repair existing spray applied firesafing at structural framing members, per square foot.

C. Unit Price includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services, and incidentals; erection, application or installation of item of the Work; overhead and profit.

D. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Architect multiplied by unit price for Work incorporated in or made necessary by the Work.

1.17 ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option.

B. Coordinate related Work and modify surrounding Work as required.

C. Schedule of Alternates:
   1. None

1.18 COORDINATION

A. Coordinate scheduling, submittals, and Work of various sections of specifications to ensure efficient and orderly sequence of installation of interdependent construction elements.

1.19 QUALITY CONTROL

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturer’s instructions.

C. When manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Owner before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.20 TOLERANCES

A. Monitor fabrication and installation tolerance control of installed Products over suppliers, manufacturers, Products, site conditions, and workmanship, to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply fully with manufacturer’s tolerances.

1.21 REFERENCES

A. Conform to reference standards by date of issue current as of date of Contract Documents.

B. When specified reference standard conflicts with Contract Documents, request clarification from Architect before proceeding.

1.22 LABELING

A. Attach label from agency approved by authority having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.

B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label.
   1. Model number.
   2. Serial number.
   3. Performance characteristics.

1.23 PRECONSTRUCTION MEETING

A. Owner/RDA will schedule preconstruction meeting after Notice of Award for affected parties.

B. Owner, RDA, Contractor Project Manager, and Foreman shall be in attendance.

C. Agenda:
   1. Scheduling of construction events, set-up, storage and etc.
   2. Project personnel with contact information.
   3. Sequence of construction, starting points, events and required resources.
   4. Subcontractors list with contact information.
   5. Temporary utilities.
   6. Inspection and acceptance of existing conditions.
   7. Owner's requirements.

1.24 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work as applicable to the work at weekly intervals.

B. Agenda:
   1. Review of work progress and Owner's Requirements.
   2. Field Observations of the completed work.
   3. Identification of any problems and associated solutions.
   4. Proposed changes.
   5. Administrative issues – payment applications, change orders, etc.

C. RDA will record meeting minutes and will issue to the project team.

1.25 PRE-INSTALLATION MEETINGS

A. Contractor shall determine any and all necessary pre-installation meetings and shall schedule the same.

B. When required in individual Specification Sections, convene preinstallation meetings at Project Site one week before starting Work of specific Section.

C. Require attendance of parties directly affecting, or affected by, Work of specific Section.

D. Prepare agenda and preside over meeting:

E. Review conditions of installation, preparation, and installation procedures.

F. Review coordination with related Work.

G. Record minutes and distribute to participants after meeting, and those affected by decisions made.

1.26 CONTRACT ADMINISTRATION

A. RDA is providing contract administration services for this project to the Owner. However, it shall be the responsibility of the Contractor and Owner to coordinate the proposed work, schedules, installations, permits, inspections, etc. as RDA is not on-site every day.

B. It is the Contractor's responsibility to contact the RDA for clarification should there be questions regarding the interpretation or intent of the documents, field discovery, etc. that would impact or affect the work as proposed. RDA shall not be liable for deviations, field changes, and Owner changes during construction.

C. It is the Contractor's responsibility to field confirm all existing conditions, proposed installations and how they interface to ensure the systems can be installed per the intent of the documents and to meet applicable building and zoning codes, local requirements, Owner requirements, provide a watertight detail, meet aesthetic requirements, etc.

D. It is the Contractor's responsibility to meet all applicable building and zoning codes requirements whether specifically noted herein or not. Building codes represent the minimum acceptable standard.

E. It is the Contractor's responsibility to install all products, materials, installations, and the like in accordance with applicable industry standards, applicable manufacturer's details and instructions, in accordance with best practices, and building code provisions. The manufacturer details / requirements are the minimum acceptable standard, RDA drawings may require additional work.

1.27 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching new Work; restore Work with new Products.

B. Execute cutting, fitting, and patching [including excavation and fill,] to complete Work, and to:
   1. Fit several parts together, to integrate with other Work.
   2. Uncover Work to install or correct ill-timed Work.
   3. Remove and replace defective and non-conforming Work.
   4. Remove samples of installed Work for testing.
   5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

C. Cut masonry and concrete materials using masonry saw or core drill. Restore Work with new Products in accordance with requirements of Contract Documents.

D. Fit Work tight to adjacent elements. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

E. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

F. Refinish surfaces to match adjacent finishes.

1.28 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial progress schedule in duplicate within 5 days after date of Owner-Contractor Agreement for Architect/Engineer review.

B. Prepare progress schedule using a bar chart of Critical Path chart to outline work and interrelated components.

C. Submit revised schedules as appropriate throughout the duration of the project.

1.29 SUBMITTAL PROCEDURES

A. Refer to Section 01 33 00.

1.30 MOCK-UPS

A. Accomplish mockups as directed by the Owner / RDA.

B. Accepted mock-ups are representative of quality required for the Work.

C. Where mock-up has been accepted by Owner / RDA and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.

1.31 TEMPORARY UTILITIES

A. Utilize existing utilities at the School as required to facilitate work.

B. Provide temporary lighting for construction operations as required by conditions and where existing lighting has been removed to facilitate work.

C. Provide temporary emergency egress and exit signage as required by conditions and where existing has been temporarily removed to facilitate work.

D. Coordinate with fire alarm system / monitoring company to disconnect and reconnect existing fire alarm devices throughout the project. Maintain system operational.

1.32 TEMPORARY SANITARY FACILITIES

A. Contractor shall provide any and all necessary portable toilet facilities at the project site as applicable to the work.

1.33 TEMPORARY BARRICADES

A. Erect temporary barricades as applicable to the work to maintain security, dust control, etc.

B. Temporary barricades during summer break when Contractor has full access to the construction area: polyethylene zip walls, etc. as required to maintain dust control and/or limit access.

C. Provide all applicable signage to limit non-construction personnel from entering the construction area.

1.34 STAGING AREA / MATERIAL STORAGE

A. Coordinate with Owner on acceptable location of project staging and material storage area. It is planned that the Contractor shall have use of the parking lot to the west of the building. There will be Owner storage containers in this parking lot for storage of Owner furniture and equipment during the project.

B. Owner will make reasonable effort to provide suitable space on the site for the Contractor to set up operations. Moving from this space may be necessary when instructed by the Owner and shall be accomplished without charge to the Owner. Cooperate with Owner to minimize conflict from Owner's operations.

C. Exterior project staging area if provided shall be enclosed with a minimum of a 6' high chain link fence to the satisfaction of the Owner.

1.35 FIELD OFFICE

A. Owner will attempt to make space available for the Contractor / Project Team use over the course of the project. Relocate if directed by Owner or as required by work.

1.36 PARKING

A. Park Contractor vehicles in areas designated by the Owner.

B. It is planned the Contractor shall have sues of the parking lot to the west of the building. There will be Owner storage containers in this parking lot for storage of Owner furniture and equipment during the project.

1.37 PROGRESS CLEANING AND WASTE REMOVAL

A. Collect and maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition to the satisfaction of the Owner. Clean up shall occur on a daily basis.

B. Failure to provide routine and daily cleanup may result in a back charge from the Owner to accomplish this work.

1.38 FIRE PREVENTION FACILITIES

A. Establish fire watch for cutting and welding and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.

B. Portable Fire Extinguishers: NFPA 10; 10 pound capacity, 4A-60B: C UL rating.
   1. Provide one fire extinguisher at each project site during work operations.

2. Supplement as necessary per the local fire department requirements for construction operations.

1.39 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

C. Protect finished pavement, concrete, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

D. Prohibit traffic or storage upon waterproofed or roofed surfaces, finished surfaces, etc as is applicable to the work. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer and provide all required protection as determined necessary. Any damage caused shall be repaired to like new condition.

E. Prohibit traffic from landscaped areas.

1.40 DELIVERY, HANDLING, STORAGE, AND PROTECTION

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

B. Contractor shall be responsible for storage and safekeeping of all materials, including company’s personal property. All damaged materials shall be removed from the site.

C. Coordinate material delivery to avoid Owner involvement.

1.41 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean interior and exterior surfaces exposed to view. Vacuum carpeted and soft surfaces.

C. Replace filters of existing operating equipment [by Owner]

D. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.42 STARTING OF SYSTEMS

A. Provide seven [7] days notification prior to start-up of each item.

B. Ensure each piece of equipment or system is ready for operation.

C. Execute start-up under supervision of responsible persons in accordance with manufacturer’s instructions.

D. Submit written report stating equipment or system has been properly installed and is functioning correctly.

1.43 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Substantial Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled times, at equipment location.

1.44 TESTING, ADJUSTING, AND BALANCING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Contractor shall retain services of independent firm to perform testing, adjusting, and balancing. Cost for these services shall be included in the bid amount.

C. Reports will be submitted by independent firm to Architect/Engineer indicating observations and results of tests and indicating compliance or non-compliance with specified requirements and with requirements of Contract Documents.

D. Cooperate with independent firm; furnish assistance as requested.

E. Re-testing required because of non-conformance to specified requirements will be the responsibility of the Contractor.

1.45 PROTECTING INSTALLED CONSTRUCTION

A. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

B. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

C. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

D. Prohibit traffic from landscaped areas.

1.46 POLLUTION AND ENVIRONMENTAL CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

B. Provide dust control, erosion and sediment control, etc. to allow for proper execution of the Work.

C. Provide protective coverings, etc. as necessary to protect work.

1.47 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove existing utilities, connections, finishes, etc. as applicable to the work. Remove back to the nearest termination, junction box, etc. as applicable to the work. Coordinate with requirements on the drawings.

B. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion review.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.48 CLOSE OUT PROCEDURES

A. Refer to Section 01 77 00

1.49 PROJECT RECORD DOCUMENTS

A. Refer to Section 01 77 00

1.50 OPERATION AND MAINTENANCE DATA

A. Refer to Section 01 77 00.

1.51 WARRANTIES

A. Refer to Section 01 77 00.

PART 2 PRODUCTS

2.1 MANUFACTURED PRODUCTS

A. Where a particular system, product, or material is specified by name it shall be considered a standard and most satisfactory for its particular purpose. Any other product or material considered equal or better in all respects must be approved by the Architect prior to bidding.

B. All products used on this project shall be new, unless otherwise noted on the drawings or as specified herein.

2.2 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components specifically identified for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically identified or allowed by the Contract Documents.

C. Provide interchangeable components of same manufacturer for components being replaced.

2.3 DELIVERY, HANDLING, STORAGE, AND PROTECTION

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

B. Contractor shall be responsible for storage and safekeeping of all materials, including company's personal property. All damaged materials shall be removed from the site.

C. Coordinate material delivery to avoid Owner involvement.

D. Locations of ground level storage and waste dumpster must be approved by the Owner.

E. All materials shall be properly secured to prevent blow off during weather, wind, etc.

2.4 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for manufacturers not named.

2.5 SUBSTITUTIONS

A. Refer to Section 01 25 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. **Beginning new Work means acceptance of existing/job-site conditions.**

B. Verify utility services are available, of correct characteristics, and in correct location.

C. Contact OUPS a minimum of 48 hours prior to beginning work to verify location of existing utilities, coordinate requirements as applicable.
   1. Contact private utility locating services as required by the conditions. It is the Contractor's responsibility to locate all public and private utilities that may be impacted by the work.

3.2 PROTECTION

A. The work shall be accomplished in accordance with the provision of Federal, State American Standard Safety Code for Building Construction and OHSA safety requirements.
   1. Contractor shall be responsible for protective railings and guards, tie-offs, fall protection, and other safety measures as required by OSHA, even if not specified. Fall protection is required. RDA is not a safety consultant and as such does not direct the means and methods of compliance with safety regulations.

B. The Contractor shall protect and maintain all building entrances, interior contents, building exterior and grounds.
   1. Return all surfaces to their original condition after all work is complete.

C. In the event of damages of any kind caused by improper protection. The Contractor shall replace/repair the damages [including interior or exterior equipment] at no expense to the Owner.

D. Contractor shall comply with all regulations of the Local Fire Department and the Owner's requirement regarding storage and handling of flammable materials, etc. It is the responsibility of the Contractor performing any hot /torch work to comply with the safety provisions of the National Fire Codes pertaining to such work and the contractor shall be responsible for all damage or fines resulting from failure to so comply.

3.3 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.4 JOB SUPERINTENDENT/EMPLOYEES

A. Each prime contractor shall have a qualified foreman on the project at all times when work is being accomplished. [ALL Shifts]

B. Employees shall refrain from fraternization with building occupants.

C. The Contractor shall furnish the Owner with a list of personnel with phone numbers that will be working on the project and emergency contacts names and numbers that has the authority to handle emergencies on a 24 hour/seven days a week.

3.5 SAFETY PROGRAM

A. Contractor must have a written safety program for all operations/ work performed on this project. The documents must be at the job site and be made available to the Owner or RDA when requested.

B. The Contractor assumes all responsibility for project safety, ways, and means and methods of constructing the project.

C. In addition, the Owner may require special safety requirements to be performed by the Contractor, these requirements will be provided prior to commencement of work.

3.6 REMOVALS AND CLEANUP

A. Contractor shall be responsible for the removal, dismantling of items that are required for proper completion of the work as applicable in each section. All debris resulting from the work not designated for reuse becomes the property of the contractor unless stated otherwise.

B. At the completion of each day, the general contractor shall maintain the work area clean of all debris to the satisfactory of the owner, including all the subcontractors work area.

C. Provide dumpsters or trash containers needed for the proper removal of project materials, trash, or debris related to the work. Keep all work areas and project sites neat and free of trash and clutter at all times.
   1. No Debris, materials, etc. may be left unprotected on the grounds.
   2. All exterior staging / dumpster areas shall be fenced / protected.

3.7 GENERAL PROJECT REQUIREMENTS

A. Equipment delivery and equipment staging must be coordinated with Owner prior to start of project.

B. Safety is paramount and all personnel on site must wear appropriate personal protection equipment [PPE]. The Contractor is responsible for means and methods to ensure that proper PPE is provided. Failure to comply may result in dismissal from site.

C. Barricade work area with appropriate construction grade barriers to establish boundaries of work area and assure safety for all workers and general public. All work areas must be properly barricaded from the general public prior to starting any work.

D. Job sites will be maintained in an orderly and neat fashion at all times.

E. Contractor will pre-determine work phases with Owner to minimize disruption of business operations.

F. IMPORTANT: Failure to show or mention petty details shall not be warranted for the omission of anything necessary for the proper completion of the work.

G. The plans and specifications are intended to depict the general scope, layout and quality of workmanship required. The documents are not an "instruction manual" to execute the work nor are they intended to show or describe in detail every item necessary for the proper installation of the work. The means and methods required to execute the work described is the sole responsibility of the Contractor. The Contractor shall include the ancillary work required, whether explicitly stated or not, for the proper completion of the work as intended. The Contractor is required to meet or exceed building code requirements, applicable industry standards, ASTM standards, and/or manufacturer installation requirements as they relate to the work.

H. The plans and specifications represent a single complete design package indicating the intended scope of the project in its entirety. As such, the project is structured to be awarded to a single Prime Contractor. The documents do not delineate bid packages or assign responsibilities to any subsequent subcontractors, dictate construction sequencing, nor provide coordination between any "trades". Such activities are the responsibility of the holder of the construction contract. In the event of a discrepancy within the drawings or between the drawings and the specifications, the more stringent requirement represented in the documents shall prevail.

I. Contractor shall not take advantage of any clerical errors, omissions, contradictions, or conflicts that may develop in plans, specifications, or details. Such errors, ambiguities and discrepancies shall be reported to the Architect immediately for clarification, revision, or correction prior to the submission of bids. If no notification is given, it shall be assumed that all specifications and conditions will be met.

END OF SECTION

SECTION 01 25 00 – SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Section 00 23 13, Instructions to Bidders shall apply to this section.

1.2 WORK INCLUDES

A. Includes administration and procedural requirement for Substitutions.
   1. Substitutions' for Cause: Changes due to project conditions, such as unavailable of product.
   2. Substitutions' for Convenience: Changes that may offer advantages to the Owner.

1.3 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions / Approved Equal: Submit request for substitution as outlined in this section for manufacturers not named.
   1. RDA/Owner is the decision maker if the proposed "approved equal" is in fact equal and approved. Any decision rendered is final.
   2. Any Contractor, Sub-contractor, or Supplier who makes their own judgement as to "approved equal" and includes within their bid without a formal approval is doing so at their own risk.

1.4 SUBSTITUTIONS PROCEDURES

A. RDA will consider requests for Substitutions by the Bidder only [not materials suppliers, etc].

B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

C. A request constitutes a representation that the Bidder:
   1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
   2. Will provide same warranty for Substitution as for specified product.
   3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension which may subsequently become apparent.

D. Substitution Procedure
   1. **Submit copy of request for Substitution for consideration to RDA no later than 7 days before bid opening date**.
   2. Submit shop drawings, product data, and applicable certified test results attesting to proposed product equivalence. Burden on proof is on proposer.
   3. RDA will notify Contractor in writing of decision to accept or reject request within 5 days of receipt of request or request additional information or documentation for evaluation.

E. Substitutions will not be considered when they are indicated or implied on Submittals, without written request or when acceptance will require revision to the Contract Documents.

F. If the Substitution will require modifications to the Contract / Bidding Documents, the cost for updating the documents shall be paid by the Contractor making the request.

G. Substitutions will not be considered after award of the project without justification.

H. Approved substitutions will be identified by Addenda.
   1. Bidders shall not rely upon approvals made in any other manner.

END OF SECTION

SECTION 01 29 00 – PAYMENT PROCEDURES

PART 1 GENERAL

1.1 WORK INCLUDES

A. Includes administration and procedural requirement for necessary to prepare and process Application for Payment.

1.2 SCHEDULE OF VALUES

A. Submit schedule on AIA Form G703.
   1. Provide line items for each applicable CSI division / defined work scope such that the Owner and RDA can review and determine/confirm progress.
   2. Include line items for each allowance, alternates [as applicable], and general conditions.

B. Submit Schedule of Values in duplicate within 5 days after date of Owner-Contractor Agreement.

1.3 APPLICATIONS FOR PAYMENT

A. Use AIA form G702 and G703 for Application for payment or a form the Owner has requested.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Complete every entry, notarize and execute by a person authorized to sign document on behalf of the contractor. Include amounts for work completed following previous Application for Payment whether or not payment has been received, include amounts of Change Orders issued before last day of construction period covered by application.
   1. Stored materials included in application must have supporting documentation that verifies amount required, do not include overhead and profit on stored material.
   2. Submit to RDA for review and processing.
      a. E-mail submittal is acceptable unless otherwise directed by the Owner. Verify hard copies with Owner if required.

D. Each application for payment following the initial Application for Payments shall be consistent for payment with previous applications.

1.4 SUBMITTAL PROCEDURES

A. Submit [1] copy of each payment application on AIA Form G702 and G703, in PDF format
   1. Pencil copy to RDA for review/acceptance. RDA will review and provide any comments or questions.
   2. Submit final payment application in PDF format to RDA for processing.
   3. RDA will certify and process the payment application and will forward to Owner for payment.

B. Submit all required waivers of lien / partial release of lien [including vendors and subcontractors as requested by Owner], payroll reports, etc. as required by the Owner. Failure to submit required paperwork can delay processing of Application for Payment.

1.5 FINAL APPLICATION FOR PAYMENT

A. Refer to provisions in Section 01 77 00 for Application for Payment at Substantial Completion.

END OF SECTION

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SECTION 01 33 00 – SUBMITTALS

PART 1 GENERAL

1.1 WORK INCLUDES

A. Review of shop drawings and product data by RDA / Owner.

1.2 SUBMITTAL PROCEDURES

A. Contractor to submit product data and shop drawings for all applicable components of the project. Refer to individual sections for additional requirements.
   1. Contractor to provide a submittal log at the beginning of the project for review by RDA / Owner. Submittal log shall identify proposed submittals by Spec Section.
   2. RDA review of the submittals will be general in nature and does not relieve the Contractor in any way of the responsibility in compliance with the contract requirements, manufacturer requirements, and/or applicable codes.

B. Submittals shall be accomplished in a digital [PDF format].
   1. Any hard copies received will be scanned and returned electronically.
   2. Provide those submittals required to maintain orderly progress of the work and those required for early lead time for manufacturer fabrication.
   3. Mark each component to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this project. Non-identified submittals will be rejected.

C. Submittals shall have a Submittal form / cover sheet to identify Project, Contractor, subcontractor or supplier; and pertinent Contract Document references.

D. Apply Contractor's stamp, signed or initialed, certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.

E. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of completed Work.

F. Revise and resubmit submittals as required; identify changes made since previous submittal.

G. All submittals shall be accomplished at the beginning of the project to allow the proper ordering of materials for the project.
   1. Failure by the Contractor to provide submittals in a timely fashion does not change the project start date nor contract period.

H. Any materials on the job site that have not been reviewed as part of the submittal process are subject to rejection / removal from the job-site. Any work undertaken without review of the submittal data is at the Contractor's risk and subject to rejection or replacement at no cost to the Owner if submittals are not in conformance with the project documents.

I. Allow 7 days for review of submittal items.

1.3 SUBMITTALS / PRODUCT DATA / SHOP DRAWINGS

A. Product Data/Shop Drawings:
   1. Submitted to RDA for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
   2. All shop drawings shall be to scale, submit drawings on sheets no larger than 24-inch x 36 inch, all other product data can be on 8 ½ X 11-inch sheets.

B. Samples for Review:
   1. Submitted to RDA for review and selection for aesthetic, color, or finish.

2. Submit samples of finishes from full range of manufacturer's standard colors, textures, and patterns for Owners selection.
3. Submit samples to illustrate functional and aesthetic characteristics of Product.

C. Personnel/Other Contractors
1. Submit a list of all subcontractors and on-site personnel with the list of lead contact and associated phone numbers.
2. Submit emergency contact sheet with contacts for an emergency – 24/7 call list.

D. Contract Items:
1. Submit Certificate of Insurance, Worker's Comp Certificates as required by Owner.
2. Submit bonds if applicable to the contract.
3. Submit a written Construction Schedule / Implementation and Sequencing Plan outlining starting points and length of time to complete work in each section.

E. Safety Data Sheets: Submit Safety Data Sheets [SDS] on all products to the Owner.
1. Owner shall be responsible to provide to employees as applicable.
2. Owner's representative /RDA does not review / approve any SDS sheets.

F. Site Specific Safety Plan
1. Provide to Owner for their Review.

G. Site Logistics Plan
1. Provide to Owner for their Review.

1.4 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit manufacturer printed instructions for delivery, storage, assembly, installation, [start-up,] adjusting, and finishing, in quantities specified for Product Data.

1.5 MANUFACTURER'S CERTIFICATES

A. When specified in individual specification sections, submit certifications by manufacturer to Owner, in quantities specified for Product Data.

B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

END OF SECTION

SECTION 01 77 00 - CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 WORK INCLUDES

A. Close-out of the actual work, including warranties, maintenance manuals and final cleaning. Close-out of all contract obligations.

1.2 CLOSE-OUT PROCEDURES

A. Contractor shall notify Owner 5 days prior to the work being complete to establish the desired inspection date. Owner / RDA will either proceed with the inspection or notify Contractor of unfulfilled requirements.

B. Owner / RDA shall inspect the completed project and notify the Contractor of any deficiencies. Deficiencies will form 'punch list' for final acceptance.

1.3 PUNCHLIST REQUIREMENTS

A. The Contractor shall review and inspect all work prior to notifying the Owner for a Punchlist inspection of the work. Provide written documentation certifying review along with documentation of Contractor generated Punchlist.

B. If work is clearly not complete, the Punchlist will be suspended until such time that it is evident that the Contractor has completed and reviewed/inspected their own work.

1. RDA anticipates [1] punchlist inspection and [1] back-punch / final inspection as part of our services to the Owner.
2. Failures by the Contractor to complete the work, complete punchlists, etc. may result in a backcharge to the Contractor for the additional time to closeout the project.

C. The Contractor shall review and provide the noted repairs and corrective work necessary at each of the Punchlist inspections to allow project close out.

1. Back-punch walk through may result in additional punchlist items which need to be addressed by the Contractor.

D. The Contractor shall provide adequate time in the construction schedule to accomplish punchout work within the overall contract period indicated within the bid documents.

E. The failure to identify any punchlist item during a walk through / inspection does not release the Contractor from contractual responsibility to address any item during the warranty period.

1.4 SUBSTANTIAL COMPLETION

A. If Requested by the owner, a Certificate of Substantial Completion will be issued upon completion of all the work as required.

1.5 PREREQUISITIES TO FINAL ACCEPTANCE AND PAYMENT

A. Prior to acceptance and final payment, all claims or disputes must have been resolved and the Contractor must have provided the following items to the Owner:

1. Notarized affidavit of waiver of liens [contractor of record], sub-contractors and material suppliers
2. Certificates of release from authorities having jurisdiction over permitting.
3. Final statement of charges [100% application for payment].
    a. Submit a final Application for Payment according to Section 01 29 00, Payment Procedures.
4. Documented evidence of completing 'punch list' as applicable.
5. Manufacturer's original warranties, including contractor maintenance agreements and warranties as applicable.
6. Evidence that claims have been settled.

7. O+M Manuals
8. Manufacturer's maintenance and repair instructions.
9. Record Drawings.
10. Final cleaning of all work areas.
11. Restore all work staging and lay-out areas to pre-construction conditions, including but not limited to, removal of debris, temporary facilities, grading and grass seeding and cleaning or repair of impacted structures.

1.6 PHOTOGRAPHIC DOCUMENTATION

A. When requested by the Owner, photos of the completed punch list along with any supporting documentation can be submitted, in lieu of a final walkthrough.

1.7 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of Contract Documents to be utilized for record documents.

B. Record actual revisions to the Work. Record information concurrent with construction progress.

C. Specifications: Legibly mark and record at each Product section description of actual Products installed.

D. Record Documents and Shop Drawings: Legibly mark each item to record actual construction.

E. Submit documents to Owner.

1.8 PROJECT WARRANTIES

A. All work undertaken as part of the project shall be warranted for a period of not less than [1] year. Individual sections / products may have specific additional warranty requirements.

B. Provide notarized copies of warranty documents to the Owner.
   1. Execute and assemble transferable warranty documents from subcontractors, suppliers, and manufacturers.

C. Original warranties are required to be provided to the Owner prior to final payment.

1.9 OPERATION AND MAINTENANCE DATA

A. Submit two sets prior to or at the final inspection, bound in 8-1/2 x 11-inch text pages, binder covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS" and title of project.

C. Internally subdivide binder contents with permanent page dividers, logically organized, with tab titles legibly printed under reinforced laminated plastic tabs.

D. Contents:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, subcontractors, and major equipment suppliers.
   2. Part 2: Permit and Inspection information
   3. Part 3: Project submittals, organized by CSI division
      a. Include applicable product warranties with individual sections / submittals
   4. Part 4: Operation and maintenance instructions, arranged by system / CSI division.
   5. Part 5: Project documents and certificates.
   6. Part 6: Colors / finishes / samples

1.10 FINAL CLEANING AND SITE REPAIR

A. Final cleaning of all work areas:
   1. Execute final cleaning prior to final inspection.

2. Clean interior and exterior surfaces exposed to view. Vacuum carpeted and soft surfaces.
3. Clean interiors of all cabinetry.
4. Clean all fixtures and finishes.
5. Replace filters of operating equipment.
6. Remove waste and surplus materials, rubbish, and construction facilities from site.

B. Restore all work staging and lay-out areas to pre-construction conditions, including but not limited to, removal of debris, temporary facilities, grading and grass seeding and cleaning or repair of impacted structures.

END OF SECTION

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SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demolishing designated building equipment and fixtures.
   2. Demolishing designated construction.
   3. Cutting and alterations for completion of the Work.
   4. Removing designated items.
   5. Protecting items designated to remain.
   6. Removing demolished materials.

1.2 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of capped utilities, concealed utilities, subsurface obstructions, and any other documentation necessary for future reference.

1.3 QUALITY ASSURANCE

A. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.

B. Conform to applicable code for procedures when hazardous or contaminated materials are discovered.

C. Obtain required permits from authorities having jurisdiction.

1.4 SCHEDULING

A. Schedule Work to coincide with proposed alterations and improvements.

B. Coordinate Work with Work by Others and Work by Owner as needed.

C. Coordinate utility and building service interruptions with Owner.
   1. Do no disable or disrupt fire alarm or life safety systems without approval from the Owner and Fire Department and/or Building Official. Coordinate requirements as needed.

1.5 PROJECT CONDITIONS

A. Cease operations immediately if structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

A. Notify affected utility companies before starting work and comply with their requirements.

B. Mark location and termination of utilities.

C. Erect, and maintain temporary barriers and security devices including warning signs and lights, and similar measures, for protection of the public, Owner, and existing improvements indicated to remain.

D. Erect and maintain weatherproof closures for exterior openings as applicable to work/scope.

E. Erect and maintain temporary partitions.

F. Prevent movement of structure; provide temporary bracing and shoring as required.

G. Provide appropriate temporary signage.

H. Do not close or obstruct building egress path.

I. Do not disable or disrupt building fire or life safety systems without **three** days prior written notice to Owner. Coordinate with Fire Department / Building Official.
   1. Building Life Safety Systems may not be taken out of service while school is in session.

3.2 SALVAGE REQUIREMENTS

A. Coordinate any applicable items to be salvaged with Owner.

B. Protect designated salvage items.

C. Package small and loose parts.

D. Deliver salvaged items to Owner.

3.3 DEMOLITION

A. Provide all selective demolition and removals necessary for the proposed alterations. Field coordinate all conditions with the design intent on the drawings.
   1. Drawings are diagrammatic and may not reflect the full extent of demolition / removals required to accomplish the proposed scope of work.
   2. The Contractor shall coordinate design intent and verify that all demolition work and restoration / repair work required is included in the scope of the project, regardless of specifically being noted on the drawings.

B. Minimize interference with adjacent and occupied building areas.

C. Maintain protected egress from and access to adjacent building areas.

D. Cease operations immediately when structure appears to be in danger and notify Architect/Engineer.

E. Disconnect and remove utilities within demolition areas, refer to Drawings.

F. Cap and identify abandoned utilities at termination points when utility is not completely removed.

G. Protect existing improvements.

H. Carefully remove building components indicated to be Reused:

I. Remove demolished materials from Site except where noted otherwise. Do not burn or bury materials on Site. Provide the proper removal and/or all required dumpsters for the project.

J. Remove materials as Work progresses.

K. Upon completion of Work, leave areas in clean condition.

L. Remove temporary Work.

3.4 CLEAN UP

A. Remove demolished materials from site as work progresses.

B. Leave areas of work in clean condition.

END OF SECTION

SECTION 02 50 00 - HAZARDOUS MATERIALS SPECIFICATIONS

PART 1 GENERAL

1.1 HAZARDOUS MATERIALS

A. There are known hazardous materials in the area of work of this project.

B. Piqua City Schools [Owner] contracts with WesTech Environmental for all required sampling, abatement, and removal of identified materials as part of the project. Information will be made available to the selected Contractor.
   1. WesTech has provided a Limited Pre-Renovation Asbestos Survey for the areas of work [see attached].

C. Contractor shall coordinate efforts as required as they interface with the scheduled work.

1.2 SUMMARY

A. Contractors must comply with Occupational Safety and Health Administration regulation 29 CFR 1926.62 “Lead in Construction Standard” as well as the Environmental Protection Agency Lead, Renovation, Repair and Painting Rule.

B. Contractor shall follow all applicable EPA rules and regulations when working with hazardous materials. It shall be the contractor’s responsibility to remain in compliance at all times during the project.

C. If any work person encounters any material which they suspect may be hazardous or toxic, they shall immediately advise the Owner. The Contractor shall take immediate and appropriate action to protect the building users and workers in accordance with federal, state, and local laws, codes and regulations. The architect and architect's consultants shall have no responsibility for the discovery, presence, handling, removal or disposal of or exposure of persons to hazardous materials in any form at the project site, including but not limited to asbestos, asbestos products, polychlorinated biphenyl (pcb) or other toxic substances.
   1. The contractor is hereby advised that RDA Group Architects, LLC is not a design professional in the determination of the presence of hazardous materials, nor is RDA a design professional involved in making recommendations regarding the testing, removal, encapsulation or other corrective measures pertaining to hazardous materials.
   2. If the work which is to be performed under the contract interfaces in any way with the existing components which contain hazardous materials, it is the contractor’s responsibility to contact the owner's environmental consultant regarding the proper means & methods to be utilized in dealing with hazardous materials.
   3. By execution of the contract for construction, the contractor hereby agrees to bring no claim for negligence, breach of contract, indemnity or otherwise against the architect, his principles, employees, agents or consultants if such a claim in any way would involve the investigation of or remedial work related to hazardous materials in the project.
   4. By execution of the contract for construction, the contractor further agrees to defend, indemnify and hold the architect, his principles, employees, agents or consultants harmless from any such asbestos or other hazardous materials related claims that may be brought by the contractor's subcontractors, suppliers or other third parties who may be acting under the direction of the contractor pursuant to this project.

END OF SECTION

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WESTECH Environmental Solutions

ACM To Be Abated
Piqua High School Academic Wing 1st Floor
1 Indian Trail
Piqua, Ohio 45356

H□□ □□□□□□□□ A□□□ (M□□□□□□□ D□□□□□□□□□□□)	L□□□□□□□ (□)	A□□□□□□□ D□□□□□ □□□□□□□	NESHAP C□□□□□□□	A□□□□□. Q□□□□□□	A□□□□□□□□□ I□□□□□ □□□□
Sink sound dampening material, off-white	Rooms 107, 117, 122, 125	ACM	Category II non-friable	40 sq ft	4 sinks
12" x 12" orange with streaks floor tile and black mastic	Clinic	ACM	Category II non-friable	200 sq ft	Mastic only
12" x 12" brown with steak floor tile and black mastic	Room 112A	ACM	Category II non-friable	240 sq ft	Mastic only
Mastic, black	Chalkboards, bulletin boards and display boards throughout	ACM	Category II non-friable	2,800 sq ft	2,800 sq ft is area of all boards with mastic

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SECTION 03 01 00 - MAINTENANCE OF CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concrete surface repair.
   2. Concrete crack repair.
   3. Concrete sealer.

1.2 SUBMITTALS

A. Product Data: Submit product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.
   1. Concrete repair products.

B. Samples: Submit color samples for patches exposed to view in finished construction and required to match existing.

C. Manufacturer's Instructions: Submit mixing instructions.

1.3 MOCK-UP

A. Construct mockup panel illustrating patching method, color and texture of repair surface.

B. Prepare one mockup of each type of patching/repair procedure.

C. Locate where directed by Architect.

D. Incorporate accepted mockup as part of Work.

PART 2 PRODUCTS

2.1 BASIS OF DESIGN

A. General basis of design for all systems is SIKA, other manufacturers accepted provided bidder/contractor submission of complete technical data of proposed products/systems for review by Architect.

2.2 CONCRETE SELF-LEVELING UNDERLAYMENT MIX

A. Concrete Leveling Mix: one-component, fast drying, cementitious skim mortar ideal for repair or reprofiling of concrete slabs. Zero feather edge to ½" thickness application. Sika, Sika Level SkimCoat
   1. Flexural strength ASTM C-293: 1,300 psi at 28 days.
   2. Compressive strength ASTM C-109: 3,700 psi at 28 days

B. Concrete Leveling Mix: one-component, polymer modified, self-leveling underlayment ideal for repair or reprofiling of concrete slabs. Zero feather edge to ½" thickness application. Sika, Sika Level-125
   1. Flexural strength ASTM C-293: 1,150 psi at 28 days.
   2. Compressive strength ASTM C-109: 4,000 psi at 28 days

C. Concrete Leveling Mix: one-component, cementitious underlayment, self-leveling underlayment ideal for repair or reprofiling of concrete slabs. Zero feather edge to ½" thickness application. Sika, Sika Level-325
   1. Flexural strength ASTM C-293: 1,500 psi at 28 days.
   2. Compressive strength ASTM C-109: 5,300 psi at 28 days

2.3 CONCRETE REPAIR / CEMENTITIOUS MORTAR –PARTIAL DEPTH REPAIRS

A. Concrete Repair/Patch Cementitious Mortar: one-component, rapid hardening [ASTM C-928], early strength gaining, cementitious mix for repairs on horizontal surfaces.
   1. Flexural strength ASTM C-293: 1,000 psi at 28 days.
   2. Bond strength ASTM C-882: 2,500 psi at 28 days,
   3. Compressive strength ASTM C-109: 7,000 psi at 28 days

B. Sika, SikaQuick 1000 or Equal

2.4 CONCRETE SEALER

A. Concrete Sealer for new and existing concrete slabs on grade. Solvent based liquid membrane forming curing compound to seal surfaces with abrasion and stain resistant coating, non-yellowing resin. 100% acrylic polymer blend, fast drying solvent blend.
   1. SIKA Scofield Cureseal 100

PART 3 EXECUTION

3.1 REMOVALS

A. Remove all existing finish flooring – tile, VCT, epoxy paint from the existing concrete slabs. Remove/strip sealer from existing unfinished concrete slabs.

B. Prep existing concrete / substrate for new floor systems as specified.

3.2 EXAMINATION

A. Verify surfaces are ready to receive work.

B. Beginning of installation means acceptance of existing surfaces.

3.3 PREPARATION

A. Provide all temporary shoring and bracing as required for intended work.

B. Provide all required formwork, tools, and equipment as required for intended work.

C. Clean concrete surfaces of dirt, laitance, corrosion, or other contamination; wire brush using water; rinse surface and allow to dry.

D. Flush out cracks and voids with chemical solvent or water to remove laitance and dirt. Chemically neutralize by rinsing with water.

E. For areas patched with epoxy mortar, remove all broken and soft concrete. Remove corrosion from steel. Clean surfaces mechanically; wash with acid; rinse with water.

3.4 APPLICATION –CEMENTITIOUS MORTAR PARTIAL DEPTH REPAIR

A. Clean all surfaces of contaminants.
   1. Clean and prep all exposed reinforcing steel.
   2. Replace deteriorated reinforcing steel with new as indicated on the drawings.

B. Prime substrate in accordance with manufacturer requirements.

C. Mixing: mechanically mix per manufacturer requirements. Mix to a uniform consistency with a thorough mixing and proper proportioning of the two components.
   1. Add 3/8” course aggregate at desired quantity to uniform consistency as necessary.

D. Screed level.

E. Finish with float or light broom finish in accordance with approved mockup for desired finish texture.

F. Cure concrete per ACI recommendations using wet burlap, water mist,
   1. Do not use curing compounds for curing of concrete.

G. Avoid contact with aluminum materials to prevent adverse chemical reaction and possible failure of the repair. Insulate potential areas of contact by coating aluminum with epoxy.

3.5 APPLICATION – SELF-LEVELING MORTAR REPAIR

A. Prepare concrete by mechanical means, shot blast, sandblast, scarifying to achieve a matt, glaze free open textured surface.

B. Prime substrate in accordance with manufacturer requirements.

C. Mixing: mechanically mix per manufacturer requirements. Mix to a uniform consistency with a thorough mixing and proper proportioning of the two components.

D. Install in accordance with manufacturer requirements using a flat edge steel trowel.

E. Screed level.

3.6 APPLICATION – CONCRETE SEALER

A. Prep and clean surface per manufacturer requirements – clean from all prior sealers, curing compounds, oils, and foreign matters that may prevent penetration or adhesion. Meet Concrete Surface Profile of 1.

B. Distribute / Apply sealer per manufacturer requirements. Apply with garden sprayer and back roll with roller.

3.7 SCHEDULE / GENERAL REPAIR SCOPE

A. Clean / prep all existing concrete slabs after removal of existing floor finishes.

B. Remove all existing surface coatings, adhesives, mortar, etc. and patch repairs.

C. Remove all existing spalling and previous repair areas/patches.

D. Apply cementitious repairs to all areas of affected surfaces and to level various areas of the concrete slab between spaces within the building.
   1. Intent of repairs is to provide a smooth, uniform, floor slab free of voids, divots, and other irregularities in the finish, ready for a new finish floor system. Repairs shall be from edge to edge, across the entire floor system without exception.
   2. Floor repairs shall be accomplished to the satisfaction of the finish floor manufacturer / system as specified. Contractor to coordinate all requirements, and provide scope for the same.

E. Apply sealant [Sika, Sikaflex 1A or Equal] to joints and cracks.

F. Prepare for new finishes to concrete surfaces as indicated.

G. Apply sealer to new / existing concrete where noted and concrete is intended to be left exposed.

END OF SECTION

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SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Formwork.
   2. Reinforcement and Accessories.
   3. Cast-in place concrete.
   4. Finishing and curing.

1.2 SYSTEM DESCRIPTION

A. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 301 to conform to design and applicable code requirements to achieve concrete shape, line and dimension as indicated on Drawings or required by proposed work.

B. Vapor Retarder Permeance: Maximum 1 perm when tested in accordance with ASTM E96/E96M, water method.

1.3 SUBMITTALS

A. Design Data: Submit mix designs, admixtures, reinforcement, and anchors.

1.4 QUALITY ASSURANCE

A. Construct and erect concrete formwork, reinforcing, and cast-in-place concrete in accordance with ACI 301.

PART 2 PRODUCTS

2.1 FORM MATERIALS AND ACCESSORIES

A. Form Materials: At discretion of Contractor.

B. Form Release Agent: Colorless mineral oil not capable of staining concrete or impairing natural bonding characteristics of coating intended for use on concrete.

C. Slab Edge Joint Filler: ASTM D1751, Premolded asphaltic board, 1/2 inch thick. As applicable to conditions.

D. Vapor Retarder: ASTM E1745 Class A; 6 mil thick clear polyethylene film; type recommended for below grade application. Furnish joint tape recommended by manufacturer.

2.2 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, plain and/or deformed billet bars to suit condition and application, uncoated finish.

B. Welded Plain Wire Fabric: ASTM A185/A185M; in flat sheets; unfinished.

C. Fabricate concrete reinforcement in accordance with ACI 301.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150, Normal-Type I Portland type.

B. Fine and Coarse Aggregates: ASTM C33.

C. Lightweight Concrete Aggregate: ASTM C330

D. Water: Clean and not detrimental to concrete.

E. Air Entrainment Admixture: ASTM C260.

F. Fiber Mesh Reinforcing: ASTM 1116-C.

G. Bonding Agent: Latex emulsion.

H. Non-shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

2.4 COMPOUNDS, HARDENERS AND SEALERS

A. Membrane Curing Compound and Sealer: ASTM C1315 Type I, Class A. Dayton Superior or Equal
   1. Install only at areas not receiving finish flooring system.

2.5 CONCRETE MIX

A. Mix and deliver concrete in accordance with ASTM C94/C94M, Option A.

B. INTERIOR CONCRETE SLAB ON GRADE: Furnish concrete of the following strength:
   1. 150 PCF
   2. Compressive strength 3,000 psi (28 day).
   3. Slump limit of 4 inches at point of placement.
   4. Minimum Cement Content: 600 pounds/cu yd.
   5. Maximum water-cement ratio: 0.45
   6. Air Entrainment: +/- 4%.
   7. Transit Mixed.

2.6 GRANULAR BASE

A. Interior slabs:
   1. Install 4” pea gravel, clean and graded, washed river-run gravel, ASTM C33, Size #7.
   2. Match existing as applicable

PART 3 EXECUTION

3.1 FORMWORK ERECTION

A. Erect formwork, shoring and bracing to achieve design requirements.

B. Apply form release agent to formwork prior to placing form accessories and reinforcement.

C. Clean forms as erection proceeds, to remove foreign matter.

3.2 INSERTS, EMBEDDED COMPONENTS, AND OPENINGS

A. Provide formed openings where required for work to be embedded in and passing through concrete members.

B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

C. Install concrete accessories straight, level, and plumb.

D. Place joint filler at perimeter of floor slab, penetrations, and isolation joints.

3.3 REINFORCEMENT PLACEMENT

A. Place reinforcement, supported and secured against displacement.

B. Ensure reinforcing is clean, free of loose scale, dirt, or other foreign coatings.

C. Do not weld reinforcement bars for assembly.

D. Space reinforcement bars with a minimum clear space in accordance with ACI 301 of not less than 1 inch.

E. Maintain concrete cover around reinforcement in accordance with ACI 301 of not less than 1 1/2" inches for concealed work and 3 inches for concrete exposed to weather.

3.4 PLACING CONCRETE

A. Install 4” minimum thickness granular base over undisturbed soils and compact as applicable.

B. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.

C. Install vapor barrier under interior slabs on grade in accordance with ASTM E1643. **Lap joints minimum 6 inches and seal watertight using manufacturer supplied tape.**

D. Repair damaged vapor retarder with vapor retarder material, lap over damaged areas minimum 6 inches and seal watertight.

E. Place concrete continuously between predetermined expansion, control and construction joints. Do not break or interrupt successive pours creating cold joints.

F. Separate slabs-on-grade from vertical surfaces with 1/2 inch thick joint filler, extended from bottom of slab to within 1/4 inch of finished slab surface.

G. Where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack with non-shrink grout.

H. Screed slabs-on-grade level.

3.5 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Remove formwork progressively and in accordance with code requirements.

3.6 FLOOR FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301.

B. Uniformly spread, screed, and float concrete.
   1. Smooth finish at interior slabs.
   2. Align flush with adjacent concrete finishes.

C. Maintain surface flatness, with maximum variation of 1/8 inch in 10 ft.

D. Control joints:
   1. Locate at maximum of 12’-0” o.c. each way.
   2. Sawcut joints permitted only at concealed concrete areas.
   3. Trowel and re-trace joints at all exposed concrete areas.

3.7 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
   1. Protect concrete footings from freezing for a minimum of 7 days.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete for not less than 7 days.

C. Apply sealer on floor surfaces not receiving finish floor system.

3.8 ERECTION TOLERANCES

A. Install reinforcement within tolerances required by ACI 301.

3.9 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with ACI 301 at the request of Architect.

B. Field Testing:
   1. Measure slump and temperature for each compressive strength concrete sample.
   2. Measure air content in air entrained concrete for each compressive strength concrete sample.

C. Cylinder Compressive Strength Testing:
   1. Test Method: ASTM C39.
   2. Test Acceptance: In accordance with ACI 301.
   3. Test two cylinders at 28 days.
   4. Dispose remaining cylinders when testing is not required.

3.10 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required lines, details and elevations, as directed by Architect.

END OF SECTION

SECTION 04 01 00 - MAINTENANCE OF MASONRY

PART 1 GENERAL

1.1 WORK INCLUDES BUT NOT LIMITED TO:

A. Removal and replacement of damaged brick, associated weeps, and flashings.
   1. Includes supplemental new masonry as required to replace damaged masonry from removals.

B. Re-pointing mortar joints including raking, pointing-up and tooling of mortar joints in masonry where impacted by work.

1.2 SUBMITTALS

A. Samples for verification: before constructing sample wall, submit samples of the type of exposed masonry unit to be used for replacing existing units for each brick type, provide straps or panels containing at least four bricks for each type of factory mixed pointing mortar in the form of sample mortar strips. Provide each type of masonry patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each sample.

1.3 QUALITY ASSURANCE

A. Installer qualifications: 10 years-experience on similar projects. Work shall be performed by experienced and skilled mechanics.

B. Source limitations: obtain each type of material for masonry restoration [face brick, CMU, cement, sand, etc.] from one source with resources to provide materials of consistent quality in appearance and physical properties.

C. Perform Work in accordance with ACI 530 Building Code Requirements for Masonry Structures and ACI 530.1 Specification for Masonry Structures.

1.4 PRODUCT HANDLING

A. Deliver mortar materials to project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

D. Store lime putty covered with water in sealed containers.

E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.5 ENVIRONMENTAL REQUIREMENTS / PROJECT CONDITIONS

A. Repoint mortar joints and repair masonry only when air temperature is between and 40°f and 90°f and is predicted to remain so for at least 7 days after completion of work.
   1. In accordance with ACI 530.1

B. Hot-weather requirements: protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 90°f and above.
   1. In accordance with ACI 530.1

C. Patch masonry only when air and surface temperatures are between and 55°f and 100°f and are predicted to remain above 55°f for at least 7 days after completion of work. On days when air temperature is predicted to go above 90°f, schedule patching work to coincide with time that surface being patched will be in shade or during cooler morning hours.

D. Provide shoring, bracing, or support to prevent movement, settlement, or collapse of structure, work under demolition, or adjacent work to remain.

E. Prevent grout or mortar used in assembly and repair work from staining face of surrounding surfaces. Immediately remove grout and mortar in contact with exposed surfaces.

F. Protect sills, ledges, and projections from mortar droppings.

1.6 SEQUENCING AND SCHEDULING

A. Perform re-pointing after repair of existing masonry, including replacing existing masonry with new masonry materials and cleaning.

B. As scaffolding is removed, patch any anchor holes used to attach scaffolding. Patch holes in mortar joints in accordance with section covering re-pointing masonry.

1.7 MOCKUP

A. Construct a mockup of the masonry repairs including thru wall flashing modifications for review by RDA, if required by RDA.

PART 2 - PRODUCTS

2.1 FACTORY-MIXED MORTAR

A. Match original mortar remnants on brick as determined from field sampling and laboratory analysis at the mortar manufacturers plant. Match for color, texture and compressive strength.

2.2 COMPONENTS

A. Portland Cement: ASTM C150, Type I, gray color.

B. Premix Mortar for below grade applications: ASTM C387/C387M, Type S using gray color cement.

C. Premix Mortar for above grade applications: ASTM C387/C387M, Type N using colored cement.

D. Mortar Aggregate: ASTM C144, standard masonry type.

E. Hydrated Lime: ASTM C206, Type N.

F. Mortar Color: color as selected by Architect from full range of available colors for above grade applications.

G. Grout Aggregate: ASTM C404, fine.

H. Water: Clean and potable.

I. Bonding Agent: Latex type.

J. Calcium chloride is not permitted.

2.3 MIXES

A. Mortar Mixes:
   1. Mortar for Structural Masonry: ASTM C270, Type S using Proportion specification.
   2. Mortar for Non-Structural Masonry: ASTM C270, Type N using Proportion specification.

B. Mortar Mixing:

1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
2. Add mortar color.

C. Grout Mixing:
1. Mix grout in accordance with ASTM C94/C94M.
2. Do not use anti-freeze compounds to lower freezing point of grout.

D. Mixing Procedures:
1. Measure materials by volume or equivalent weight. Do not measure by shovel; use known measure.
2. To hydrate mortar, thoroughly mix ingredients dry. Mix again, adding only enough water to produce a damp mix which will retain its form when pressed in a ball. After keeping mortar in this dampened condition for 1-2 hours, add sufficient water to form proper consistency.
3. Mix mortar using a clean mechanical batcher for 3-5 minutes or by hand until completely mixed.
4. Place mortar within two hours of final mixing.
5. Do not re-temper or use partially hardened materials

2.4 MASONRY / BRICK

A. Provide masonry/brick units with colors, surface texture, size, and shape to match existing masonry and with physical properties not less than those determined from pre-construction testing of selected existing units.

B. Clay Masonry:
1. Face Brick: ASTM C216, Type FBX, Grade MW, color and texture to match existing
2. Brick Size and Shape: Nominal size of 4 x 4 x 12 [utility brick] to match existing

C. Concrete Masonry Units:
1. Size and Shape: Nominal modular size of 4 x 8 x 16, 6 x 8 x 16, 8 x 8 x 16, or 12 x 8 x 16 inches as indicated on drawings. Furnish special units for 90 degree corners, bond beams, lintels, bullnosed corners.
    a. Hollow Load Bearing Concrete Masonry Units: ASTM C90; normal weight.
    b. Hollow Non-Load Bearing Concrete Masonry Units: ASTM C129; normal weight.

D. Provide specially molded shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

E. For existing masonry that exhibits a range of colors, provide brick that matches that range rather than brick that matches an individual color within that range. Provide a sample for architect's approval where possible remove from areas to be demolished and salvage for reuse.

2.5 ACCESSORIES

A. Single Wythe Joint Reinforcement: ASTM A951/A951M; truss or ladder type; steel; 0.148 inch diameter side rods with 0.148 inch diameter cross ties; hot dip galvanized.

B. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars, uncoated finish.

C. Preformed Control Joints: Neoprene material. Furnish with corner and tee accessories.

D. Precast Concrete Lintels: nominal 4”x8”, 6”x8”, or 8”x8” precast concrete lintels as required by conditions at new door openings. Refer to Drawings.

E. Steel Lintels: See Section 05 12 00 and Lintel Schedule on Drawings.

F. Adjustable Anchors / Wire Ties to Connect to Existing Structure: Anchors / Wire Ties that allow for vertical and / or horizontal adjustment but resist tension and compression forces on the wall.
1. Adjustable ties with pintle and eye connections with an adjustment of +/- 1 inch.

G. Flexible Flashing:
   1. Self-adhering, flexible membrane flashing; cross laminated polyethylene film; self-healing; Nominal 40 mils thick.
      a. WR Meadows; Air-Shield Thru-Wall Flashing
      b. Grace Products, Perm-A-Barrier Wall Flashing
      c. York, York Seal Peel & Stick Flashing

H. Compressible Expansion Joint Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from closed cell neoprene or urethane. Sized as applicable to conditions.

I. Weeps: Cellular Plastic Weep: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than other wythe of masonry.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

B. Prevent mortar from staining face of surrounding masonry and other surfaces. Cover sills, ledges, and projections to protect from mortar droppings. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering. Immediately remove mortar in contact with exposed masonry and other surfaces. Clean mortar splatters from scaffolding at end of each day.

3.2 INSTALLATION

A. Install mortar in accordance with ACI 530.1 Specification for Masonry Structures.

3.3 FIELD QUALITY CONTROL

A. Testing of Mortar Mix: In accordance with ASTM C780.

B. Testing of Grout Mix: In accordance with ASTM C1019.

3.4 BRICK REPLACEMENT

A. Remove and replace masonry where indicated on drawings and as required to facilitate work. Reuse/reinstall existing salvaged masonry and supplement with new masonry to match where required [match existing].

B. Remove in an undamaged condition as much masonry as possible. Remove mortar, loose particles, and soil from brick and stone by cleaning with hand chisels, brushes, and water.

C. The documents show the masonry to be removed at each area of repair. Depending on the Contractor's care, additional masonry may require replacement. The Contractor shall include in the base bid allowance for additional replacement masonry at the designated areas of removal. These masonry quantities are not to be considered under the stated bid allowance for additional replacement.

D. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

E. Install replacement masonry into bonding and coursing pattern of existing masonry. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

F. Lay replacement masonry with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption [suction] of more than 30 g/30 square inch per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid. Maintain joint width for replacement units to match existing joints.

G. Tool exposed mortar joints in repaired areas to match surrounding existing brickwork.

H. Pointing: during the tooling of joints, enlarge any voids or holes, except weep holes and completely fill with mortar. Point up all joints at corners, openings and adjacent work to provide a neat, uniform appearance, properly prepared for application of caulking of sealant compounds.

3.5 THRU WALL FLASHING

A. General: Install new embedded thru-wall flashing and weep vents in masonry. Flashing shall be installed longitudinally continuous and terminated with end dams. Comply with NCMA recommendation for drainage wall system masonry construction.
   1. Install concealed thru wall flashing in accordance with SMACNA and NCMA TEK Bulletins 19-4 and 19-5 to ensure water resistant masonry construction.
   2. Apply primer, if required by manufacturer according to manufacturer's written instructions.
   3. Install pre-formed corners and end dams, cants, etc. under flexible flashing membrane, bedded in sealant in appropriate locations along wall.
   4. Extend membrane up wall above thru wall flashing a minimum of 8 inches onto outer face of inner wythe of masonry. Terminate with manufacturer approved termination bar and sealant as applicable.
   5. Extend membrane through wall and leave ¼ inch exposed.
   6. Roll flashing into place. Ensure continuous and direct contact with substrate. Avoid trapping air and forming wrinkles, bird's mouths, etc.
   7. Lap ends and overlap pre-formed corners by 4 inches minimum. Seal all laps with sealant.
   8. Protect installed flexible flashing from damage during construction.
   9. Install weep vents in head joints in exterior masonry in the first course of masonry immediately above embedded flashing [not mortar] with weep vents spaced at 24" o.c. maximum.

3.6 RE-POINT EXISTING MASONRY [AS IMPACTED BY MASONRY REMOVAL]

A. Joint raking: rake out all joints to be pointed by hand, using a mason's chisel that is not more than ¼ inch thick or by approved hand grinding methods. If grinding is used, wet methods are required to minimize dirt and dust. Rake or grind out mortar from joints to depths equal to 2-1/2 times their widths but not less than 1-inch nor less than required to expose sound, un-weathered mortar.
   1. Remove mortar to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum or flush joints to remove dirt and loose debris. No abrasive methods of cleaning shall be used.
   2. Do not spall edges of masonry units or widen joints. Replace masonry units which become damaged.
      a. Do not use power-operated grinders without Architect's written approval based on submission by Contractor of a satisfactory quality-control program and demonstrated ability of operators to use tools without damaging masonry. Quality control program shall include provisions for supervising performance and preventing damage due to worker fatigue.
   3. Replace any units which become damaged.
   4. if the existing bricks have worn rounded edges, recess final mortar slightly from face to a point where joint face will not be wider than the original joint.

B. Joint Pointing:

1. Rinse masonry joint surfaces with water to remove any dust and mortar particles. Time application of rinsing so that, at time of pointing, excess water has evaporated or run off, and joint surfaces are damp but free of standing water.
2. Apply first layer of pointing mortar to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8-inch until uniform depth is formed. Compact each layer thoroughly and allow to become thumbprint-hard before applying next layer.
3. After joints are filled to uniform depth, place remaining pointing mortar in 3 layers with each of first and second layers filling approximately 2/5 of joint depth and third layer the remaining 1/5. Fully compact each layer and allow to become thumbprint-hard before applying next layer. Take care not to spread mortar over edges onto masonry surfaces, or to featheredge mortar.
4. When mortar is thumbprint-hard, tool joints to match original appearance of joints as determined by the architect. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in damp condition for not less than 72 hours.

3.7 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure. Do not use metal scrapers or brushes. Do not use acidic or alkaline cleaners.

B. Sweep and rake adjacent pavement and grounds to remove masonry debris. Where necessary, pressure wash surfaces to remove mortar, dust, dirt, and stains.

3.8 GENERAL CLEANING

A. As work proceeds and on completion, remove excess mortar, smears, droppings.

B. Clean dirt and light staining from all brick surfaces.

C. Perform cleaning working from top to bottom working in sections around the building at one elevation at a time.

D. Use spray equipment that provides controlled application at volume and pressure indicated. Adjust pressure and volume to ensure cleaning methods do not damage masonry.

END OF SECTION

SECTION 04 05 14 - MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes mortar and grout for masonry.

1.2 SUBMITTALS

A. Samples: Submit two samples of mortar illustrating mortar color and color range.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 Building Code Requirements for Masonry Structures and ACI 530.1 Specification for Masonry Structures.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.

B. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

PART 2 PRODUCTS

2.1 MORTAR AND MASONRY GROUT

A. Manufacturers:
   1. Cemex
   2. Glen-Gery
   3. Quikrete Companies
   4. Southern Grouts and Mortars.

2.2 COMPONENTS

A. Portland Cement: ASTM C150, Type I, gray color.

B. Premix Mortar for below grade applications: ASTM C387/C387M, Type S using gray color cement.

C. Premix Mortar for above grade applications: ASTM C387/C387M, Type N using colored cement.

D. Mortar Aggregate: ASTM C144, standard masonry type.

E. Hydrated Lime: ASTM C206, Type N.

F. Mortar Color: color as selected by Architect from full range of available colors for above grade applications.

G. Grout Aggregate: ASTM C404, fine.

H. Water: Clean and potable.

I. Bonding Agent: Latex type.

J. Calcium chloride is not permitted.

2.3 MIXES

A. Mortar Mixes:
   1. Mortar for Structural Masonry: ASTM C270, Type N using Proportion specification.
   2. Mortar for Non-Structural Masonry: ASTM C270, Type N using Proportion specification.

B. Mortar Mixing:
   1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
   2. Add mortar color.

C. Grout Mixing:
   1. Mix grout in accordance with ASTM C94/C94M.
   2. Do not use anti-freeze compounds to lower freezing point of grout.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install mortar in accordance with ACI 530.1 Specification for Masonry Structures.

3.2 FIELD QUALITY CONTROL

A. Testing of Mortar Mix: In accordance with ASTM C780.

B. Testing of Grout Mix: In accordance with ASTM C1019.

3.3 SCHEDULES

A. CMU: 6” and 8” CMU with Type S mortar.

3.4 REPOINTING MASONRY

A. Rake out joints as follows:
   1. Rake out mortar from joints to depths equal to 2 ½ times their widths, but not less than ½” or not less that that required exposing sound unweathered mortar.
   2. Remove mortar from masonry surfaces within raked out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum or flush joints to remove dirt and loose debris.
   3. Do not spall edges of masonry units or widen joints. Replace damaged masonry units.
      a. Cut out old mortar by hand with a chisel and mallet, unless otherwise indicated.
      b. Do not use power-operated grinders without Architect’s written approval based on submission by Contractor of a satisfactory quality-control program and demonstrated ability of operators to use tools without damaging masonry. Quality control program shall include provisions for supervising performance and preventing damage due to worker fatigue.

B. Point joints as follows:
   1. Rinse masonry-joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at the time of pointing, excess water has been evaporated or run off and joint surfaces are damp but free of standing water.
   2. Apply first layer if pointing mortar to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers in not greater than 3/8 inch until a uniform depth is formed. Compact each layer thoroughly and allow it to become thumbprint hard before applying the next layer.
   3. After joints have been filled to a uniform depth, place remaining pointing mortar in three layers with first and second layers each filling about two-fifths of joint depth; third layer, the remaining one-fifth. Fully compact each layer and allow becoming thumbprint hard before applying next layer. Where existing bricks have rounded edges, slightly recess final layer from face. Take care not to spread mortar over edges onto exposed masonry surfaces or to featheredge mortar.
   4. When mortar is thumbprint hard, too l joints to match original appearance of joints, unless otherwise indicated. Remove excess mortar from edge of joint by brushing.
   5. Cure mortar by maintaining in a damp condition for at least 72 hours.

6. Where repointing work precedes cleaning of existing masonry, allow hardening at least 30 days before beginning cleaning work.

END OF SECTION

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SECTION 04 20 00 - UNIT MASONRY

PART 1 GENERAL

1.1 SUMMARY

A. Section includes clay masonry, concrete masonry units, reinforcement, anchorage, and accessories.

1.2 PERFORMANCE REQUIREMENTS

A. Concrete Masonry Compressive Strength (f'm): 2,000 psi; determined by unit strength method.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 530 Building Code Requirements for Masonry Structures and ACI 530.1 Specification for Masonry Structures.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.

B. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Clay Masonry:
   1. Face Brick: ASTM C216, Type FBX, Grade MW, color and texture to match existing
   2. Brick Size and Shape: Nominal size of 4 x 4 x 12 [utility brick] to match existing

B. Concrete Masonry Units:
   1. Size and Shape: Nominal modular size of 4 x 8 x 16, 6 x 8 x 16, 8 x 8 x 16, or 12 x 8 x 16 inches as indicated on drawings. Furnish special units for 90 degree corners, bond beams, lintels, bullnosed corners.
      a. Hollow Load Bearing Concrete Masonry Units: ASTM C90; normal weight.
      b. Hollow Non-Load Bearing Concrete Masonry Units: ASTM C129; normal weight.

2.2 ACCESSORIES

A. Single Wythe Joint Reinforcement: ASTM A951/A951M; truss or ladder type; steel; 0.148 inch diameter side rods with 0.148 inch diameter cross ties; hot dip galvanized.

B. Reinforcing Steel: ASTM A615/A615M, 60 ksi yield grade, deformed billet bars, uncoated finish.

C. Mortar and Grout: As specified in Section 04 05 14.

D. Preformed Control Joints: Neoprene material. Furnish with corner and tee accessories.

E. Joint Filler: Closed cell **polyurethane**; oversized 50 percent to joint width; self expanding; 1/2 inch wide x by maximum lengths.

F. Precast Concrete Lintels: nominal 4”x8”, 6”x8”, or 8”x8” precast concrete lintels as required by conditions at new door openings. Refer to Drawings.

G. Steel Lintels: See Section 05 12 00 and Lintel Schedule on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field conditions are acceptable and are ready to receive Work.

3.2 PREPARATION

A. Coordinate placement of anchors supplied by other sections.

B. Wet clay and shale brick before laying when initial rate of absorption is greater than 30 grams when tested in accordance with ASTM C67.

3.3 INSTALLATION

A. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

B. Coursing of Clay Masonry [Brick] Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 4 inches.
   3. Mortar Joints: Concave.

C. Coursing of Concrete Masonry Units:
   4. Bond: Running.
   5. Coursing: One unit and one mortar joint to equal 8 inches.
   6. Mortar Joints: Concave.

D. Cut mortar joints flush where ceramic wall tile is scheduled, cement parging is required, resilient base is scheduled.

E. Joint Reinforcement And Anchorage - Single Wythe Masonry:
   1. Install horizontal joint reinforcement 16 inches oc. Place joint reinforcement continuous in first joint below top of walls.
   2. Place masonry joint reinforcement in first horizontal joint above and below openings. Extend minimum 16 inches each side of opening.
   3. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches oc.

F. Lintels:
   1. Install loose steel or precast concrete lintels over openings.
   2. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled or indicated.
   3. Maintain minimum 8 inch bearing on each side of opening.

G. Grouted Components:
   1. Reinforce bond beam and pilasters as detailed.
   2. Support and secure reinforcing bars from displacement.
   3. Place and consolidate grout fill without displacing reinforcing.
   4. At bearing locations, fill masonry cores with grout for minimum 12 inches both sides of opening.

H. Control Joints:
   1. Install control joints at the following maximum spacings, unless otherwise indicated on Drawings:
      a. Exterior Walls: 20 feet on center and within 24 inches on one side of each interior and exterior corner.
      b. Interior Walls: 30 feet on center.
      c. At changes in wall height.
   2. Do not continue horizontal joint reinforcement through control joints.

3. Form control joint with sheet building paper bond breaker fitted to one side of hollow contour end of block unit. Fill resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.
4. Install preformed control joint device in continuous lengths. Seal butt and corner joints.

I. Built-In Work:
1. As work progresses, install built-in metal door frames, window frames, anchor bolts and plates and other items to be built in the work furnished by other sections.
2. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout or mortar. Fill adjacent masonry cores with grout minimum 12 inches from framed openings].

J. Cutting And Fitting:
1. Cut and fit for chases, pipes, conduit, sleeves, grounds and other penetrations. Coordinate with other sections of work to provide correct size, shape, and location.

K. Cleaning:
1. Remove excess mortar and mortar smears as work progresses.
2. Clean soiled surfaces with cleaning solution.

L. Tolerances:
1. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
2. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

END OF SECTION

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SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Structural shapes; Channels and angles; plates; bolts, connectors, and anchors; Grout.

1.2 SUBMITTALS

A. Shop Drawings: Indicate sizes, spacing, and locations of structural members, openings, connections, and welded connections.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
   1. Structural Steel: AISC 303.
   2. High Strength Bolted Connections: RCSC Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL

A. Channels and Angles: ASTM A36/A36M. 36 ksi.

B. Structural Pipe: ASTM A53/A53M, Grade B.

C. Structural Plates: ASTM A36/A36M. 36 ksi.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. Bolts: Heavy hex, structural type.
   1. ASTM A325; Type 1, hot dipped galvanized, or Type 3, plain.

B. Nuts: ASTM A563 heavy hex type.
   1. Finish: Hot dipped galvanized.

C. Washers: ASTM F436; Type 1, circular. Furnish clipped washers where space limitations require.
   1. Finish: Hot dipped galvanized.

D. Anchor Rods: ASTM F1554; Grade 55, weldable.

E. Threaded Rods: ASTM A36/A36M.
   1. Finish: Hot dipped galvanized.

2.3 WELDING MATERIALS

A. Welding Materials: AWS D1.1; type required for materials being welded.

2.4 FABRICATION

A. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

B. Fabricate connections for bolt, nut, and washer connectors.

2.5 FINISHES

A. Prepare structural component surfaces in accordance with SSPC SP 3 or as required by conditions.

B. Shop prime structural steel members.

C. Galvanizing: ASTM A123/A123M; hot dip galvanize after fabrication.

D. Galvanizing for Bolts, Connectors, and Anchors:

1. Hot-Dipped Galvanizing:
   a. Bolts, Nuts, and Washers: ASTM F2329.
   b. Connectors and Anchors: ASTM A153/A153M.
2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

2.6 ACCESSORIES

A. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing minimum compressive strength of 5,000 psi at 28 days.

B. Shop Primer: SSPC Paint 15, Type 1, red oxide.

C. Touch-Up Primer: Match shop primer.

D. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify bearing surfaces are at correct elevation.

B. Verify anchors rods are set in correct locations and arrangements with correct exposure for steel attachment.

3.2 ERECTION

A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.

B. Field weld components indicated.

C. Do not field cut or alter structural members without approval of Architect/Engineer.

D. After erection, touch up welds and abrasions to match shop finishes.

3.3 GROUT INSTALLATION

A. Shim bearing plates and equipment supports to proper elevation, snug tighten anchor bolts.

B. Fill void under bearing surface with grout. Install and pack grout to remove air pockets.

C. Moist cure grout.

D. Remove forms after grout is set. Trim grout edges to from smooth surface, splayed 45 degrees.

E. Tighten anchor bolts after grout has cured for a minimum of 3 days.

3.4 FIELD QUALITY CONTROL

A. Bolted Connections: Inspect in accordance with AISC 303.
   1. Visually inspect all bolted connections.
   2. For Direct Tension Indicators, comply with requirements of ASTM F959. Verify that gaps are less than gaps specified in Table 2.

B. Welding:
   1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2. Visually inspect all welds.
   3. Ultrasonic Inspection: ASTM E164; perform on all full penetration welds.

C. Correct defective bolted connections and welds.

END OF SECTION

SECTION 05 31 23 - STEEL ROOF DECKING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel roof deck and accessories.
   2. Bearing plates and angles.

1.2 PERFORMANCE REQUIREMENTS

A. Design metal deck in accordance with SDI 29 Design Manual and ASCE 3.

B. Calculate to structural limit stress design and maximum vertical deck deflection of 1/240.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sheet Steel: ASTM A653, Grade 33 Structural Quality; with G90 galvanized coating.

B. Bearing Angles: ASTM A36/A36M steel, unfinished, primed.

C. Shop Primer: SSPC Paint 15, Type 1, red oxide

D. Touch-Up Primer for Galvanized Surfaces: SSPC Paint 20 Type I Inorganic.

2.2 FABRICATION

A. Metal Deck: Sheet steel, configured as follows:
   1. Span Design: single.
   2. Minimum Metal Thickness Excluding Finish: 20 gage.
   3. Nominal Height: 1-1/2 inch, fluted profile to match existing.
   4. Side Joints: lapped.
   5. Flute Sides: plain vertical face.

B. Related Deck Accessories: Metal closure strips, cover plates, 20 gage thick galvanized sheet steel; of profile and size required for conditions.

C. Fasteners: Galvanized hardened steel, self tapping.

PART 3 EXECUTION

3.1 INSTALLATION

A. Erect metal deck in accordance with SDI Manual.

B. Bear deck on adjacent steel deck or steel supports with 6 inch minimum bearing. Align and level.

C. Fasten deck to steel support members at ends and intermediate supports with mechanical fasteners at 12 inches oc maximum, parallel with deck flute and at every other transverse flute.

D. Mechanically **clinch** male/female side laps at 24 inches oc maximum.

E. Reinforce steel deck openings from 6 to 24 inches in size with 3 x 3 x 1/4 inch steel angles. Place framing angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and mechanically attach to deck at each flute.

F. Install 6 inch minimum wide sheet steel cover plates, of same thickness as deck, where deck changes direction. Mechanically attach at 12 inches oc maximum.

G. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings.

END OF SECTION

SECTION 05 52 00 – ALUMINUM RAILINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Aluminum Tube handrail and fittings.

1.2 DESIGN REQUIREMENTS

A. Design handrail, guardrail, and attachments to resist forces as required by Ohio Building code. Apply loads non-simultaneously to produce maximum stresses.
   1. Handrail Concentrated Load: 200 pounds applied at any point in any direction.

1.3 SUBMITTALS

A. Shop Drawings: Indicate sizes, profiles, connection attachments, anchorage, size and type of fasteners and accessories.

1.4 QUALITY ASSURANCE

A. Perform Work for structural aluminum according to AA ADM 1.

B. Finish joints according to NOMMA Guideline 1.

PART 2 PRODUCTS

2.1 HANDRAILS

A. CR Laurence or Equal

2.2 ALUMINUM RAILING SYSTEM COMPONENTS

A. Rails: 1-1/2 inch diameter, extruded tubing conforming to ASTM B211
   1. 6063-T6 Aluminum Allow
   2. 1/8 inch wall thickness

B. Fittings: Elbows, T-shapes, wall brackets, escutcheons; machined aluminum

C. Mounting: brackets and flanges with aluminum brackets for embedding into masonry, or anchorage as necessary for the proposed railing system.

D. Splice Connectors: Concealed spigot, machined aluminum.

E. Exposed Fasteners: Flush countersunk screws or bolts; consistent with the design of railing.

F. Finish coatings to conform to AAMA 2603.

G. Interior Aluminum Surfaces: AAMA A42 anodized, dark bronze color

2.3 FABRICATION

A. Fit and shop assemble components in largest practical sizes for delivery to Site.

B. Fabricate components with joints tightly fitted and secured. Furnish spigots and sleeves to accommodate Site assembly and installation.

C. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

E. Exposed Welded Joints: NOMMA Guideline 1 Joint Finish #1.

F. Accurately form components to suit ramps and steps to each other and to building structure.

G. Accommodate for expansion and contraction of members and building movement without damage to connections or members.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field conditions are acceptable and are ready to receive Work.

B. Verify concealed blocking and reinforcement is installed and correctly located to receive wall-mounted handrails.

3.2 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Anchor railings to structure with anchors, plates as appropriate.

C. Field weld anchors as indicated on Shop Drawings. Touch-up welds with primer. Grind welds smooth.

D. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

E. Assemble with spigots and sleeves to accommodate tight joints and secure installation.

END OF SECTION

SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: plywood wall sheathing; blocking in wall openings; concealed wood blocking; and preservative treatment of wood.

1.2 QUALITY ASSURANCE

A. Perform Work according to following:
   1. Lumber Grading Agency: Certified by DOC PS 20.
   2. Lumber: DOC PS 20.
   3. Wood Structural Panels: DOC PS 1 or DOC PS 2.

B. Surface Burning Characteristics:
   1. Fire Retardant Treated Materials: Maximum 25/450 flame spread/smoke developed index when tested according to ASTM E84.

PART 2 PRODUCTS

2.1 MATERIALS

A. Lumber Grading Rules: SPIB; ASLS

B. Miscellaneous Framing: Stress Group D SPF or SYP species, #2 grade, 19 percent maximum moisture content.

C. Plywood: APA/EWA, Structural I, Grade B-C; Exposure Durability 2; sanded, fire retardant treated.

2.2 FIRE-RETARDANT-TREATED MATERIALS (FRT)

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Use treatment that does not promote corrosion of metal fasteners.
   2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

2.3 ACCESSORIES

A. Fasteners and Anchors:
   1. Fasteners: ASTM A153/A153M, hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.

2. Nails and Staples: ASTM F1667.
3. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel. All anchors sized to suit application and loads.

2.4 FIREBLOCKING AND FIRESTOPPING

A. Fireblocking: Solid lumber, structural wood panel, or particleboard, fire retardant treated.
   1. Solid lumber nominal 2 inches thick.
   2. Structural wood panel 23/32 inch thick with joints backed by structural wood panel.

2.5 FACTORY WOOD TREATMENT

A. Wood Preservative (Pressure Treatment): AWPA U1, Commodity Specification A-Sawn Products or F-Wood Composites using water-borne ACQ preservative.

B. Fire Retardant Treatment: Chemically treated and pressure impregnated, having flame spread of 25 or less when tested according to ASTM E84 and showing no evidence of significant progressive combustion when test is continued for an additional 20 minute period, Interior Type.

C. Moisture Content after Treatment: Kiln dried (KDAT).
   1. Lumber: Maximum 19 percent.
   2. Structural Panels: Maximum 15 percent.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate conditions are ready to receive blocking and framing.

3.2 PREPARATION

A. Coordinate placement of blocking and framing items.

3.3 FRAMING

A. Erect wood framing/blocking in accordance with Ohio Building Code. Place members level and plumb. Place horizontal members crown side up.

B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.

C. All exterior blocking intended to be left exposed to weather shall be pressure treated and anchored with galvanized fasteners and appropriate connectors.

D. All blocking and framing shall be fire retardant treated.

E. Fasten blocking per conditions and in accordance with Ohio Building Code.

3.4 FIREBLOCKING AND DRAFTSTOPPING

A. Install fireblocking to cut off concealed draft openings as required.
   1. Concealed Framed Wall and Furred Spaces: Install fireblocking vertically at floor and ceiling levels and horizontally.
   2. Connections Between Horizontal and Vertical Spaces: Install fireblocking between vertical walls and partitions and the following:
      a. Horizontal floor and roof framing.
      b. Soffits, dropped ceilings, cove ceilings and other horizontal concealed spaces.

3.5 SITE APPLIED WOOD TREATMENT

A. Treat site sawn cuts. Brush apply one coat of preservative treatment on untreated wood in contact with cementitious materials.

B. Allow preservative to cure prior to erecting members.

3.6 TOLERANCES

A. Framing members: ¼ inch from indicated position, maximum.

END OF SECTION

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SECTION 06 41 00 - ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Custom casework.
      a. Plastic-laminate-finished casework.
   2. Counter tops.
      a. Plastic-laminate-finished counter tops.
   3. Cabinet hardware.
   4. Wall Protection

1.2 SUBMITTALS

A. Product Data:
   1. High-pressure decorative laminates.
   2. Hardware accessories.

B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location, schedule of finishes.

1.3 QUALITY ASSURANCE

A. Perform Work according to AWS, Section 6, Section 10, and Section 11; custom grade.

B. Surface Burning Characteristics: Maximum 25/450 flame-spread/smoke-developed index when tested according to ASTM E84.

C. Fabricator: Company specializing in fabricating products specified in this Section with minimum five years' experience similar to this Project.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.5 AMBIENT CONDITIONS

A. Maintain storage space relative humidity within ranges indicated in AWS Section 2.

B. Subsequent Conditions: Maintain same temperature and humidity conditions in building spaces as will occur after occupancy during and after installation of Work of this Section.

1.6 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 CUSTOM CASEWORK

A. Plastic-Laminate-Finished Custom Casework:
   1. Frameless construction.
   2. Style: Flush overlay.
   3. AWS Section 10.
   4. Custom grade.
   5. Exterior and Interior Exposed Surfaces: High-pressure decorative laminate over medium density fiberboard [MDF].
   6. Semi-Exposed Surfaces: Thermally Fused Melamine over particleboard.

7. Interior Surfaces, Interior Cabinet Shelves, Drawers: Thermally Fused Melamine over particleboard.

B. Casework Construction Details:
   1. Drawer Side Joinery: dovetailed.
   2. Drawer and Door Edge Profile: Square with thin, applied band.
   3. Toe Base Finish: Rubber Base as specified in Section 09 65 00.

C. Plastic-Laminate-Finished Counter Tops: AWS Section 11; custom grade.
   1. Core: Medium density fiberboard or Particleboard.
   2. Splash Top Profile: Square with scribe.
   3. Front Edge: Square edge, plastic laminate, 1 1/2 face dimension.
   4. Splash Assembly: Field assembled.

D. Solid Surface Counter Tops: Refer to Section 06 61 16.

2.2 CASEWORK MATERIALS

A. Softwood Lumber: DOC PS 20.

B. Particleboard: ANSI A208.1 Grade M2 or better; composed of wood chips or sawdust, medium density.
   1. Fire-Retardant Particleboard: ASTM E84; 25 maximum flame-spread index and 450 maximum smoke-developed index.

C. Medium-Density Fiberboard: ANSI A208.2, composed of wood fibers, medium density.
   1. Fire-Retardant Fiberboard: ASTM E84; 25 maximum flame-spread index and 450 maximum smoke-developed index.

D. High-Pressure Decorative Laminate (HPDL): NEMA LD 3; through color, style/pattern as selected, and surface texture as selected.
   1. Horizontal Surfaces: HGS; 0.048 in thick.
   2. Vertical Surfaces: VGS; 0.028 in thick.
   3. Cabinet Liner: CLS; 0.020 in thick.
   4. Backing Sheet: BKL; 0.020 in thick.

2.3 FABRICATION

A. Fabricate casework to AWS Section 10 custom grade.

B. Fabricate counter tops to AWS Section 11 custom grade.

C. Shop-assemble casework for delivery to Site in units easily handled and to permit passage through building openings.

D. Fit exposed plywood edges with matching veneer edging. Use one piece for full length only.

E. Cap exposed high-pressure decorative laminate finish edges with material of same finish and pattern.

F. Door and Drawer Fronts: 3/4 inch thick.

G. When necessary to cut and fit on-Site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and Site cutting.

H. Apply high-pressure decorative laminate finish in full, uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.

I. Apply laminate backing sheet to reverse side of plastic-laminate-finished surfaces where required by AWS for specified grade.

J. Fabricate cabinets and counter tops with cutouts for applicable fixtures and fittings and cutouts. Verify locations of cutouts from on-Site dimensions. Seal cut edges.

2.4 ACCESSORIES

A. Adhesive for High-Pressure Decorative Laminates: Type recommended by laminate manufacturer to suit application.

B. Fasteners and Anchors:
   1. Fasteners: ASTM A153, hot-dip galvanized steel for high-humidity and treated wood locations, unfinished steel elsewhere.
   2. Nails and Staples: ASTM F1667.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application.

D. Shelf Rests: In-line bored holes 1-3/8 in o.c., to within 6 in of top and bottom of opening with four support pins for each shelf.

E. Drawer and Door Pulls:
   1. U-shaped pull, stainless steel with satin finish.
   2. Size and Spacing: 4 in centers.

F. Drawer Slides: Self-closing, galvanized steel construction, ball bearings separating tracks, rail mounted full extension type.

G. Hinges: Concealed Grade knuckle disappearing type, steel with chrome finish.

2.5 SHEET METAL COMPONENTS

A. Sheet metal enclosures at wall openings: 24 gauge, sized to fit conditions
   1. Painted finish at exposed locations.
   2. Galvanized finish at semi-finished and concealed locations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with Work of this Section.

3.2 PREPARATION

A. Prime paint surfaces of woodwork items and assemblies to be in contact with cementitious materials.

3.3 INSTALLATION – PLASTIC LAMINATE CASEWORK

A. Install casework according to AWS Section 10 custom grade.

B. Install counter tops according to AWS Section 11 custom grade.

C. Set and secure casework, interior finish carpentry, and counter tops in place; rigid, plumb, and level.

D. Use fixture attachments in concealed locations for wall-mounted components.

E. Use concealed joint fasteners to align and secure adjoining cabinets and counter tops.

F. Carefully scribe casework abutting other components, with maximum gaps of 1/32 in. Do not use additional overlay trim for this purpose.

3.4 INSTALLATION – SHEET METAL ENCLOSURES

A. Install sheet metal enclosure at existing openings / penetrations in walls where new ductwork is not being installed, or ductwork is different in size. Install in 2-piece configuration around new ductwork as applicable to the conditions. Follow requirements by Building Department.
   1. Provide metal frame or FRT wood blocking as applicable to the conditions.
   2. Field verify all conditions.

B. Install sheet metal enclosure around new penetrations in walls where required by conditions, follow requirements by Building Department.
   1. Provide metal frame or FRT wood blocking as applicable to the conditions.
   2. Field verify all conditions.

3.5 TOLERANCES

A. Conform to AWS Sections 6 and 10 requirements for following:
   1. Smoothness.
   2. Gaps.
   3. Flushness.
   4. Flatness.
   5. Alignment

3.6 ADJUSTING

A. Adjust moving or operating parts to function smoothly and correctly.

3.7 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

3.8 SCHEDULE

A. Refer to Drawings.

END OF SECTION

SECTION 06 61 16 - SOLID SURFACING FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes cast plastic / solid surface fabrications as scheduled at end of section.

1.2 REFERENCES

A. ASTM International:
   1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. South Coast Air Quality Management District:
   1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

C. Underwriters Laboratories Inc.:
   1. UL - Fire Resistance Directory.

1.3 SUBMITTALS

A. Shop Drawings: Indicate dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, field jointing, adjacent construction, methods of support, integration of electrical components, and anchorages.

B. Product Data: Submit data on specified component products, electrical characteristics and connection requirements.

C. Samples: Submit two samples representative of countertop illustrating color, texture, and finish.

D. Manufacturer's Installation Instructions: Submit preparation of opening required, rough-in sizes; tolerances for item placement, temporary bracing of components.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit list of approved cleaning materials and procedures required; list of substances harmful to component materials, Include instructions for stain removal, surface and gloss restoration, and general repairs.

1.5 QUALITY ASSURANCE

A. Surface Burning Characteristics: Maximum **25/450** flame spread/smoke developed index when tested in accordance with ASTM E84.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.8 WARRANTY

A. Manufacturer Warranty: Provide 10 year material warranty against defects and/or deficiencies in the solid surface materials.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer List:
   1. Corian, Dupont [basis of design]

2. Samsung Chemical
3. Wilsonart Contract

2.2 MATERIALS

A. Solid Surface Materials: Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment; not coated, laminated or of composite construction; meeting following criteria:

B. Performance / Design Criteria:
1. Tensile Strength: 6,000 PSI min [ASTM D638]
2. Tensile Modulus: 1.5 x 10^6 PSI min. [ASTM D638]
3. Tensile Elongation: 0.4% min. [ASTM D638]
4. Flexural Strength: 10,000 PSI min [ASTM D790]
5. Flexural Modulus: 1.2 x 10^6 PSI min [ASTM D790]
6. Hardness: >85-Rockwell “M” scale min. [ASTM D785]
7. Thermal Expansion: 2.2 X 10^-5 in/in/deg. F [ASTM E228]
8. Fungi/ Bacteria: does not support microbial growth [ASTM G21 / G22]
9. Microbial Resistance: Highly resistant to mold growth [UL 2824]
10. Ball Impact: No fracture – ½ lb. ball, 144” drop onto 12 mm slab [NEMA LD 3, Method 3.8]
11. Flammability [ASTM E84]
12. Flame Spread: <25
13. Smoke Developed Index: <25
14. Class A Rated

C. Adhesive for Bonding to Other Products: One component silicone to ASTM C920.

D. Sealant: A standard mildew-resistant, FDA/UL and NSF/ANSI 51 compliant in Food Zone area, recognized silicone color matched sealant or clear silicone sealants.

2.3 COMPONENTS

A. Counter Perimeter Frame: 3/4" thick, moisture resistant cores for counter tops in wet areas having sinks or lavatories are 3/4" thick exterior grade plywood with waterproof adhesive, Fir or Poplar plywood, veneer core only. MDF core conforming to ANSI/NPA A208.2 balanced design, of minimum density of 48 lb/cu ft and surface character to match sample approved by Architect. Ensure fire retardant Product contains fire-retardant chemicals injected with raw materials during manufacturing and achieves a maximum flame-spread rating of 25 with a maximum smoke development of 200 when tested to ASTM E84.

B. Countertops: 1/2” [12 mm] thick countertop of solid polymer solid surfacing material, cast to desired profiles and sizes having edge details as indicated on Drawings conforming to CSA B45.5/IAPMO Z124. Provide countertops complete with backsplashes of size shown on Drawings. Attach to mounting hardware / brackets according to manufacturer's instructions.

C. Polishing Cream: Compatible polishing cream to achieve specified sheen to gel coat.

D. Adhesive: as recommended by Manufacturer.

2.4 FABRICATION

A. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved Shop Drawings and solid polymer manufacturer requirements. Form joints between components using manufacturer’s standard joint adhesive without conspicuous joints. Provide factory cutouts for plumbing fittings and accessories as indicated on Drawings.

B. Where indicated, thermoform corners and edges or other objects to shapes and sizes indicated on Drawings, prior to seaming and joining. Cut components larger than finished dimensions and sand edges to remove nicks and scratches. Heat entire component uniformly prior to forming.

C. Ensure no blistering, whitening and cracking of components during forming.

D. Fabricate backsplashes from solid surfacing material with radius cove where counter and backsplashes meet as indicated on Drawings.

E. Fabricate joints between components using manufacturer's standard joint adhesive. Ensure joints are inconspicuous in appearance and without voids. Attach 50 mm (2") wide reinforcing strip of solid polymer material under each joint.

F. Provide holes and cutouts for plumbing and bath accessories as indicated on Drawings.

G. Rout and finish component edges to a smooth, uniform finish. Rout cutouts, then sand edges smooth. Repair or reject defective or inaccurate work.

H. Finish: Ensure surfaces have uniform finish. Matte finishes unless noted otherwise.

I. Radius corners and edges.

2.5 SHOP FINISHING

A. Color: as selected from full range of Manufacturer colors and patterns

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify joint preparation and affected dimensions are acceptable.

3.2 PREPARATION

A. Provide anchoring devices for installation and embedding.

B. Provide templates and rough-in measurements.

3.3 INSTALLATION

A. Install components plumb, level, rigid, scribed to adjacent finishes in accordance with reviewed Shop Drawings and Product installation details.

B. Fabricate field joints using manufacturer's recommended adhesive, with joints being inconspicuous in finished work. Exposed joints/seams are not permitted. Keep components and hands clean when making joints. Reinforce field joints as specified herein. Cut and finish component edges with clean, sharp returns.

C. Route radii and contours to template. Anchor securely to base component or other supports. Align adjacent components and form seams to comply with manufacturer’s written recommendations using adhesive in color to match work. Carefully dress joints smooth, remove surface scratches and clean entire surface.

D. Install countertops with no more than 1/8" sag, bow or other variation from a straight line.

E. Seal between wall and components with joint sealant as specified.

F. Provide backsplashes and endsplashes as indicated on Drawings. Adhere to countertops using a standard color-coordinated silicone sealant. Adhere applied sidesplashes to countertops using a standard color-matched silicone sealant. Provide coved backsplashes and sidesplashes at walls and adjacent millwork. Fabricate radius cove at intersection of counters with backsplashes to dimensions shown on reviewed Shop Drawings. Adhere to countertops using manufacturer’s standard color-coordinated joint adhesive.

G. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Ensure components are clean on date of Substantial Completion of the Work.

3.4 ERECTION TOLERANCES

A. Maximum Variation From Indicated Dimension: 1/8 inch.

B. Maximum Offset From Indicated Position: 1/8 inch.

3.5 CLEANING

A. Clean and polish fabrication surfaces.

3.6 SCHEDULE

A. Refer to Drawings

END OF SECTION

SECTION 07 21 00 - THERMAL INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes batt thermal / sound insulation.

1.2 SYSTEM DESCRIPTION

A. Vapor Retarder Permeance: Maximum 1 perm when tested in accordance with ASTM E96/E96M, desiccant method.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product data including thermal performance of materials.

1.4 QUALITY ASSURANCE

A. Insulation Installed in Concealed Locations Surface Burning Characteristics:
   1. Batt Insulation: 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

PART 2 PRODUCTS

2.1 BUILDING INSULATION

A. Manufacturers:
   1. Johns Manville.
   2. Certain Teed.
   3. Owens-Corning.

2.2 COMPONENTS

A. Sound Attenuation Batt Insulation: ASTM C665, Type I, preformed glass fiber batt, friction fit:
   1. Thickness: 3 inch and 6 inch
   2. Facing: Unfaced.

B. Batt Insulation: ASTM C665, preformed mineral wool insulation, friction fit
   1. Size / thickness as required for fire resistance rated assemblies.
   2. Facing: Unfaced.

C. Two part closed cell **polyurethane expandable insulation**
   1. Applications: Sealing open cracks in building envelope, etc.
   2. CLR Handifoam or equal.

2.3 ACCESSORIES

A. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate, adjacent materials, and insulation boards are dry and ready to receive insulation.

3.2 INSTALLATION

A. Sound Attenuation Batt Insulation:
   1. Install in wall stud cavities without gaps or voids.
   2. Fit insulation tight in spaces. Leave no gaps or voids.
   3. Install friction fit insulation tight to framing members, completely filling prepared spaces.

B. Fire Resistance Rated Assemblies:
   1. Install in voids and cavities without gaps or voids in fire resistance rated assemblies in accordance with UL Assembly criteria and / or Building Department requirements.

C. Miscellaneous gaps and cracks in building envelope: Fill gaps with expanding foam sealant where applicable such as gaps at window and door openings, etc. Install minimal expansion foam at all locations where sealant may bow or warp materials.

D. Expanding foam sealant: Install at all penetrations of ductwork, conduits, etc. through the floor, walls or ceiling. Cap all chases with a rigid air barrier as applicable for the condition.

END OF SECTION

SECTION 07 52 00 - MODIFIED ROOF SYSTEM AND ROOF SPECIALTIES

PART 1 GENERAL

1.1 WORK INCLUDES BUT NOT LIMITED TO

A. Provide modifications and repairs to existing modified roof system as required for removed, altered, and new roof penetrations.

B. Existing roof system is approximately 3 years old and is under warranty with US PLY. The installing contractor was KREMER ROOFING. All roof repairs shall be accomplished by KREMER ROOFING to maintain the existing roof warranty intact.

C. Coordination with mechanical contractor working in the building below to coordinate removals and any new penetrations required in the roof system.

D. Clean and dry deck surface.

E. Installation of a multi-ply roofing system with SBS modified granular base/cap with both plies heat welded with torch grade membrane.

F. Installation of new sheet metal items, bib flashing, vent flashings, equipment supports, termination bars, expansion joint and counter- flashings as is applicable to the work.

G. Installation of new flat stock and tapered insulation, cover board, tapered insulation saddles [see roof schedule] to match existing / adjacent roof system.

H. Installation of new membrane flashings and roof accessories/specialties.

I. Installation of liquid flashing system on supports, vent flashing and other areas required by the manufacturer or as noted.

1.2 APPLICABLE REFERENCES

A. The following references form a part of this specification.
1. ASTM D 41 Asphalt Primer Used in Roofing, Damp proofing Waterproofing.
2. ASTM D 4586 Type II, Asphalt Roof Cement, Asbestos Free.
3. ASTM A792, Pre-Finished [Galvalume], Grade 50, Coating Class AZ50, Sheet Steel, Aluminum-Zinc Alloy.
4. ASTM A755 Pre-Finished [Galvanized], Grade A, Hot Dipped, Zinc Coated G90.
5. Galvanized Steel: ASTM A 653, hot dipped, zinc-coated, G90, gauges as shown.
6. ASTM C 1289-13 Closed cell, polyiso Insulation Board, Type II, Class 1, Grade 2
7. ASTM E 108 Fire Test of Roof Coverings
8. [FMG] Factory Mutual Global - Current Approval System [NAV assembly numbers], Loss Prevention Data Sheets for Roof Deck Securement for Above Deck Roof Components, Perimeter Flashings, Wind Design – ANSI/FM 4474, Approval Standard FM 4470 and Roof Loads for Construction.
9. [UL] Underwriters Laboratories - Roofing Materials and Systems Directory, Fire Resistance Directory, Current Edition.
10. [NRCA] National Roofing Contractors Association - Current Roofing and Waterproofing Manual
11. [SMACNA] Sheet Metal and Air Conditioning Contractors Association- 6th Edition or Current Manual
12. [OSHA] Occupational Safety and Health Administration, Guidelines
13. ASCE 7-05 Minimum Design Loads for Buildings
14. ASTM D 6163/4 General Standards for SBS Modified Membrane. Type I, Grade G and S
15. ANSI/SPRI/FM 4435 ES-1 Wind Design for Edge Systems.
16. [NFPA] National Fire Protection Association, 58 Liquefied Petroleum Gas Code.
17. ASTM C1177, Gypsum Faced, Cover Board.

1.3 QUALITY ASSURANCE

A. Manufacturer inspection of the roof is required upon completion to ensure and document the roof system remains under warranty.

B. Contractor is required to locate under metal deck conduits/lines prior to using any penetrating deck fasteners to avoid punching conduits/lines, coordinate inspection with owner. Contractor is responsible to repair any damages that incur from penetrating conduits/lines.

1.4 REGULATORY PERFORMANCE REQUIREMENTS

A. Fire Hazard Classification: Underwriters Laboratories [UL], Use only Class A fire-rated materials as tested in accordance with ASTM E 108 or UL 790 for exterior fire.

B. American Society of Civil Engineers [ASCE], Factory Mutual Global Corporation [FMG]/Roof Material Manufacturer/NRCA: Roof materials supplied must be FMG approved meeting FM 4470 test standards meeting the intent of the test criteria set forth in FMG/ANSI standard 4474 to resistance the uplift design pressure as noted on the drawings and for **FMG** windstorm resistance classifications, to support internal/external fire , exposure **Class 1A** [metal deck], to support corrosion resistance fasteners/anchors and impact resistance for **severe hail [SH]** rating. The roof membrane manufacturer in compliance with the building code must provide the roof assembly securement requirements to resist the wind pressures as noted along with meeting the roof warranty wind requirements and other requirements as shown and outlined in the specifications. The manufacturer's roof assembly securement must **not** be less stringent then the ASCE 7-10 calculations and must be successfully tested to resist wind uplift pressure according with FMG procedures. A field pull [ANSI/SPRI FX-1] or adhesion test [ANSI/SPRI 1A-1] will be necessary prior to commencing work when conditions are different then manufacture's assembly test criteria for their approval to meet the design pressures or required by the state building codes or RDA Group. If a test has been accomplished the results will be provided herein.

C. Roof membrane sheets that require torching must follow FMG data Sheet 1-33 [safeguarding torch-apply roof installation guidelines] along with NRCA's and the manufacturer's requirement. All personnel that uses a torch on this project must read and sign this document.

1.5 DELIVERY, STORAGE AND HANDLING

A. Do not overload structure with storage of materials, verify roof deck weight capacity and location of structural supports, only items needed that day shall be stored on the roof. Limit loads on roof to 25 pounds per square foot for uniformly distributed loads for metal/gypsum decks, 75 pounds per square for concrete decks. **Provide temporary securement of existing membrane to prevent membrane blow off while installing new roof system, if applicable.**

B. Store and protect products in accordance with manufacturer's instructions.

C. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact. All materials must be UL or FM labeled.

D. Store products in weather-protected environment [manufacturer's plastic wrap is accepted for proper protection, unless wrap is broken, torn, removed or if noted otherwise by the manufacturer as part of the packaging label], clear of ground 4 inches and moisture. Use tarps for moisture protection as needed. Protect foam insulation from direct sunlight exposure. Water damaged materials will be marked 'rejected' by the contractor/owner or RDA and removed from the site.

E. Storage of flammable liquids in buildings is prohibited. All combustible debris shall be removed from the site daily.

F. Storage shall be in areas designated by owner.

G. If applicable, liquid propane [LP] gas containers shall be in an upright position at all times, comply with NFPA 58.

1.6 WEATHER CONDITIONS

A. Do not apply roofing system during inclement weather or when the chance is 40% or greater, percentage as listed on www.weather.com for the local area, percentage as listed when read at 7 AM local time or time of work commencement. Proceed with roofing and associated work when weather conditions will permit unrestricted use of materials and quality control of the work being installed.

B. Do not apply roofing system to damp or frozen deck surface.

C. Adverse weather conditions e.g. extreme temperature, high winds, high humidity and moisture could have a detrimental effect on adhesives, contact manufacturer for acceptable tolerances. See additional restrictions specified herein.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate the work of installing all associated items in such sequence that will not necessitate movement of workers and equipment over completed roof areas.

B. Sequence daily work of new roofing to be limited only that can be covered and made 100% watertight at the end of each day, including full adhesion of the membrane, flashings and night seals. No temporary roofing shall be allowed unless approved by RDA Group.

1.8 MANUFACTURER WARRANTIES

A. Maintain existing manufacturer warranty in place. Accomplish all work / repairs / modifications such that existing warranties remain in place.

1.9 PORTABLE FIRE EXTINGUISHER

A. Two standard listed multipurpose dry chemical fire extinguisher, NFPA 10, with 10-pound capacity, 4A-60B:C UL rating shall be provided and located near the work area. Additional fire extinguishers shall be provided for different roof levels/work sites.
   1. Contractor to ensure all personnel are trained to use fire extinguishers.

PART 2 PRODUCTS

2.1 ROOFING SYSTEM DESCRIPTION

A. Styrene Butadiene Styrene [SBS] Modified: Two-ply membrane, which includes an SBS mineral granulated surfaced polymer modified fire resistance cap sheet [top ply must contain a non-woven polyester reinforcement, unless stated otherwise herein].

B. Modified Manufacturers, Membrane Products and Membrane Application Summary:
   1. US PLY, DuraFlex 190S SBS/DuraFlex FR SBS. [DuraFlex 90 TG SBS/DuraFlex 190FRTG]
   2. Insulation [polyisocyanurate] Manufacturers: manufacturers approved insulation.
   3. Base Flashing Designations, modified: US Ply, Modified, same as roof system unless manufacturer requires a difference product for their warranty or as noted herein. [See torch restrictions herein]. Use manufacturer approved liquid membrane system product as required by condition.
   4. Other Flashing Designation: Manufacturers approved details for 20-year warranty.

ROOFING SYSTEM SCHEDULES

The contractor's quote must match the roof system including all components and application procedures [cover board, fasteners, membrane and etc.]. The roofing schedules set the parameters for the roof system assembly and its application procedures.

ROOF SYSTEM [Modified Heat Weld]

Deck, Prep:	Infill deck opening / modify as applicable to conditions.
Insulation System:	polyiso roof insulation to match adjacent roof thicknesses, install in multiple layers where applicable [+/- 5 inches in thickness], insulation is mechanically fastened into the metal deck.
Cover Board:	First layer, 1/4-inch-thick, set-in low-rise adhesive to the insulation.
Base Ply Sheet:	One ply SBS smooth modified sheet heat welded [torched] to the cover board
Cap Sheet:	One ply, mineral surfaced SBS modified fire rated sheet, heat welded [torched] to the base ply.

2.2 SHEET MATERIALS [MODIFIED / FELTS / MEMBRANE]

A. SBS Base/Ply Sheet: ASTM D 6164 or ASTM D 6163 [Heat Weldable-base], Type I, Grade S, non-woven polyester or fiberglass reinforced mat coated with SBS polymer modified asphalt, 90-138 mils thick, smooth surfaced, both sides surfaced with a sanded or heat weldable surface.

B. SBS Cap Sheet: ASTM D 6164, Type I, Grade G, non-woven polyester reinforced mat which may be enhanced with fiberglass strands/scrim, 120-160 mils thick, granular surfaced, coated only with SBS polymer modified asphalt and fire-retardant additives. One side surfaced with a heat weldable or sanded surface and the exposed to view side surfaced with **white** ceramic granules.

C. SBS Flashing Sheets, [two ply system]: ASTM D 6164, **First ply,** a layer of non-woven polyester, smooth surfaced mat coated with SBS polymer modified asphalt. One side surfaced with a sanded or heat weldable surface. **Top ply**, a layer of non-woven polyester granular surfaced mat which may be enhanced with fiberglass coated on both sides by SBS polymer modified asphalt. One side surfaced with a heat weldable or sanded surface and the exposed to view side surfaced with **white** ceramic granules.

2.3 BITUMINOUS MATERIALS

A. Asphalt Primer: ASTM D 41, solvent or water-based-use water based above 35 degrees F and raising.

B. Plastic Cement, asbestos free as recommended by the manufacturer.

C. Modified Flashing Cement [trowel grade]: ASTM D 4586, type I, MBR Flashing Cement, elastomeric adhesive specially formulated to be compatible with SBS modified products. Use a non-odor product if available.

2.4 INSULATION AND COVER BOARD

A. General: All flat stock insulation or cover board from the same manufacturer. Board configuration: 48 inches x 96 inches [mechanically fastened] or 48 inches x 48 inches for adhered applied. Mixing of insulation panels from different manufacturers is not acceptable. Insulation shall meet FMG 4450.

B. Flat/Tapered Board Stock [includes infill, replacement, tapered saddles and leveling]: ASTM C1289, closed cell polyiso, rigid board; type II, class 1, grade 2, non-asphaltic, glass fiber reinforced organic facers on both sides, square edges; minimum 20 psi compressive

strength, size as approved for application and as supplied by the roof membrane manufacturer. Thickness/slope as indicated in roofing schedule and roof matrix.

1. Saddles: Each side of the saddle width shall be minimum 1/4 [25%] of the drain to drain length as applicable for conditions. Saddle insulation shall be sloped at ½ inch per foot.
2. Drains: Tapered min. 1/4 inch per foot slope drain sumps are required at all drains.

C. Gypsum Cover Board, Flat Stock, [top layer over existing dry insulation or replaced insulation]:
   1. ASTM C1177, Georgia Pacific, Dens-Deck Primed, glass mat faced, primed surface, 1/4-inch-thick with square edges.

2.5 CANTS / EDGE

A. Cant and Tapered Edge Strips: Perlite, fire resistant, performed to 45 degree angle and 18" long tapered edge strip, tapered front to back as required by the manufacturer.

2.6 ACCESSORIES / ROOF SPECIALTIES

A. General: Fasteners/Anchors: strength, type and configuration must meet the required pull test resistance for each attachment application. Fasteners rate and pattern must be FMG or local code approved to meet the intent of the wind uplift rating specified. The contractor shall determine fastener lengths, minimum embedment: steel 3/4-inch, concrete/concrete block-1 ¼ inch, and wood-1 1/4 inch. Fastener manufacturers listed are ITW Buildex, IWT Red Head and TruFast or equal. All fasteners shall be corrosion resistant steel in accordance with meeting or ASTM F1667 [2015] or type 304 -316 stainless. Some items below may not be required for this project.

B. Summary of items and requirements are as follows:
   1. Roofing and Other Nails: square or round head, ring shanked galvanized or non-ferrous type, length and diameter as required to suit application.
   2. Other Fasteners:
      a. Metal Counterflashing and other LG metal sheets to Wood, ITW Buildlex, 'Scots Teks' [AB point] stainless steel-hex head, ¼ inch, corrosion resistance steel shank with EPDM washer.
      b. New -Existing Wood Members or New-Existing Nailers to Steel, ITW Buildex, # 14 or ¼ inch tek/ 3, 4.5 or 5, hex washer head, corrosion resistant self-drilling steel fastener [pre-drill holes and countersink head- max. wood thickness 7 inches].
      c. New -Existing Wood Members or New-Existing Nailers to Metal Decking, TruFast , #14 HD, phillips head, corrosion resistant self drilling steel roof fastener .
      d. Metal Counterflashing and Other LG Sheet Metal [exposed] to Masonry, ITW Red Head, ¼ inch,'Scots Tapcon', stainless steel-hex head, HL treads, corrosion resistant steel shank, with EPDM washer.
      e. Termination Bars [exposed] to Masonry, ITW Red Head, ¼ inch, 'Scots Tapcon', stainless steel-hex head, HL treads, corrosion resistant steel shank, with EPDM washer.
      f. Metal Sheets or Metal Decking to Metal Decking, #10, ITW Buildex,' tek/ 1', hex washer head, ABOT self-tapping with corrosion resistant steel shank.
      g. Metal Decking to Metal Joists, #14 or 1/4 inch, ITW Buildex, ' tek/ 4 or 4.5 hex washer head, self tapping with corrosion resistant steel shank.
      h. Wood Members/Nailers to Masonry: ITW Red Head, ¼ inch 'tapcon' steel anchor, corrosion resistant, pre-drilled and countersink head - max wood thickness 5 inches required. Or use TruFast, #14, HD phillips head, corrosion resistance steel roof fastener.
      i. General Purpose Stainless Steel: Series 304 fasteners, with or w/out EPDM washers.

3. Pitch Pans: Pre-finished 24 gauge stainless steel, soldered together with 4 inch roof flange and 4 inch height or size required for condition, only use if liquid flashing system not applicable.
4. Continuous Cleats: Galvanized steel, 22 gauge.
5. Counter-flashing and Flange/Sleeve: 24-gauge stainless steel [flange/sleeve], with 4 inch roof flange, length/style as shown. CF corners shall be mitered and sealed with sealant
6. Pipe Supports/Hangers: Manufactured by Portable Pipe Hangers, Adjustable, stainless metal components, polypropylene base, 'type SS8 – C or R [up to 2 ½ inch pipes] or PP10' [up to 3 ½ inch pipes] or Manufactured by OMG, Pipe-Guard, non-adjustable, PGM-BK, PGS-BK, PGTS-BK pipes up to 2 inches, as required for conditions.
7. Termination Bars: Aluminum 1.3-inch-wide, 10 feet long, 1.08 inch [min.] thick bars with flat or with [integral caulk edge], if applicable per manufacturer.
8. Rail Curbs: Manufactured by Pate, type es-1, es-2 or es-5, as required for condition, size as required by unit base size.
9. Bib Metal: 24-gauge stainless steel, minimum 4 inch wide.
10. Pourable Sealer: Polyurethane, manufacturer's standard.
11. Insulation Fasteners/Plate, Metal Deck: Steel, HD #14, phillips head, superior corrosion resistance with a 3-inch round metal cap, meeting FMG 4450 standard requirements and must be supplied or approved by the roofing manufacture for their warranty.
12. Equipment enclosure shall be 24-gauge stainless steel, shop or pre-manufactured with top fabricated [angled] to allow no moisture from entering the pipe areas. Install mortar in the bottom of base with polyurethane pourable sealer poured around pipes [2-inch depth minimum]. Seal pipes that exit enclosure with sealant/foam.

2.7 SHEET METAL

A. General: Roof membrane manufacturer supplied and approved components must be used, these sheet metal components must be tested and approved in accordance with ANSI/SPRI/FM 4435 ES-1 test methods and must be included into the roof warranty. All other metal shall be shop fabricated in accordance with SMACNA 6th Edition or other details or pre-manufactured as shown. All pre-finished metal [steel] shall be fabricated using galvalume, unless not available or wind resisting testing was used with galvanized steel.

B. Pre-Finished Metal [Galvalume]: ASTM A792, grade 50, 24 or 22 gauges [as outlined], primed and finished one side with a fluoropolymer Kynar 500 coating and a wash coat applied to the reverse side, 20-year warranty covering fade, chalking and film integrity. Colors as selected by the RDA Group and owner.

C. Pre-Finished Metal [Galvanized]: ASTM A755, grade A, 24 or 22 gauges [as outlined], primed and finished one side with a fluoropolymer Kynar 500 coating and a wash coat applied to the reverse side, 20-year warranty covering fade, chalking and film integrity.

D. Lead: ASTM B 749, 2 1/2 pounds per square foot [roof drain and vent pipe flashing-modified].

E. Stainless Steel: ASTM A 240/A 240M, dead soft fully annealed, smooth 24-gauge, type/grade 304 and 316 [exposed to view].

F. Galvanized Steel: ASTM A 653, hot dipped, zinc-coated, G90, gauges as shown.

2.8 SEALANT

A. General Use: ASTM C 920, Tremco's 'Dymonic FC' polyurethane, non- staining, non-shrinking, non-sagging and ultra-violet resistant, clear or to match surrounding existing color.

PART 3 EXECUTION

3.1 EXAMINATION / SURFACE CONDITIONS

A. Verify that surfaces and site conditions are ready to receive work. Verify that deck [total removed sections] is clean, dry and smooth, free of depressions, irregularities, or projections, **properly leveled**, start of work constitutes acceptance of conditions.

B. Areas of substrate where ponding water will occur [1in. deep or greater one hour after rainfall] shall be built-up in accordance with the leveling fill manufacturer's recommendations prior to the installation of the final ply sheet, string leveling deck/insulation prior to final ply recommended. Water test may be required upon request of RDA group. Failure to perform this action could result in total roof removal at contractor expense.

3.2 PROTECTION

A. Protect building surfaces/interior spaces against damage from roofing work. It is the contractor’s responsibility to take any necessary actions to prevent construction-related leaks, to include but not limited to repairing watertight existing surrounding roofing scheduled to be replaced or overlaid. Surround roofing areas include roof top material storage areas, workers roof top access to from roofing work site areas and any drainage system [roof drain-scuppers] leak issues located in work area

B. Provide, erect barricades, guardrails as required by applicable regulatory advisory to protect occupants of building and workers.

C. Cover all drains and other openings intended for drainage during construction to prevent clogging of system, remove at the end of each day to allow for drainage.

D. Special precautions shall be taken to avoid fumes from entering the facilities through air intakes, coordinate with owner to deal with active A/C units intake location and required preparation [fibers etc] prior to starting work.

3.3 DECK PREPARATION

A. Metal Deck: Fasten any loose or non- welded sections place. Replace or retro-fit [overlay] new 1-1/2 inch metal deck to match existing / adjacent deck. Match existing deck profiles and gauge. Fasten in place 15 inches on center in all directions [end laps/side laps]. Holes or weak areas, less than 1 square foot or 12 inches in diameter and deck tie-ins shall be covered with 18-gauge steel sheets fastened in place in all /edges overlapping good decking 4 inches [min. 4 fasteners or 18 inches on center fastening].

3.4 INSULATION / COVER BOARD

A. Secure insulation/cover board to roof deck to the requirements of FMG loss Prevention Data Sheet 1-28 and 1-29 to include additional securement at the corners and perimeters.

B. Metal Deck: Overlay new insulation and cover board on the existing dry metal deck. Mechanically fasten the insulation in accordance with the Manufacturer’s / Contractors / RDA approved layout, Secure the cover board to the insulation in low rise adhesive. Adhered insulation or cover boards shall be walked-in before skin coat develops and boards shall have continuous pressure until the adhesive sets [4 to 8 minutes, less time if adhesive is the quick setting type] to ensure not less than 85% of any board be in contact with the substrate. Install the insulation board perpendicular to roof slope with joints staggered [as applicable] no less than 24 inches in all directions Stagger joints of top layers/cover boards from bottom layers/saddles as applicable, in accordance with windstorm resistance classification securement pattern as specified and/or insulation manufacturer’s securement pattern. Two opposite edges on any panel shall be supported on the flutes minimum 1 1/2 inch where total removal has taken place. Any portion of an insulation board that falls within the calculated perimeter or corner area has the increased securement applied over the entire board.

C. Apply no more insulation than can be sealed watertight with roofing membrane in the same day. Cut insulation to fit neatly to perimeter blocking and around penetrations through the roof, maximum joint width 3/8 inch.

D. All ventilators, A/C unit curbs, supports etc. [square or rectangle] will have a tapered edge strip [formed as a saddle] placed around the high side of unit to slope water from unit. Ventilators, A/C unit, supports etc. curbs over 2 feet wide will require insulation saddles sloped ½ inch per foot.

E. Provide adequate separation of insulation between hot exhaust stacks.

3.5 ASPHALT PRIMER APPLICATION

A. Prime all dissimilar surfaces [metal, concrete, etc] which asphalt or membrane will come in contract. Apply at rate of 150-200 sq. ft. per gallon. Ensure that the primer is **completely dry** before any insulation or membrane can be installed.

3.6 MEMBRANE APPLICATION [MODIFIED]

A. Apply the SBS modified smooth membrane over the new cover board. Shingle fashion, starting at the low edge of the roof or at roof drains, apply one full width sheet of the modified membrane being sure to maintain 4-inch side and 6-inch end laps over preceding sheets, stagger end laps 12 inches. Align sheets [chalk lines] to maintain uniform laps. The sheet must be firmly and uniformly torched or set in cold adhesive at the rate of 1 1/2-2 gallon per square over the entire surface with laps heat air welded.

B. Apply the SBS modified cap sheet using one full width sheet to maintain 4-inch side and 6-inch end laps over preceding sheets with staggered laps 12 inch. The sheet must be firmly and uniformly torched at the rate of 1 ½-2 gallon per square over the entire surface. Ensure that side laps that are perpendicular to a fastened thru roof metal edge be held back 2 feet 6 inch from metal edging and a full cap sheet is installed parallel [picture framing] under the fastened metal edge flange, prior to flange installation. Apply sheets smooth without voids, free from air pockets, wrinkles, fishmouths, or tears, and avoid seams intersecting into drains.

C. Extend roofing plies over and terminate above cants strips [as applicable].

D. Special application shall be exercised at all T-joints [3 or more membranes], follow manufacturers printed instructions.

3.7 FLASHING APPLICATION [MODIFIED] – Vertical Surfaces, Edges, Pipes and Drains

A. General: Install flashing sheets over cants strips and other vertical surfaces, at edges and penetrations through roof as per manufacture's recommendations, requirements of FMG loss Prevention Data Sheet 1-49 including details and the following requirements.

B. Remove loose or unsecured flashings, mineral surfaced or coated flashings and excessive asphalt from walls, curbs etc. to provide a smooth, sound surface for new flashings.

C. Vertical Surface

1. Adhere each layer of roofing ply flashing [base layer of smooth surfaced and exposed to view layer of a granular surfaced ply sheet] in strips four-six feet long [max] on the primed vertical surfaces extending onto the flat field surface of the roof minimum four inches [six inches for the cap sheet] then heat weld or cement the plies ply in place. **Use cement applied base membrane [both plies] when adhering to roof top wood unit curbs, wood nailers or combustible material, no torching.** Firmly press flashing into position extending up walls or parapets minimum of 8 inches, [max. 25 inches - intermediate fastening may be required above 25 inches] above roof surface and nail cap sheet on 8-inch centers or install a termination bar at the top [as applicable]. Side laps shall be three inches and shall be staggered a minimum of twelve inches from the proceeding ply below. Flashing shall never be installed above

any thru-wall metal flashing unless authorized by RDA. Seam all corners and seams as per manufacturer recommendations.

2. Liquid flashing system shall be installed with a reinforced fabric in a multi-layer components configuration where noted or as required by condition per the manufacturer.

D. Flanges [curbs, flues, etc]

1. Primed all metal flanges and set primed metal flanges on top of smooth surfaced SBS sheet or on top of the modified cap, strip-in flange with 12-inch-wide smooth or cap sheet, as applicable, anchor in place as per manufacturer's guidelines. Manufactured supplied edges shall be installed in accordance with written instructions.

E. Pipes

1. All plumbing vents stack shall be flashed with a one-piece lead flange and sleeve installed over existing pipe, striped-in lead roof flanges with the modified membrane as per manufacturer recommendations. Extend short pipes to minimum 8 inches above finished roof surface. All other pipes that cannot be fitted with a lead flashing shall be flashed using liquid material/system as per manufacturer guidelines and as specified herein. Liquid flashing can be use on all vent stacks as an option.

3.8 INSTALLATION OF SHEET METAL / ROOF SPECIALTIES

General: Sheet metal items shall be installed in accordance with manufacturers and NRCA's/SMACNA, FMG recommendations and details from their current manual.

A. Continuous cleat [for non-pre-manufactured metal components]: Cleats shall not exceed 12 feet in length; allow a ¼ inch gap between pieces. Fasten cleat to wood nailer or deck as applicable at 6 inches on center with corrosion resistant annular threaded nails [3/16-inch head], long enough to penetrate the wood 1 ¼ inch or metal 3/4 inch.

B. Pitch pans shall have mortar installed in the bottom of pitch pans with polyurethane pourable sealer [2 inches min.] filled to the top of the pan, then slope.

C. Roof drain clamp rings/bolts where distorted, corroded or too short, shall be replaced. Clamp rings shall be clean of all asphalt and other deposits. Provide new drain strainers where missing.

D. Bib Flashing shall be installed around all roof top units/supports and all items that cannot be removed and reinstalled. Position under unit curb and anchor to unit with corrosion resistance fasteners with EPDM washers at 12 inches on center unless otherwise noted.

E. Rail curbs and pipe supports shall be installed in accordance with the manufacturer's instructions. Place curbs on deck and position curbs ends to allow water to flow toward drains or gutters.

F. Equipment enclosure shall have mortar installed in the bottom with polyurethane pourable sealer [2-inch depth minimum] filled. Seal pipes that exit enclosure with sealant.

G. Counter-flashing [CF] that is surfaced mounted shall be attached with concrete self-tapping [Scots tapcon] or wood fasteners, as applicable fitted with an EPDM washer at 12 inches on center, 1 in. minimum embedment. Apply a bead of sealant on the top of 45-degree angle lip of the metal flashing. CF that is placed in existing reglet shall be installed with lead anchors, re-cut reglet as necessary. Apply a bead of sealant where metal enters the masonry. All CF shall overlap base flashing a minimum of three inches and shall terminate no lower than 4 inch above finished roof surface, unless approved by the manufacturer.

H. Termination bars shall be placed no more then 1 1/2 inches down from top of base flashing and be fastened at 6 inches o. c with 1/4 in. diameter self-tapping [Scots tapcon] or wood steel fasteners, as applicable, 1-inch minimum embedment. Provide sealant at top edge of bars, if applicable.

I. Pipe supports shall be installed in accordance with manufacturer's instructions and be spaced no longer than ten feet.

J. Wind Rated, Pre-Manufactured, ES-1 approved roof fascia shall have a 20-gauge formed bar face fastened as outlined per the metal manufacturer, 12 inches on center to the nailer with 1 1/2 inch or 2-inch-long stainless steel fasteners, with fascia cover plate cleated/snapped in place with no exposed fasteners. The formed roof flange/cover plate set in approved sealant on finished roof surfaced in accordance with the written manufacturer's guidelines. Edge face shall be a single piece exceeding down to overlap and cover nailers as shown – extension piece will be required and extending down exterior wall. Follow manufacturer installation instructions.

K. Expansion joint, and other accessories not noted herein shall be installed in accordance with the manufacturer's recommendations and as shown on the drawings.

3.9 HEAT WELD SAFETY

A. Measures to be implemented by the contractor are to minimize the possibility of fire and to provide a safe work environment. It is the responsibility of the contractor performing any hot /torch work to comply with the safety provisions of the National Fire Codes pertaining to such work along with other requirements specified herein. All torched-applied material shall be in accordance with FM 1-33 and NRCA requirements. Never torch apply membrane to any flammable substrate. Crew members handling torches shall be trained by an authorized certified torch applicator [CERTA] trainer. One crewmember shall watch for fires or smoldering materials on all areas of the roof during torching application, **an infrared device that measures the material temperature shall be used for this watch. The watch shall continue one hour after roofing material application has been completed for the day checking all materials with the infrared device.**

B. In the event of a fire of any size, contractor shall notify the Local Fire Department.

3.10 WATER CUT-OFF [NIGHT SEALS]

A. At the end of the day's work or when precipitation is imminent, a water night seal or other cut-off waterproof protection shall be provided to ensure a 100 % watertight condition is obtained, between the new and existing conditions, to prevent water from penetrating behind or beneath the new roofing, remove cut-off prior to resuming the installation of the roofing system.

3.11 CLEANING

A. In areas where finished surfaces are soiled by any other source of soiling caused by work of this section, consult manufacturer for cleaning advice.

END OF SECTION

SECTION 07 81 00 - APPLIED FIREPROOFING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Spray-on cementitious fireproofing for interior structural steel.
   2. Intumescent paint fireproofing for structural steel.

1.2 SYSTEM DESCRIPTION

A. Applied (Sprayed-On) Fireproofing Systems: Provide UL fire rated assemblies to hourly ratings as follows:
   1. Interior Roof Deck and Exposed Structure: 1 hour.

B. Air Erosion: Maximum 0.025 gram/sq. ft allowable weight loss of fireproofing when tested in accordance with ASTM E859.

C. Corrosion: No contribution to corrosion of steel test panels when tested in accordance with ASTM E937.

D. Mold Resistance: Material to show resistance to fungi growth when tested in accordance with ASTM C665 requirements for fungi resistance of insulation or ASTM G21.

E. Fire test reports of fireproofing application to substrate materials, including primers, similar to Project conditions, conducted in conformance to ASTM E84 and ASTM E119.

1.3 SUBMITTALS

A. Product Data: Submit data indicating product characteristics, performance criteria, and limitations of use.

B. Manufacturer's Installation Instructions: Submit information including special procedures, and conditions requiring special attention.

1.4 QUALITY ASSURANCE

A. Fireproofing Assembly:
   1. Tested Rating: Determined in accordance with ASTM E119.

B. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Maintain minimum ambient and substrate temperature of 40 degrees F during and for minimum 24 hours after application of fireproofing, unless otherwise recommended by manufacturer.

B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.

C. Provide temporary enclosure to prevent spray from contaminating air.

1.6 WARRANTY

A. Furnish five year manufacturer warranty for applied fireproofing.

PART 2 PRODUCTS

2.1 SPRAY-ON CEMENTITIOUS FIREPROOFING

A. Product Description:

1. Low Density Cementitious Type: Factory mixed, cementitious material blended for uniform texture with vermiculite or lightweight synthetic aggregate, and conforming to the following requirements:
   a. Compressive Strength: ASTM E761, minimum 10 psi.
   b. Dry Density: ASTM E605, minimum average density of 15 pcf.
   c. Bond Strength: ASTM E736, 200 psf when set and dry.
   d. Bond Impact: ASTM E760, no cracking, flaking or delamination.

2.2 INTUMESCENT PAINT FIREPROOFING

A. Intumescent Fireproofing: Water based, factory mixed, asbestos free, intumescent material blended for uniform texture; color as selected.

B. Primer: Type recommended by manufacturer.

2.3 ACCESSORIES

A. Primer, Adhesive, Bonding Agent, Coating: Of type recommended by fireproofing manufacturer.

B. **Sealer**: As recommended by manufacturer of fireproofing material.

C. Metal Lath: Expanded metal lath; 3.4 lb/sq ft, galvanized finish; conform with ASTM C847.

D. Water: Clean, potable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify surfaces are ready to receive fireproofing.

B. Verify clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

C. Verify ducts, piping, equipment, or other items interfering with application of fireproofing have not been installed.

D. Verify voids and cracks in substrate have been filled. Verify projections have been removed where fireproofing will be exposed to view as finish material.

E. Verify roof traffic has ceased and roof mounted equipment is in place.

3.2 PREPARATION

A. Perform tests as recommended by fireproofing manufacturer in situations where adhesion of fireproofing to substrate is in question.

B. Remove incompatible materials affecting bond by scraping, brushing, scrubbing, or sandblasting.

C. Prepare substrates to receive fireproofing.

D. Apply fireproofing manufacturer's recommended bonding agent on primed steel.

E. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

F. Close off and seal duct work in areas where fireproofing is being applied.

3.3 APPLICATION - SPRAY-ON CEMENTITIOUS FIREPROOFING

A. Install metal lath over structural members where required by conditions.

B. Apply primer adhesive coating, fireproofing and overcoat sealer as applicable to conditions.

C. Apply fireproofing in sufficient thickness to achieve required fire ratings, with as many passes as necessary to cover with monolithic blanket of uniform density and texture.

D. In exposed locations, trowel surface smooth and form square edges, using tools and procedures recommended by fireproofing manufacturer.

E. Apply overcoat sealer at rate recommended by fireproofing manufacturer.

F. Remove excess material, overspray, droppings, and debris.

G. Remove fireproofing from materials and surfaces not required to be fireproofed.

H. At exposed fireproofing, clean surfaces soiled or stained, using manufacturer's recommended procedures.

I. Patch damaged work.

3.4 APPLICATION - INTUMESCENT FIREPROOFING

A. Apply primer and fireproofing in accordance with manufacturer's instruction.

B. Cut back primer 3 inches for bolted connections and 12 inches for welded connections.

C. Apply fireproofing in sufficient thickness to achieve indicated fire rating with as many passes necessary.

END OF SECTION

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SECTION 07 84 00 - FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Firestopping through-penetrations of fire rated assemblies.
2. Firestopping joints in fire rated assemblies.
3. Firestopping tops of fire rated walls.
4. Smoke sealing at joints between floor slabs and exterior walls.
5. Smoke sealing penetrations and joints of smoke partitions.

1.2 REFERENCES

A. ASTM International:
1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

B. Forest Stewardship Council:
1. FSC Guidelines - Forest Stewardship Council Guidelines.

C. Intertek Testing Services (Warnock Hersey Listed):
1. WH - Certification Listings.

D. South Coast Air Quality Management District:
1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

E. Underwriters Laboratories Inc.:
1. UL 263 - Fire Tests of Building Construction and Materials.
2. UL 1479 - Fire Tests of Through-Penetration Firestops.
3. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
4. UL - Fire Resistance Directory.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 PERFORMANCE REQUIREMENTS

A. Conform to UL for fire resistance ratings and surface burning characteristics.

1.5 SUBMITTALS

A. Product Data: Submit data on product characteristics, performance and limitation criteria.

B. Manufacturer's Installation Instructions: Submit preparation and installation instructions.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements and applicable code requirements.

1.6 QUALITY ASSURANCE

A. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
   1. Floor / Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.

B. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.

C. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.

D. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain this minimum temperature before, during, and for minimum 3 days after installation of materials.

B. Provide ventilation in areas to receive solvent cured materials.

PART 2 PRODUCTS

2.1 FIRESTOPPING

A. Manufacturers:
   1. 3M Fire Protection Products
   2. United States Gypsum Co.
   3. Equal.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
   1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
      a. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
   2. Foam Firestopping Compounds: Single component foam compound.
   3. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
   4. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.

2.2 ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive firestopping.

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.

B. Remove incompatible materials affecting bond.

C. Install backing materials to arrest liquid material leakage.

3.3 APPLICATION

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating, to uniform density and texture.

D. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

3.4 FIELD QUALITY CONTROL

A. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

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SECTION 07 90 00 - JOINT PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes sealants and joint backing.

1.2 SUBMITTALS

A. Product Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
   1. Certify volatile organic compound for each interior adhesive and sealant and related primer.
      a. All sealants must comply with Regulation 8, Rule 51 of the Bay Area Air Quality Management District.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

1.4 QUALITY ASSURANCE

A. Sealant shall be installed by a qualified sealant applicator for any/all joint sealant exposed to view. Owner reserves the right to request a mockup of the quality for the joint sealant installation.

PART 2 PRODUCTS

2.1 JOINT SEALERS

A. Manufacturers:
   1. Tremco [basis of design]
   2. Sika
   3. GE Silicones.
   4. Pecora Corp.
   5. DAP

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 sealant manufacturer, based on testing and field experience.

C. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Liquid-Applied Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.

E. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

F. Additional Movement Capability: Where additional movement capability is specified, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, to withstand the specified percentage change in the joint width existing at the time of installation and remain in compliance with other requirements of ASTM C920 for uses indicated.

G. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range, unless otherwise noted.

2.2 SILICONE JOINT SEALANTS:

A. **Type S-1**: Single component, nonsag, Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, Use NT
   1. Tremco Spectrem 1 or Spectrem 800 or Equal

B. **Type S-2**: Single Component, nonsag, Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 50, use NT
   1. Tremco Spectrem 2 or Spectrem 3 or Equal

C. **Type S-3**: Multi-Component, Nonsag, Silicone Joint Sealant: ASTM C920, Type M, Grade NS, Class 50, Use NT
   1. Tremco Spectrem 4-TS or Equal

D. **Type S-4**: Single Component, nonsag, Traffic-Grade, Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, Use T
   1. Tremco Spectrem 800 or Equal

E. **Type S-5**: Mildew Resistant, Single Component, Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT
   1. Tremco Tremsil 200 Sanitary or Equal

2.3 URETHANE JOINT SEALANTS

A. **Type U-1**: Single Component, nonsag, Urethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 25 or 35, Use NT:
   1. Tremco Dymonic or Dymonic FC or Equal

B. **Type U-2**: Single Component, nonsag, Traffic Grade, Urethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, Use T.
   1. Tremco Vulkem 116 or Equal.

C. **Type U-3**: Multi-Component, nonsag, Urethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, Use T.
   1. Tremco Dymeric 240 or Dymeric 240 FC or Equal

D. **Type U-4**: Multi-Component, nonsag, Urethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, Use NT.
   1. Tremco Vulken 227 or Equal

E. **Type U-5**: Multi-Component, nonsag, Traffic Grade, Urethane Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, Use T.
   1. Tremco Vulken 227 or Equal

2.4 BUTYL JOINT SEALANTS

A. **Type B-1**: Butyl Rubber based Joint Sealants: ASTM C 1311
   1. Tremco General Purpose Butyl Sealant or Equal

2.5 LATEX JOINT SEALANTS

A. **Type L-1**: Latex Joint Sealant: Acrylic latex or Siliconized Acrylic Latex: ASTM C834, Type OP, Grade NF or better
   1. Tremco Tremflex 834 or Equal.

B. **Type L-2**: Paintable Mildew-Resistant Latex Joint Sealant: Acrylic Latex or Siliconized Acrylic Latex: ASTM C834, Type OP, Grade NF or better.
   1. Tremco Tremflex 834 or Equal.

2.6 ACCESSORIES

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
   1. Oversized to 30 to 50 percent larger than joint width.

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

E. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated. Non-staining type, recommended by sealant manufacturer to suit application.

F. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

G. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate surfaces and joint openings are ready to receive work.

B. Verify joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Remove loose materials and foreign matter impairing adhesion of sealant.

B. Clean and prime joints.

C. Perform preparation in accordance with ASTM C1193.

3.3 INSTALLATION

A. Perform installation in accordance with ASTM C1193.

B. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

C. Install bond breaker where joint backing is not used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Tool joints concave.

3.4 SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and non-traffic horizontal surfaces.
   1. Joint locations such as, but not limited to:
      a. Construction joints in cast-in-place concrete.
      b. Control joints in unit masonry.

1) Provide joint sealants slightly darker than the adjacent masonry units. Provide multiple colors as may be required for match.

c. Perimeter joints between masonry, concrete, or stone and frames of doors, windows, storefronts, louvers, and similar openings.
d. Lintels and shelf angles to masonry construction.
e. Butt joints between metal panels.
f. Control and expansion joints in ceiling/soffit and similar overhead surfaces.
g. Exterior joints between dissimilar materials where the joining of the two surfaces leaves a gap between the meeting materials or components as may be dictated by various methods of construction to make building watertight.
h. Other joints as indicated on Drawings.

2. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type S-1, Type S-2, Type S-3**
3. Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
1. Joint locations such as, but not limited to:
a. Isolation joints in cast-in-place concrete slabs.
b. Perimeter of floor slabs or concrete curbs which abut vertical surfaces.
c. Areas around all piping systems that penetrate the slab or foundation walls below grade (utility trenches, electrical conduits, plumbing penetrations, etc.).
d. Control and expansion joints in tile flooring.
e. Other joints as indicated on Drawings.
2. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type S-4**
3. Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal non-traffic surfaces, subject to movement, unless otherwise noted.
1. Joint locations such as, but not limited to:
a. Control joints on exposed interior surfaces of exterior walls.
b. Interior joints where interior partitions meet exterior walls of dissimilar materials and components.
c. Other joints as indicated on Drawings.
2. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type U-1**
3. Color: As selected by Architect from manufacturer's full range of colors. Paintable Sealant, prep for painted finish.

D. Joint-Sealant Application: Interior joints in vertical surfaces subject to abuse and movement.
1. Joint locations such as, but not limited to:
a. Vertical joints, including control joints and joints between masonry and structural support members, on exposed surfaces of interior unit masonry walls and partitions.
2. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type U-2**
3. Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces not subject to movement.
1. Joint locations such as, but not limited to:
a. Interior perimeter joints of exterior openings.
b. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
c. Interior joints between dissimilar materials where a gap is created where materials meet, unless otherwise noted.
2. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type L-1, Type L-2**
3. Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Mildew-resistant interior joints in non-painted vertical surfaces and horizontal nontraffic surfaces.
   1. Joint locations such as, but not limited to:
      a. Interior joints between plumbing fixtures and adjoining floors and counters.
      b. Joints between countertops and backsplashes.
      c. For interior joints in non-painted vertical and horizontal surfaces where incidental food contact may occur.
      d. Tile control and expansion joints where indicated.
      e. Other joints as indicated on Drawings.
   2. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type S-5**
      a. For potable water storage sealant shall be certified by National Sanitation Foundation as conforming to the requirements of NSF Standard 61 – Drinking Water System Components – Health Effect.
      b. For surfaces where incidental food contact may occur sealant must comply with United States Department of Agriculture (USDA) guidelines for incidental food contact with cured sealant.
   3. Color: As selected by Architect from manufacturer's full range of colors.

G. Joint-Sealant Application: Mildew-resistant interior joints in painted vertical surfaces and horizontal non-traffic surfaces.
   1. Joint locations such as, but not limited to:
      a. Interior joints between plumbing fixtures and adjoining painted walls.
      b. Joints where countertops or backsplashes intersect painted walls.
      c. For interior joints in painted vertical and horizontal surfaces where incidental food contact may occur.
   2. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type L-2**
   3. Color: As selected by Architect from manufacturer's full range of colors.

H. Joint-Sealant Application: Interior or exterior joints in vertical surfaces between laps in fabrications of sheet metal.
   1. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type U-1**
   2. Color: As selected by Architect from manufacturer's full range of colors.

I. Joint-Sealant Application: Exterior joints under metal thresholds and saddles, sill plates, or as bedding sealant for sheet metal flashing and frames of metal or wood.
   1. Provide one of the following acceptable sealants as approved by manufacturer for substrates and uses indicated: **Type S-1, Type U-1, Type B-1**
   2. Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION

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SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes steel doors and frames; non-rated and fire rated, interior borrowed light window frames.

1.2 SUBMITTALS

A. Shop Drawings: Indicate door and frame elevations, internal reinforcement, cut-outs for glazing, and finishes.

B. Product Data: Submit door and frame configurations, location of cut-outs for hardware reinforcement.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with the following:
   1. ANSI 250.8 - Recommended Specifications for Standard Steel Doors and Frames.
   2. DHI - Door Hardware Institute - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.

B. Fire Rated Door Construction: Conform to NFPA 252.

C. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated on Drawings.

D. Attach label from agency approved by authority having jurisdiction to identify each fire rated door.

E. Surface Burning Characteristics:
   1. Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

F. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation material.

PART 2 PRODUCTS

2.1 STEEL DOORS AND FRAMES

A. Manufacturers:
   1. Ceco Door Products.
   2. Fleming Steel Doors and Frames.
   3. Kewanee Corp.
   4. Republic Doors.
   5. Steelcraft.

B. Product Description: Standard shop fabricated steel doors, and frames; fire rated and non-rated types; flush face.

2.2 DOOR TYPES

A. Exterior Doors (Insulated): ANSI A250.8, SDI 108, 1-3/4 inch thick.
   1. Level 3 – Extra Heavy Duty, Model 1, full flush design, 16 gauge face galvanized sheets, steel construction, factory applied baked on primer.
   2. Door Face sheets: One sheet of metal with no visible seams.
   3. Lock and Hinge Edge: Continuously of spot welded full height of door, with welds filled and ground smooth.
   4. Top: Closed with a flush steel and closure treatment.

5. Bottom: Closed with a recessed channel end closure.
6. Interior Core: Foamed in place, closed cell, polyurethane chemically bonded to the door face sheets.

B. Interior Doors (Non-Rated and Rated): ANSI A250.8, SDI 108, 1-3/4 inch thick.
1. Level 3 – Extra Heavy Duty, Model 1, full flush design, 16 gauge cold rolled steel, factory applied baked on primer.
2. Door Face sheets: One sheet of metal with no visible seams.
3. Lock and Hinge Edge: Continuously of spot welded full height of door, with welds filled and ground smooth.
4. Top: Closed with a flush steel and closure treatment.
5. Bottom: Closed with a recessed channel end closure.
6. Interior Core: Honeycomb or polystyrene core bonded to both door skins, unless otherwise required in rated doors. Foamed in place, closed cell, polyurethane chemically bonded to the door face sheets.
7. Prep for glazing as indicated on drawings, Refer to Section 08 80 00.

2.3 FRAME TYPES

A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.

B. Thermal Break Exterior Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 400. Exterior frames shall be thermally broken for use in masonry construction. Fabricate with 1/16 inch positive thermal break and integral vinyl weatherstripping.

C. Frames for exterior door openings shall be fabricated with 2 inch face at jambs, heads and mullions, unless otherwise indicated.
1. 16 gauge steel, galvanized, A60, steel with factory applied baked on primer, for Level 3 doors.
2. Thermally break frames with manufacturers standard thermal break material, at exterior openings, unless otherwise noted or fire-rating is required.

D. Frames for interior door openings and borrowed lights shall be fabricated with 2 inch face at jambs, heads, and mullions, unless otherwise indicated:
1. 16 gauge steel, cold rolled, factory applied baked on primer, for Level 2 and Level 3 steel doors and wood doors.

2.4 FRAME ASSEMBLIES

A. Stops and Beads: Furnish minimum 20 gauge metal glazing beads with the hollow metal frames at transoms, side lights, interior glazed panels, and other locations where beads are indicated in pressed steel frames. Glazing beads for exterior frames shall be on the interior side of transoms and sidelights. Glazing beads for interior frames shall be on the same side of door.

B. Mortar/Plaster Guards: Provide minimum 26 gauge steel plaster guards or mortar boxes, welded to the frame, at back of door hardware cutouts where materials might obstruct hardware operation.

C. Provide minimum 9 MSG hinge reinforcement, including all doors with continuous type hinges.

D. Provide minimum 12 MSG frame head reinforcement for closers, surface, and concealed overhead stop and holders, removable mullions, flush bolts, and top latch of vertical rod exit devices.

E. Door Silencers: Drill stops and install 3 silencers on strike jambs of single swing frames and 2 silencers on heads of double swing frames.

F. Hollow metal frames requiring continuous hinges shall have a continuous mortar guard of a minimum 26 gauge steel, welded to frame, the full height of the door. Mortar guards shall be shop applied by frame supplier.

G. Exterior door frames shall be furnished with a mortar box installed, as a junction box for door security monitoring contacts. Install junction box in frame head 12 inches from strike edge of frame to centerline of box. Weld junction box to inside of 1-15/16 inch frame rabbet.
   1. Mortar Box
      a. 10 inch by 1-3/4 inch by 1-3/4 inch inside dimensions.
      b. Serves as mortar shield.
      c. Knock outs at each end for standard conduit fittings.

2.5 FRAME ANCHORAGE

A. Jamb Anchors
   1. Frames Set in Existing Masonry: Provide specifically designed 18 gauge jamb anchors used to add support for bolting the frame into the rough opening of the existing wall.
   2. Frames Set in New Masonry: Provide metal anchors of shapes and sizes required for the adjoining wall construction. Provide a minimum of 3 wall anchors per jamb.
      a. Provide adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 18 gauge, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 7 WMG.
   3. Frames Set in Metal Stud Partitions: Provide a minimum of three 18 gauge metallic coated "Z" shaped sheet metal jamb anchor clips welded in each jamb.

B. Provide head anchors at door or window heads over 5 feet wide at minimum 3 feet o.c. mounted in metal-stud partitions.

C. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottom of jambs.
   1. Provide 14 gauge minimum anchors punched for two 3/8 inch diameter bolts each.

2.6 FIRE DOORS AND FRAMES

A. Provide approved and labeled hollow metal fire doors and frames at locations indicated in Door Schedule. Approved doors, frames, and hardware shall be constructed and installed in accordance with requirements of NFPA 80 and tested by UL (Underwriters' Laboratories, Inc.) or WH (Warnock Hersey) for the class of door opening indicated in schedules.

B. Provide 3/4 inch stops for sidelights and transoms where the individual glass areas for fire rated openings exceeds the allowable area for 5/8 inch stops.

C. Where continuous hinges are specified for labeled openings, apply the label in rabbet of the frame head and on top of the door. Labels shall be placed 12 inches from strike edge of door(s).

D. Label Materials and Attachment: Labels shall be steel, brass, aluminum, or non-metallic. Metal labels shall be attached by welding, riveting, pop riveting, or with drive screws. Embossed labels stamped directly into the steel will not be acceptable. Labels shall be provided for doors, door frames, and borrowed lites. Labels shall be protected during painting. Label protection shall be removed after final coat of paint has been completed and approved.

E. Labeled metal frames are required for labeled wood doors.

2.7 FABRICATION

A. Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects, warp, or buckle. Accurately form metal to required sizes and profiles. Wherever practicable, fit and assemble units in the manufacturer's plant. Clearly identify

work that cannot be permanently factory assembled before shipment, to assure proper assembly at the Project site.

B. Hollow-Metal Doors:
   1. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches, unless otherwise noted.
   2. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closure at exterior doors of same material as face sheets.
   3. Bottom Edge Closures: Close bottom edge of doors with end closures or channels of same material as face sheets. Coordinate with weatherstripping.
   4. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in Sections due to shipping or handling limitations, provide alignment plates of angles at each joint, fabricated of same thickness metal as frames.
   1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings
   2. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
      a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
      b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners, reinforcement, edge channels, and moldings from either cold rolled or hot rolled steel (at fabricator's option).
   1. Minimum hardware reinforcement gage shall comply with Table 4 of ANSI/SDI A250.8 “SDI 100, Recommended Specifications for Standard Steel Doors and Frames”.

E. Clearances for Non-Fire Rated Doors: Not to exceed 1/8 inch at jambs and heads, 3/32 inch between pairs of doors, and 3/4 inch at bottom.

F. Clearances for Fire Rated Doors: As required by NFPA 80.

G. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.

H. Door Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
   1. Prepare hollow metal units to receive mortised and concealed door hardware, including cutouts, steel reinforcing, drilling, and tapping in accordance with final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A250.6 and ANSI/BHMA A156.115 for preparation of hollow-metal work for hardware.
   2. Reinforce hollow metal units to receive nontemplated, mortised, and surface mounted hardware. Hardware installer shall drill and tap for surface applied hardware.

I. Stops and Moldings: Manufacturer’s standard, formed from minimum 20 gauge steel sheet stops and moldings around glazed lites and louvers. Form corners of stops and moldings with butted or mitered hairline joints.
   1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
   2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite are capable of being removed independently.

3. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
4. Provide screw applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.
5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 STEEL FINISHES

A. General: Comply with recommendations in "Metal Finishes Manual by Architectural and Metal Products (AMP) Division of National Association of Architectural Metal Manufacturers (NAAMM) for applying and designating finishes.
   1. Finish standard steel door and frames after assembly.

B. Metallic Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A780.
   1. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in steel, complying with SSPC Paint 20.

C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP1, SSPC-SP 3, SSPC-SP 6/NACE No. 3.

D. Factory Priming for Field Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.
   1. Shop Primer: Manufacturer's standard, fast curing, lead and chromate free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field applied finish paint system indicated; and providing a sound foundation for field applied topcoats despite prolonged exposure.

2.9 GLAZING

A. Refer to Section 08 80 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify opening sizes and tolerances are acceptable.

3.2 PREPARATION

A. Prior to installation, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
   1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   2. Alignment: Plus or minus 1/16 inch, measured on jambs on a horizontal line parallel to plane of wall.
   3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines,
   4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

B. Drill and tap doors and frames to receive nontemplated mortised and surface mounted door hardware.

3.3 INSTALLATION

A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install standard steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Install doors and frames in accordance with ANSI A250.11.

C. Install fire rated doors and frames in accordance with NFPA 80.

D. Coordinate installation of doors and frames with installation of hardware specified in Section 08 71 00.

E. Coordinate door frames with masonry and gypsum board wall construction for frame anchor placement.

F. Steel Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non Fire Rated Standard Steel Doors:
      a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
      c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
      d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
   2. Fire Rated Doors: Install with clearances according to NFPA 80.
   3. Smoke Control Door Assemblies: Install according to NFPA 105.

G. Coordinate installation of glass and glazing specified in Section 08 80 00.

H. Adjust door for smooth and balanced door movement.

I. Tolerances:
   1. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.4 SCHEDULE

A. Refer to Drawings.

END OF SECTION

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Flush wood doors.
   2. Door glazing.
   3. Door louvers.

1.2 SUBMITTALS

A. Shop Drawings: Indicate:
   1. Door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, and factory machining criteria.
   2. Cutouts for glazing and louvers.

B. Product Data:
   1. Door core materials and construction.
   2. Veneer species, type and characteristics.
   3. Factory finishes.

C. Samples:
   1. Two of door construction, veneer cut and grain pattern. Show veneer slices, pattern, joints, etc. Illustrate wood grain, stain color and sheen and variation in finish color.

1.3 QUALITY ASSURANCE

A. Perform Work according to AWI AWS Section 9, Premium Grade.

B. Finish doors according to AWI AWS Section 5 Premium Grade.

C. Fire-Rated Door Construction: Conform to one of following:
   1. NFPA 252; with neutral pressure level at 40 inches maximum above sill at five minutes into test.
   2. UL 10C.
   3. Twenty-Minute Fire-Rated Corridor and Smoke Barrier Doors: Fire tested without hose stream test.

D. Installed Fire-Rated Door Assembly: Conform to NFPA 80 for fire-rated class as indicated.

E. Smoke and Draft Control Doors: Tested according to UL 1784 and installed according to NFPA 105.
   1. Air Leakage: Maximum 3.0 cfm/sq ft of door opening with 0.10 inch w.g. pressure differential.

F. Attach label from agency approved by authority having jurisdiction to identify each fire-rated door.
   1. Indicate temperature rise rating for stair doors.
   2. Attach smoke label to smoke and draft control doors.

G. Manufacturer: Company specializing in manufacturing products specified in this Section with three years' experience.

1.4 COORDINATION

A. Coordinate Work with door opening construction, door frame and door hardware installation.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect wood doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced ANSI standard and recommendations of

WDMA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors," as well as with manufacturer's instructions.

B. Identify each door with individual opening numbers that correlate with designation system used on shop drawings for door, frames, and hardware, and STC or fire rating where applicable, using temporary, removable, or concealed markings.

C. Polybag protect each door for shipment and handling.

D. Environmental Limitations: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with requirements of the referenced quality standard for Project's geographical location.

1.6 WARRANTY

A. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

B. Interior Doors:
   1. Factory-Finished Doors: Furnish life of installation warranty from Manufacturer.

PART 2 PRODUCTS

2.1 FLUSH WOOD DOORS

A. Manufacturers:
   1. Chappell Door Company
   2. Approved Equal – door MUST match Chappell Door Specifications and finish.

B. Flush Interior Doors: Solid core.
   1. Thickness: 1-3/4 inches.
   2. Core: PC, flush doors
   3. Core: SCLA, structural composite lumber core for doors with light openings and / or louvers.
   4. Face Construction: five-ply.
   5. Performance Duty Level: Extra Heavy duty.
   6. Quality Grade: Premium with Grade A faces.

C. Performance / Design Criteria:
   1. Performance Duty Level: WDMA I.S. 1A.
   2. Fire Resistance: As indicated on drawings / door schedule.
   3. Sound Transmission Resistance: ASTM E413; minimum STC 35 for door and frame assemblies indicated as acoustically rated.

D. Sound Retardant Doors
   1. Door face and grade to match Flush Interior Doors
   2. Core: Sound retardant core
   3. STC: STC Rating of 42
   4. Door Thickness: 1-3/4 inch or 2-1/4 inch with STC rating listed
   5. Glazing: Double-glazed with 5/16 inch laminated glass
   6. Sound Control Door Hardware: standard sound control system including head and jamb seals, door bottoms as required to achieve STC rating.

2.2 MATERIALS

A. Door Cores: AWI AWS Section 9.
   1. Solid Core, Non-Fire-Rated:
      a. Type: PC; particleboard, ANSI A208.1.
   2. Solid Core, Fire-Rated: Category A for positive pressure fire test.
      a. Type FD; fire-resistive composite.

B. Interior Door Faces:
   1. Transparent Finished Faces: Wood veneer.
      a. Species: Natural White Birch.
      b. Veneer Cut: Rotary cut.
      c. Veneer Matching: Book matched.
      d. Face Matching: Running. Pair match multiple door leaves in single opening.

C. Facing Adhesive: Type I - waterproof.

2.3 VISION PANEL / LITE KITS

A. Wood to match doors, unless otherwise required for rated doors.

B. Vision Panels for Fire-Rated Doors: manufacturer's standard frame formed of cold-rolled sheet steel, factory primed for painted finished and approved for use in fire-protection rating indicated.

2.4 FABRICATION

A. Fabricate doors according to AWI AWS Section 9 requirements.

B. Astragals for Double Doors: Steel, T-shaped, overlapping and recessed at face edge, specifically for double doors.

C. Furnish lock blocks at lock edge and top of door for closer for hardware reinforcement.

D. Vertical Exposed Edge of Stiles: Wood veneer matching door facing.

E. Fit door edge trim to edge of stiles after applying veneer facing.

F. Bond edge banding to cores.

G. Factory machine doors for finish hardware according to hardware requirements and dimensions. Do not machine for surface hardware.

H. Factory-fit doors for frame opening dimensions identified on Shop Drawings.

I. Provide edge clearances according to AWI AWS Section 9.

2.5 FINISHES

A. Finish Work according to AWI AWS Section 5; Premium Grade.

B. Transparent Finish System: Stained, **Heritage Brown**; semi-gloss sheen to match existing.
   1. System 5; conversion varnish.
   2. System 11; catalyzed polyurethane.

C. Factory finish doors according to approved sample.

D. Seal door top edge with color sealer to match door facing.

2.6 ACCESSORIES

A. Light Frames:
   1. Wood beads: manufacturer standard, flush style. Wood species to match door face.

B. Wood Door Louvers:
   1. Material and Finish: Match door face.
   2. Louver Blade Style: Chevron.
   3. Louver Free Area: 33 percent.

C. Door Glazing:
   1. Glass: As specified in Section 08 80 00.

2. Glass: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind FT fully tempered, Condition A uncoated, float glass with horizontal tempering; conforming to CPSC 16 CFR 1201 Category II.
3. Glazing Stops: Wood, of same species as door facing.
4. Glazing Stops: Wood with metal clips for rated doors.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install doors according to AWI AWS Section 9 and manufacturer's instructions.

B. Field Fitting and Trimming:
   1. Trim non-rated door width by cutting equally on both jamb edges.
   2. Trim door height by cutting bottom edges to maximum of 3/4 inch.
      a. Trim fire door height at bottom edge only, according to fire-rating requirements.
   3. Machine cut doors for hardware installation.

C. Coordinate installation of doors with installation of frames specified in Section 08 12 14 and hardware specified in Section 08 71 00.

D. Coordinate installation of glass and glazing as specified in Section 08 80 00.

3.2 TOLERANCES

A. Conform to AWI AWS Section 9 requirements for following:
   1. Fit and clearance tolerances.
   2. Gaps.
   3. Flushness.
   4. Flatness.
   5. Squareness.

3.3 SCHEDULE

A. Refer to Door and Frame Schedule on Drawings.

END OF SECTION

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Fire-resistive-rated and non-rated Access doors and panels with frames.

1.2 SUBMITTALS

A. Product Data: Indicate sizes, types, finishes, hardware, scheduled locations, fire-resistance listings, and details of adjoining Work.

B. Manufacturer's Installation Instructions: Include rough-in dimensions.

1.3 QUALITY ASSURANCE

A. Fire-Rated Access Door Construction:
   1. Wall Access Doors: NFPA 252 or UL 10B.
   2. Ceiling Access Doors: ASTM E119 or UL 263.

B. Installed Fire-Rated Access Door Assembly: Conform to NFPA 80 for fire-rated class as indicated.

C. Attach label from agency approved by authority having jurisdiction to identify each fire-rated access door.

1.4 COORDINATION

A. Coordinate Work with Work requiring controls, valves, traps, dampers, cleanouts, and similar items requiring operation being located behind finished surfaces.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS

A. Flush Framed Access Doors (Type 1): Frames and nominal 1 inch wide exposed flanges of 16 gage steel and door panels of 14 gage steel.

B. Gypsum Board Access Doors (Type 2): Frames and nominal 1 inch wide flanges of 16 gauge steel and door panels of 14 gauge steel. Design flanges to be concealed by gypsum board joint finishing compound.

C. Fire-Rated Access Doors (Type 3): Frames and nominal 1 inch wide exposed flanges of minimum 16 gage steel and door panels of 20 gage steel. Provide self-closing and latching doors with cam lock.

2.2 FABRICATION

A. Fabricate units of continuous welded construction; weld, fill, and grind joints to assure flush and square unit.

B. Wall and Ceiling Access Door and Panel Hardware:
   1. Hinge: Standard continuous or concealed spring pin type, 175-degree steel hinges.
   2. Lock: Self-latching lock. Screw driver slot for quarter turn cam lock.

2.3 SHOP FINISHING

A. Base Metal Protection: Prime coat units with baked on primer.

B. Finish: to match adjacent wall/ceiling surface.

PART 3 EXECUTION

3.1 INSTALLATION

A. Set concealed frame type units flush with adjacent finished surfaces.

B. Position unit to provide convenient access to concealed Work requiring access.

C. Install fire-rated units according to NFPA 80 and requirements for fire listing.

3.2 SCHEDULES

A. Provide and install access panels where required by existing construction, utilities, etc.

B. Field coordinate requirements, sizes, and locations.

END OF SECTION

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes aluminum-framed storefronts including aluminum and glass doors, frames, hardware, receivers, and accessories.

1.2 SYSTEM DESCRIPTION

A. Aluminum-Framed Storefront System: Tubular aluminum sections with supplementary internal support framing as required, factory fabricated, factory finished, glass infill, related flashings, anchorage and attachment devices.

B. System Assembly: Site assembled or Factory unitized assembly as applicable.

C. System Design: Provide for expansion and contraction within system components caused by temperature cycling. Design and size members to withstand loads caused by pressure and suction of wind.

D. Air Infiltration: Limit air leakage through assembly to 0.06 cfm/min/sq ft of wall area, measured at reference differential pressure across assembly of 6.24 psf when tested in accordance with AAMA/WDMA 101/I.S.2 or ASTM E283.

E. Water Leakage: None, when measured in accordance with AAMA/WDMA 101/I.S.2 or ASTM E331 with test pressure difference of 20 percent of design pressure, with minimum differential of 2.86 lbf/sq ft and maximum of 12.00 lbf/sq ft.

F. Uniform Load Deflection: < L/175 at 50 PSF positive and negative

G. System Internal Drainage: Drain water entering framing system to exterior.

1.3 SUBMITTALS

A. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work and expansion and contraction joint location and details.

B. Product Data: Submit component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with AAMA SFM-1 and AAMA MCWM-1 - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B. Surface Burning Characteristics:
   1. Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

C. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation board.

D. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years experience.

E. Installer: Company specializing in performing Work of this section with minimum five years experience.

1.5 WARRANTY

A. Furnish five year manufacturer warranty for insulated glass and factory finishes.

PART 2 PRODUCTS

2.1 ALUMINUM-FRAMED STOREFRONTS

A. Manufacturers:
   1. Capitol Aluminum and Glass [245 TMP Storefront Series – basis of design]
   2. Kawneer
   3. EFCO
   4. Manko
   5. Graham
   6. Approved Equal

B. Product Description: Aluminum-framed storefronts, extruded aluminum, including interior systems, with aluminum and glass doors, glazing, and hardware.

2.2 COMPONENTS

A. Frames: Thermally broken extruded aluminum; flush glazing stops. Frames for interior glazing need not to be thermally broken.
   1. 2 inch sightline
   2. 4 1/2 inch depth
   3. Glass: Center glazed with elastomeric gaskets exterior and interior of glass

B. Doors: 1 3/4 inches thick, nominal 5 inch wide top rail and vertical stiles, 12 inch wide bottom rail, square glazing stops.

C. Glass and Glazing: 1 inch insulated glazing as specified in Section 08 80 00.

D. Hardware: As specified in Section 08 71 00.

E. Aluminum Extrusions: Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.060" wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper. Extrusions for aluminum doors shall be 0.125” wall thickness and glazing stops to be 0.060” thick.
   1. Fabricate custom extrusions as required for a complete installation and to suit conditions. Coordinate with Architect and Owner as applicable.

F. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated. [as required by work].

G. Flashings: Minimum 0.32 inch thick aluminum.

H. Steel Sections: ASTM A36/A36M, Structural shapes to suit mullion sections; galvanized.

I. Primer: Zinc chromate for factory application and field touch-up.

J. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum members, trim hardware, anchors, and other components.

K. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

L. Thermal Barrier: A minimum 1/4 inch separation between the interior and exterior aluminum created by intermittent polymer clips.

M. Perimeter Sealant and Backing Materials: Specified in Section 07 90 00.

N. Weatherstripping: Manufacturer standard, replaceable compression type of molded neoprene or molded PVC.

2.3 STOREFRONT FRAMING SYSTEM

A. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Stainless steel where exposed

C. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action

2.4 FABRICATION

A. Fabricate doors and frames allowing for minimum clearances and shim spacing around perimeter of assembly.

B. Accurately and rigidly fit and secure joints and corners, flush, hairline, and weatherproof.
   1. Provide means to drain water passing joints, condensation occurring within the framing members, and moisture migrating within the system to the exterior.
   2. Provide physical and thermal isolation of glazing from framing members.

C. Arrange fasteners, attachments, and jointing to ensure concealment from view.

D. Prepare components with internal reinforcement for door hardware [and door operator / hinge hardware].

2.5 SHOP FINISHING

A. Color Anodized Aluminum Surfaces: AA-M12C22A44, Architectural Class I 0.7 mils dark bronze anodized coating conforming to AAMA 611.

B. Concealed Steel Items: Galvanized to ASTM A123/A123M; galvanize after fabrication.

C. Apply bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar metals.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.2 INSTALLATION

A. Install doors, frames, glazing, hardware, and flashings in accordance with AAMA MCWM-1 - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B. Use anchorage devices to securely attach frame assembly to structure.

C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

D. Coordinate attachment and seal of air and vapor retarder materials. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

E. Coordinate installation of hardware with Section 08 71 00.

F. Coordinate installation of glass with Section 08 80 00; separate glass from metal surfaces.

G. Coordinate installation of perimeter sealants with Section 07 90 00.

H. Tolerances:
   1. Variation from Plane: 1/8 inch per foot maximum or 1/4 inch per 30 feet; whichever is less.

END OF SECTION

SECTION 08 71 00 - DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes commercial door hardware for the following:
   1. Swinging doors.
   2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical door hardware.
   3. Automatic operators.
   4. Cylinders specified for doors in other sections.

C. Related Sections:
   1. Division 08 Section “Hollow Metal Doors and Frames”.
   2. Division 08 Section “Flush Wood Doors”.
   3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ICC/IBC - International Building Code.
   3. NFPA 70 - National Electrical Code.
   4. NFPA 80 - Fire Doors and Windows.
   5. NFPA 101 - Life Safety Code.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
   8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
   1. ANSI/BHMA Certified Product Standards - A156 Series.
   2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
   3. ANSI/UL 294 - Access Control System Units.
   4. UL 305 - Panic Hardware.
   5. ANSI/UL 437- Key Locks.

1.2 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. System Operational Descriptions: Complete system operational narratives for the integrated access controlled openings defining the owner's prescribed requirements for the opening functionality. Narratives include, but are not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.

C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door

Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
3. Content: Include the following information:
    a. Type, style, function, size, label, hand, and finish of each door hardware item.
    b. Manufacturer of each item.
    c. Fastenings and other pertinent information.
    d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    e. Explanation of abbreviations, symbols, and codes contained in schedule.
    f. Mounting locations for door hardware.
    g. Door and frame sizes and materials.
    h. Warranty information for each product.
4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

D. Shop Drawings: Details of electrified access control hardware indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.
2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

E. Proof of Certification: Upon request provide a copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary access control components.

F. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

G. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

H. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete access control and site management installation in quantity as required in Division 01, Closeout Submittals. The manual to include

the name, address, and telephone number of the supplier/integrator providing the installation and the nearest service representatives for each item of equipment included in the system. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

1. As-Built Drawings: During system installation, the Contractor to maintain a separate hard copy set of drawings, elevation diagrams, and wiring diagrams of the access control system to be used for record drawings. This set to be kept up to date by the Contractor with all changes and additions to the access control system accurately recorded.

I. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.3 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Supplier Qualifications: Supplier/Dealers, verifiably authorized and in good standing with the primary product manufacturers, with a minimum of three (3) years of experience supplying integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance.

1. ASSA ABLOY access control products are required to be supplied only through designated “Authorized Channel Partners.”
    a. List Qualified ACP Companies

F. System Integrator Qualifications: Systems Integrators, verifiably factory trained and certified by the primary product manufacturers, with a minimum of three (3) years documented experience installing complete integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance. Qualifications include, but are not necessarily limited, to the following:

1. References: Provide a list of references for similar projects including contact name, phone number, name and type of project.
2. Professional Staffing: Firms to have a dedicated access control systems integration department with full time, experienced professionals on staff experienced in providing on site consulting services for both electrified door hardware and integrated access control systems installations.
3. Factory Training: Installation and service technicians are to be competent factory trained and certified personnel capable of maintaining the system.

4. Service Center: Firms to have a service center capable of providing training, in-stock parts, and emergency maintenance and repairs at the Project site with 24-hour/7-days a week maximum response time.

G. Installer Qualifications: Certified technicians, verifiably authorized with the primary product manufacturers for installation of IP-Enabled, Wireless, and Power-over-Ethernet Access Control products in accordance with documented instructions and NFPA 80.
   1. ASSA ABLOY access control products are required to be installed only through designated "Preferred Installers" with Intertek Qualified Hardware Installer certification.
   2. Installation technicians are authorized by Intertek to apply supplemental serialized labels to Warnock-Hersey fire-rated openings modified after access control hardware has been installed.

H. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
   1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
   2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

I. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

J. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
   1. Function of building, purpose of each area and degree of security required.
   2. Plans for existing and future key system expansion.
   3. Requirements for key control storage and software.
   4. Installation of permanent keys, cylinder cores and software.
   5. Address and requirements for delivery of keys.

K. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
   1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
   2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
   3. Review sequence of operation narratives for each unique access controlled opening.
   4. Review and finalize construction schedule and verify availability of materials.
   5. Review the required inspecting, testing, commissioning, and demonstration procedures

L. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

D. Coordinate quantity and arrangement of assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.

E. Access Control System Electrical Coordination: Coordinate the layout and installation of scheduled electrified door hardware, and related access control equipment, with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.
   1. Door Hardware Interface: The card key access control system to interface and be connected to electronic door control hardware (electromechanical locks, electric strikes, magnetic locks, door position switches, other monitoring contacts, and related auxiliary control devices) as described under Division 8 "Door Hardware". Coordinate the installation and configuration of specified door hardware being monitored or controlled with the controls, software and access control hardware specified in this Section.

F. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing electrified door hardware and access control system components. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing access control system hardware to comply with indicated requirements.

G. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.6 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship

within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Five years for exit hardware.
3. Twenty five years for manual overhead door closer bodies.
4. Five years for motorized electric latch retraction exit devices.
5. Two years for electromechanical door hardware, unless noted otherwise.
6. Two years for Electrified, Wiegand Output, and IP-Enabled Access Control Door Hardware.

E. Maintenance Support and Extended Service Agreement: Submit for Owner’s consideration an optional extended Service Agreement for the installed access control system, including support for software related issues. The extended Service Agreement is considered elective and is without manufacturer's requirement stipulating mandatory coverage for owner and/or vendor system support.

1. A published copy of this agreement to be included with the submittal package
2. Support for the installed access control system components is provided through the vendor under a 24 hour technical assistance program.
3. Access control and management system components are to be available on a one-day turn around time frame from the manufacturer.
4. Primary systems manufacturer to offer and provide remote modem or internet access for direct factory support to the vendor. The factory level support to include diagnostics and troubleshooting support on systems related issues at no additional cost to the owner.

F. Access Control Software Upgrades: Version upgrades and "fix" releases to the access control system software are available at no extra charge as long as the version of software provided under this specification remains the current manufacturer’s version or for up to (2) years after a new version release.

1. Major access control software revisions that provide new functionality to the product provided free of charge for up to one (1) year from the date of substantial completion.
2. Access control system software is to be upgradable as may be required or as necessary, to expand and manage the owner’s site or sites. Upgrades are to be offered at a published flat fee for the primary system software, with single license modules included in the primary fee structure. System upgrades offered at a costing structure based upon the original number of licensed modules issued, or on those to be purchased at a future date, are not allowed.
3. As part of the submittal package, provide a list of available software upgrades and/or expansions modules. List to identify related costs for upgrades, or expansions to the original system, up to the next qualifying operational level.

1.7 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance by skilled employees

of the Systems Integrator. Include repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

1.8 SCOPE OF WORK

A. On-Line Electronic Access Control System: Furnish and install at the indicated locations the specified electrified and integrated door hardware and access control firmware and software for a completely operational access control and security site management system. System includes, but is not necessarily limited, to the following:
   1. Electrified integrated card reader locks and exit hardware, permanent and temporary override cylinders, network control processors, reader controller panels, I/O monitor/control interfaces, door position switches, remote card readers, keypads, and display terminals, access cards and credentials, system application software, special tools, operating manuals, and required cabling and accessories as detailed below and listed in the Access Control Hardware Sets at the end of Part 3.
      a. Provide the appropriate number of reader controller panels and I/O monitoring/control expansion interfaces as needed to handle the number of card readers, locking devices, door status devices, and identified alarm inputs specified in this section, and as shown on the security drawings.
      b. Provide manufacturer approved integrated card reader locks, exit hardware, and remote mounted card readers, keypads, and display terminals that are functionally compatible with the specified access control equipment interfaces.
   2. Access control system equipment to be installed in an enclosure box compatible with the specified components. This enclosure to include, but is not necessarily limited to, the network control processor, I/O monitor/control interface panels, power supplies, terminal strips, wire ducts, keyed lock cylinder, integrated outlet for A/C power, and standoffs.
      a. Enclosure box to be located in the designated IT/Telecom room(s) with connection to local area network for communication back to the central server host.
   3. Owner to provide the following:
      a. Central server host computer, client workstations, and hardware peripherals to be from an approved, major line computer manufacturer. Specific information detailing compliance with system requirements to be included in the project submittal package as specified.
      b. Owner will be responsible for ensuring that each computer hardware component includes the required interfaces, expansion boards, and peripherals that will be necessary to allow the system to operate as described within this specification and as indicated on the drawings.
      c. Power Sourcing and Network Switches: Quantity as required to accommodate installed access control (and video surveillance) devices.
      d. Network Control Processor Connections:
         1) LAN/Ethernet communication ports (jacks) and network interface cards as needed, CAT5e cabling from network router/switch to network control processor, outlet and cover plates and/or patch cables required for network connection within each designated IT/Telecom room.
         2) Required static IP addresses.
   4. Power Supplies, including battery back up and separately fused surge protection, required for the electrified door hardware and access control equipment.
   5. Installation, final configuration and commissioning of electrified door and access control system hardware, communication firmware, power supplies and related accessories.
   6. System application software including installation, programming, and end user training of the access control system demonstrating operating, repair, and maintenance procedures. Include no fewer than 8 hours of on-site central server training for designated personnel (facilities maintenance, security, IT, administration) by a factory certified representative.

7. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."
8. Electrical contractor, Division 26, to provide the following:
    a. Source power wiring (120VAC) as required for the electrified locking and access control hardware, equipment, accessories and power supplies. This includes quad outlets as required on a dedicated circuit in the designated IT/Telecom room(s) and the related conduit, stub-in, junction boxes and connectors required for the source power delivery and connections.
    b. Provide required conduit, stub-in, junction and back boxes for both the electrified locking hardware and access control equipment at each of the access controlled or monitored openings per plan drawings and specs. Supply and install conduit between each of the aforementioned devices and between the electrical junction boxes, power supplies and access control equipment located on or above the door opening.
        1) At wall mounted remote readers, provide conduit on the secured side of the door, 36" from the finish floor and 6" from the edge of the frame, to the related power supplies and access control equipment.
        2) At electrical hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.
    c. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.
9. Access Control System Integrator to provide the following:
    a. Low voltage wiring (12/24VDC) and communication cabling (RS-232/RS-485) from network control processors to reader controllers, I/O monitor/control interface panels, electrified and integrated locking hardware, remote card readers, keypads, or display terminals, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations, and hook-ups required for a complete and functional access controlled opening in accordance with applicable codes and specified system operational narratives.
10. Elevator Contractor to provide the following:
    a. Interface or landing of interface cable onto the elevator call button will be performed by a certified elevator contractor.
    b. Coordinate with access control systems integrator provisions for a card reader with output allowing the elevator call button to be activated. A validated card read will be required for activation.
11. Full and seamless integration of the site intrusion alarm service if applicable, with the installed site access control system software.
12. Final connections to fire alarm system, if required, by electrical and fire alarm system contractors.
13. Provide permits, submittals and approvals required by the authority having jurisdiction, prior to commencing with work.
14. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."
15. Electrical contractor (Division 26) to provide the following:
    a. Provide required conduit, stub-in, junction and back boxes for both the electrified locking hardware and access control equipment at each of the access controlled or monitored openings per plan drawings and specs. Supply and install conduit between each of the aforementioned devices and between the electrical junction

boxes, power supplies and access control equipment located on or above the door opening.
1) At off-line remote readers, provide conduit on the secured side of the door, 36" from the finish floor and 6" from the edge of the frame, to the related power supplies and access control equipment.
2) At electrified hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.

b. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.

16. Access Control System Supplier to provide the following:
a. Low voltage wiring (12/24VDC) for the electrified locking hardware, remote card readers, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations and hook-ups required for a complete and functional access controlled opening in accordance with applicable codes and specified system operational narratives.

17. Typical System Requirements (Owner Provided): Central server host computer, client workstations, and hardware peripherals to be from an approved, major line computer manufacturer. Specific information detailing compliance with system requirements to be included in the project submittal package as specified.

1.9 PRE-INSTALLATION MEETING

A. Establish final provisions related to security and key control. Examine hardware items of unusual provisions including special operational features, security devices, UL labels, and similar considerations related to installation.

B. Inspect and discuss preparatory work performed by other trades.

C. Review manufacturer’s installation procedures related to the schedule of hardware, doors, and frames. Review the wiring diagrams for related electronic hardware and connection to the security access system and intended function.

D. Inspect and discuss electrical rough-in for electrified door hardware.

E. Review sequence of operation for each type of electrified door hardware.

F. Keying Conference: Conduct conference at Project site.
1. Flow of traffic and degree of security required.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Requirements for access control.

PART 2 PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
   1. Quantity: Provide the following hinge quantity:
      a. Two Hinges: For doors with heights up to 60 inches.
      b. Three Hinges: For doors with heights 61 to 90 inches.
      c. Four Hinges: For doors with heights 91 to 120 inches.
      d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
   2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
      a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
      b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.
   3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
      a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
      b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
   4. Hinge Options: Comply with the following:
      a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
   5. Manufacturers:
      a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs. Where continuous hinges are used with aluminum thermal break doors and frames, provide hinges that are tested and approved to meet aluminum door manufacturer requirements and submit for approval.
   1. Manufacturers:
      a. Pemko (PE).

2.3 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable. Use same manufacturer electric power transfer as the wire harness cable.

B.
   1. Manufacturers:
      a. Securitron (SU) - EL-CEPT Series.

C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening. Use same manufacturer wire harness as the door mounted electromechanical hardware and frame-to-door power transfer hardware.
   1. Provide one each of the following tools as part of the base bid contract:
      a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
      b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.
   2. Manufacturers:
      a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC-C Series.

2.4 DOOR OPERATING TRIM

A. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
   1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
   2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
   3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
   4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
   5. Manufacturers:
      a. Rockwood (RO).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
   1. Threaded mortise cylinders with rings and cams to suit hardware application.
   2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
   3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
   4. Tubular deadlocks and other auxiliary locks.
   5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
   6. Keyway: Match Facility Standard.

C. Permanent Cores/Cylinders: Match standard. Reference Division 01 "Cash Allowances" for material required under project. Installation to be included under Division 08 "Door Hardware" base bid package.

D. Keying System: Each type of lock and cylinders to be factory keyed.
   1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.

2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide construction master keyed cylinders.

G. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
1. Manufacturers:
a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

2.7 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
1. Where specified, provide status indicators with highly reflective color and wording for “locked/unlocked” or “vacant/occupied” with custom wording options if required. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status. Indicator window size to be a minimum of 2.1” x 0.6” with a curved design allowing a 180 degree viewing angle with protective covering to prevent tampering.
2. Manufacturers:
a. Sargent Manufacturing (SA) - 8200 Series.

B. Multi-Point Locksets: ANSI/BHMA A156.37, Certified Products Directory (CPD) listed vertical rod locking devices designed for openings requiring multiple latching points within one locking mechanism. Rods are retracted by dual mounted outside lever trim controls available in a variety of ANSI/BHMA operational functions. Option for single top latching only eliminates the need for bottom strikes.
1. Manufacturers:
a. Sargent Manufacturing (SA) - 7000 Series.

C. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed.
1. Vertical Impact: Exceed 100 vertical impacts (20 times ANSI/BHMA A156.2 requirements).
2. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
3. Locks are to be non-handed and fully field reversible.
4. Manufacturers:

a. Sargent Manufacturing (SA) - 10X Line.

2.8 ELECTROMECHANICAL LOCKING DEVICES

A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed, subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below and in the hardware sets.
   1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.
   2. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
   3. Manufacturers:
      a. Sargent Manufacturing (SA) - 8200 Series.

B. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty, High Security Monitoring): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed, subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below.
   1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.
   2. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
   3. High Security Monitoring: Provide lock bodies which have built-in request to exit monitoring and are provided with accompanying door position switches. Provide a resistor configuration which is compatible with the access control system.
   4. Manufacturers:
      a. Sargent Manufacturing (SA) - NAC 8200 Series.

C. Electromechanical Mortise Locksets, Grade 1 (Commercial Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed, subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below.
   1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.
   2. Manufacturers:

D. Electromechanical Multi-Point Locks: Vertical rod locking devices designed for openings requiring multiple latching points within one locking mechanism. Rods are retracted by dual mounted outside lever trim controls available in a variety of ANSI/BHMA operational functions. Option for single top latching only eliminates the need for bottom strikes. Electromechanical options include solenoid activated trim, electric latch retraction, and inside and outside lever monitoring.

1. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
2. Manufacturers:
   a. Sargent Manufacturing (SA) - 7000 Series.

2.9 STAND ALONE ACCESS CONTROL LOCKING DEVICES

A. Stand Alone Electronic Keypad Locksets: Internal, battery-powered, self-contained ANSI Grade 1 mortise or cylindrical lock consisting of electronically motor driven locking mechanism and integrated keypad without requirements for separate electronic programming devices. Locks to accept standard, interchangeable (removable) core, security and high security override cylinders. Provide keypad locks with a minimum 100 user codes furnished standard with 6 "AA" batteries and non-volatile memory.
   1. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
   2. Manufacturers:
      a. Sargent Manufacturing (SA) - KP Series.

2.10 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
   1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
   2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
   3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
   4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:
   1. Strikes for Mortise Locks and Latches: BHMA A156.13.
   2. Strikes for Bored Locks and Latches: BHMA A156.2.
   3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
   4. Dustproof Strikes: BHMA A156.16.

2.11 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
   1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
   2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
   3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
   4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
    1. Manufacturers:
        a. Sargent Manufacturing (SA) - 80 Series.

2.12 ELECTROMECHANICAL EXIT DEVICES

A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.
    1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
    2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.
    3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
    4. Manufacturers:
        a. Sargent Manufacturing (SA) - 80 Series.

2.13 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:
    1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
    2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
    3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
    4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
    5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
   1. Manufacturers:
      a. Norton Rixson (NO) - 7500 Series.
      b. Sargent (SA) – 351 Series

C. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted closers with door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width. Where manufacturer does not offer the "Unitrol" arm, provide special template extra heavy duty parallel arm with heavy duty surface overhead stop.
   1. Manufacturers:
      a. Norton Rixson (NO) - Unitrol Series.

2.14 ELECTROHYDRAULIC DOOR OPERATORS

A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.
   1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Standard: Certified ANSI/BHMA A156.19.

C. Performance Requirements:
   1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
   2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.

F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

I. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Norton Rixson (NO) - 6000 Series.

2.15 ARCHITECTURAL TRIM

A. Door Protective Trim
   1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
   2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
   3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
   4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
      a. Stainless Steel: 300 grade, 050-inch thick.
   5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
   6. Manufacturers:
      a. Rockwood (RO).

2.16 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
   1. Manufacturers:
      a. Rockwood (RO).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
   1. Manufacturers:
      a. Norton Rixson (RF).

2.17 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
   1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
   1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:
   1. Pemko (PE).

2.18 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
   1. Manufacturers:
      a. Securitron (SU) - DPS Series.

B. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.
   1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
   2. Manufacturers:
      a. Securitron (SU) - AQL Series.

2.19 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.20 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified and integrated access control door hardware installation.

C. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
   1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
   1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
   2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
   3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
   4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Boxed Power Supplies: Verify locations.
   1. Configuration: Provide the least number of power supplies required to adequately serve doors with access control hardware and equipment.

D. Final connect the system control switches (integrated card key locking hardware, remote readers, keypads, display terminals, biometrics), and monitoring, and signaling equipment to the related Controller devices at each opening to properly operate the electrified door and access control hardware according to system operational narratives.

E. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9

Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

F. System Application Software: Install, and test application(s) software and databases for the complete and proper operation of systems involved. Assign software license(s) to Owner.

G. Door Closers:
1. Install closers on room side of corridor doors, and stair side of stairways.
2. Lobby doors: Mount on vestibule side.
3. Exterior doors: Parallel rigid arm installation.
4. Where through-bolts are required, install closers using only manufacturer-furnished through-bolts.
5. Install closers using only manufacturer-furnished template machine screws for metal doors and manufacturer -furnished wood screws for wood doors.
6. Coordinate with door supplier to provide proper blocking for surface mounting.
7. Use of self-drilling or self-tapping fasteners is not allowed.
8. Where full glazed door units are specified, use closer arm and mounting configuration as required to avoid use of drop brackets whenever possible.

H. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

I. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

B. Adjust and check each operating item of integrated access control door hardware, and each door opening to ensure proper secured operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

B. Engage an authorized systems manufacturer representative to train Owner's maintenance personnel to adjust, operate, and maintain electronic integrated door hardware and the access control system.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
   1. Quantities listed are for each pair of doors, or for each single door.
   2. The supplier is responsible for handing and sizing all products.
   3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
   4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer’s Abbreviations:
   1. MK - McKinney
   2. PE - Pemko
   3. MR - Markar
   4. SU - Securitron
   5. RO - Rockwood
   6. SA - SARGENT
   7. OT - Other
   8. RU - Corbin Russwin
   9. HS - HES
   10. RF - Rixson
   11. NO - Norton
   12. CR - Curries (Hardware Only)
   13. AK - Alarm Controls

Set: 1.0

(ALD/ALF) Exterior - 2-Card Reader (DPS) - Pair: Rim Exit Device (storeroom, CD) x Fixed Mullion x EL Strike x Overhead Stop x Door Closer

2	Continuous Hinge	_FM x HD1 x Door Height		PE	
2	Rim Exit Device, nightlatch	16 43 AD8506 ETL	US10BE	SA	⚡
4	Cylinder	Type as Req'd (as specified)		OT	
2	Electric Strike	9400-LBM	613E	HS	⚡
2	Conc Overhead Stop	1-X36	613	RF	
2	Surface Closer	PR7500	690	NO	
2	Drop Plate	as req'd	690	NO	
1	Threshold	252x__FG		PE	
1	Rain Guard	346_		PE	
2	Sweep	345_PK		PE	
1	Set Weatherstrip	(door manufacturer’s heavy duty standard)		00	
2	ElectroLynx Harness	QC-C3000_		MK	⚡
2	Position Switch	DPS		SU	⚡
1	Power Supply	AQL4-R8E1		SU	⚡
2	Access Control Reader	By Security Contractor		OT	
1	Set Wiring Diagrams	Wiring Diagrams		00	

Door normally closed and locked.
Entrance by presenting a valid card to card-reader.
Egress allowed at all times.
Loss of power, activation of fire alarm, or sprinkler system maintains security from lock side, entrance by mechanical key only.
Door monitored for door ajar and forced open.
Room side card-reader for audit trail purposes, and for shunting door-ajar/forced-open alarm within access control system.

Set: 2.0

(ALD/ALF) Exterior - 2-Card Reader (DPS) - Pair: Rim Exit Device (storeroom, CD) x Mullion x EL Strike x Overhead Stop x Door Closer x Audible Alarm

2	Continuous Hinge	_FM x HD1 x Door Height		PE	
1	Mullion	L980A		SA	
1	Mounting Kit	98-2578		SA	
2	Rim Exit Device, nightlatch	16 43 AD8506 ETL	US10BE	SA	⚡
4	Cylinder	Type as Req'd (as specified)		OT	
2	Electric Strike	9400-LBM	613E	HS	⚡
2	Conc Overhead Stop	1-X36	613	RF	
2	Surface Closer	PR7500	690	NO	
2	Drop Plate	as req'd	690	NO	

1	Threshold	252x__FG		PE
1	Rain Guard	346_		PE
2	Sweep	345_PK		PE
1	Set Weatherstrip	(door manufacturer's heavy duty standard)		00
2	ElectroLynx Harness	QC-C3000_		MK
2	ElectroLynx Harness	QC-C00_		MK
1	Alarm	W Box 0E-1GANGSIRN (flush mount)		OT
2	Position Switch	DPS		SU
1	Power Supply	AQL4-R8E1		SU
2	Access Control Reader	By Security Contractor		OT
1	Set Wiring Diagrams	Wiring Diagrams		00

Door normally closed and locked.
Entrance by presenting a valid card to card-reader.
Egress allowed at all times.
Loss of power, activation of fire alarm, or sprinkler system maintains security from lock side, entrance by mechanical key only.
Door monitored for door ajar and forced open.
Room side card-reader for audit trail purposes, and for shunting door-ajar/forced-open alarm within access control system.

Set: 2.1

(ALD/ALF) Exterior - Schedule (DPS) - Pair: Rim Exit Device (storeroom, CD) x Fixed Mullion x Overhead Stop x (1) Door Closer x (1) Automatic Operator x Audible Alarm

2	Continuous Hinge	_FM x HD1 x Door Height		PE
2	Rim Exit Device, nightlatch	16 43 AD8506 ETL	US10BE	SA
4	Cylinder	Type as Req'd (as specified)		OT
2	Electric Strike	9400-LBM	613E	HS
2	Conc Overhead Stop	1-X36	613	RF
1	Automatic Opener	60xx	690	NO
2	Door Switch	505		NO
1	Surface Closer	PR7500	690	NO
2	Drop Plate	as req'd	690	NO
1	Threshold	252x__FG		PE
1	Rain Guard	346_		PE
2	Sweep	345_PK		PE
1	Set Weatherstrip	(door manufacturer's heavy duty standard)		00
2	ElectroLynx Harness	QC-C3000_		MK
1	Alarm	W Box 0E-1GANGSIRN (flush mount)		OT
2	Position Switch	DPS		SU
1	Power Supply	AQL4-R8E1		SU

1	Access Control Reader	By Security Contractor		OT
1	Set Wiring Diagrams	Wiring Diagrams		00

SECURED TIME PERIOD:
Door normally closed, latched, and locked - free egress at all times.
Door monitored for door ajar or forced open.
Entrance by mechanical key or access control scheduled open.
During secured period of time, only inside actuator switch activates automatic operator for accessibility needs, unless a valid card to card-reader allows the outside actuator switch to function.
Loss of power maintains security from locked side of opening, automatic door operator loses the electrically open operation, yet operator will function as a normal mechanical door closer - Entrance by mechanical key only - free egress at all times.
Room side card-reader for audit trail purposes, and for shunting door-ajar/forced-open alarm within access control system.

UNSECURED TIME PERIOD:
Unsecured period of time setup in access control system allows free entrance - free egress at all times.
During unsecure period of time, depressing either actuator switch activates automatic operator for accessibility needs.
Loss of power maintains security from locked side of opening, automatic door operator loses the electrically open operation - Entrance by mechanical key only - free egress at all times.

Set: 2.2

(ALD/ALF) Exterior - 2-Card Reader (DPS) - Pair: Rim Exit Device (storeroom, CD) x Fixed Mullion x EL Strike x Overhead Stop x Door Closer x Audible Alarm

2	Continuous Hinge	_FM x HD1 x Door Height		PE	
2	Rim Exit Device, nightlatch	16 43 AD8506 ETL	US10BE	SA	⚡
4	Cylinder	Type as Req'd (as specified)		OT	
2	Electric Strike	9400-LBM	613E	HS	⚡
2	Conc Overhead Stop	1-X36	613	RF	
2	Surface Closer	PR7500	690	NO	
2	Drop Plate	as req'd	690	NO	
1	Threshold	252x__FG		PE	
1	Rain Guard	346_		PE	
2	Sweep	345_PK		PE	
1	Set Weatherstrip	(door manufacturer’s heavy duty standard)		00	
2	ElectroLynx Harness	QC-C3000_		MK	⚡
1	Alarm	W Box 0E-1GANGSIRN (flush mount)		OT	
2	Position Switch	DPS		SU	⚡
1	Power Supply	AQL4-R8E1		SU	⚡
1	Access Control Reader	By Security Contractor		OT	
1	Set Wiring Diagrams	Wiring Diagrams		00	

Door normally closed and locked.
Entrance by presenting a valid card to card-reader.

Egress allowed at all times.
Loss of power, activation of fire alarm, or sprinkler system maintains security from lock side, entrance by mechanical key only.
Door monitored for door ajar and forced open.
Room side card-reader for audit trail purposes, and for shunting door-ajar/forced-open alarm within access control system.

Set: 3.0

(ALD/ALF) Scheduled (DPS) - Pair: Rim Exit Device (storeroom, CD) x Fixed Mullion x EL Strike x Overhead Stop x Door Closer

2	Continuous Hinge	_FM x HD1 x Door Height		PE	
2	Rim Exit Device, nightlatch	16 43 AD8506 ETL	US10BE	SA	⚡
4	Cylinder	Type as Req'd (as specified)		OT	
2	Electric Strike	9400-LBM	613E	HS	⚡
2	Conc Overhead Stop	1-X36	613	RF	
2	Surface Closer	PR7500	690	NO	
2	Drop Plate	as req'd	690	NO	
1	Set Weatherstrip	(door manufacturer’s heavy duty standard)		00	
2	ElectroLynx Harness	QC-C3000_		MK	⚡
2	Position Switch	DPS		SU	⚡
1	Power Supply	AQL4-R8E1		SU	⚡
1	Set Wiring Diagrams	Wiring Diagrams		00	

SECURED TIME PERIOD:
Door normally closed and locked.
Entrance by Access Control System schedule.
Free egress at all times.
Loss of power maintains security from locked side of opening - Entrance by mechanical key only.
Door monitored for door ajar or forced open.

UNSECURED TIME PERIOD:
Unsecured period of time setup in access control system allows entrance.
Free egress at all times.
Loss of power maintains security from locked side of opening - Entrance by mechanical key only.

Set: 4.0

(ALD/ALF) Exterior - 2-Card Reader (DPS) - RLS - Pair: Rim Exit Device (storeroom, CD) x Fixed Mullion x EL Strike x Overhead Stop x Door Closer x audible alarm

2	Continuous Hinge	_FM x HD1 x Door Height		PE	
2	Rim Exit Device, nightlatch	16 43 AD8506 ETL	US10BE	SA	⚡
4	Cylinder	Type as Req'd (as specified)		OT	
2	Conc Overhead Stop	1-X36	613	RF	
2	Surface Closer	PR7500	690	NO	

2	Drop Plate	as req'd	690	NO
1	Threshold	252x__FG		PE
1	Rain Guard	346_		PE
2	Sweep	345_PK		PE
1	Set Weatherstrip	(door manufacturer's heavy duty standard)		00
1	ElectroLynx Harness	QC-C3000_		MK
1	Alarm	W Box 0E-1GANGSIRN (flush mount)		OT
2	Position Switch	DPS		SU
1	Door Release	TS-18		AK
1	Power Supply	AQL4-R8E1		SU
2	Access Control Reader	By Security Contractor		OT
1	Set Wiring Diagrams	Wiring Diagrams		00

SECURED TIME PERIOD:
Door normally closed, latched, and locked - free egress at all times.
Door monitored for door ajar or forced open.
Entrance by mechanical key or valid card to card-reader.
During secured period of time, only inside actuator switch activates automatic operator for accessibility needs, unless a valid card to card-reader allows the outside actuator switch to function.
Loss of power maintains security from locked side of opening, automatic door operator loses the electrically open operation, yet operator will function as a normal mechanical door closer - Entrance by mechanical key only - free egress at all times.
Room side card-reader for audit trail purposes, and for shunting door-ajar/forced-open alarm within access control system.

UNSECURED TIME PERIOD:
Unsecured period of time setup in access control system allows free entrance - free egress at all times.
During unsecure period of time, depressing either actuator switch activates automatic operator for accessibility needs.
Loss of power maintains security from locked side of opening, automatic door operator loses the electrically open operation - Entrance by mechanical key only - free egress at all times.

Set: 5.0

(ALD/ALF) Card Reader (DPS) - Pair: Rim Exit Device (storeroom, CD) x Fixed Mullion x EL Strike x Overhead Stop x (1) Door Closer (1) Automatic Operator

2	Continuous Hinge	_FM x HD1 x Door Height		PE
2	Rim Exit Device, nightlatch	16 43 AD8506 ETL	US10BE	SA
4	Cylinder	Type as Req'd (as specified)		OT
2	Electric Strike	9400-LBM	613E	HS
2	Conc Overhead Stop	1-X36	613	RF
1	Automatic Opener	60xx	690	NO
2	Door Switch	505		NO
1	Surface Closer	PR7500	690	NO
1	Drop Plate	as req'd	690	NO

1	Set Weatherstrip	(door manufacturer's heavy duty standard)	00
2	ElectroLynx Harness	QC-C3000_	MK
2	Position Switch	DPS	SU
1	Power Supply	AQL4-R8E1	SU
1	Access Control Reader	By Security Contractor	OT
1	Set Wiring Diagrams	Wiring Diagrams	00

SECURED TIME PERIOD:
Door normally closed, latched, and locked - free egress at all times.
Door monitored for door ajar or forced open - internal switch within unsecure side of latching hardware allows an individual to freely leave without sending an alarm to the access control system.
Entrance by mechanical key or valid card to card-reader.
During secured period of time, only inside actuator switch activates automatic operator for accessibility needs, unless a valid card to card-reader allows the outside actuator switch to function.
Loss of power maintains security from locked side of opening, automatic door operator loses the electrically open operation, yet operator will function as a normal mechanical door closer - Entrance by mechanical key only - free egress at all times.

UNSECURED TIME PERIOD:
Unsecured period of time setup in access control system allows free entrance - free egress at all times.
During unsecure period of time, depressing either actuator switch activates automatic operator for accessibility needs.
Loss of power maintains security from locked side of opening, automatic door operator loses the electrically open operation - Entrance by mechanical key only - free egress at all times.

Set: 6.0

REUSE ALL EXISTING HARDWARE

1	Hardware	Reuse All Existing Hardware	OT

Set: 7.0

EXISTING OPENING: Push/Pull x Door Closer (thru-bolts)

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Pull Plate	111x70C	US32D	RO
1	Push Plate	73E	US32D	RO
1	Surface Closer	R7500 / PR7500 x TBGN	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-existing mortise deadbolt

Set: 8.0

EXISTING OPENING (NEW DOORS/HMF) - Pair x Fixed Mullion: Rim Exit Device (classroom) x Door Closer

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
2	Rim Exit Device, Classroom	(12) 43 *16 8813 ETL	US32D	SA
2	Cylinder	Type as Req'd (as specified)		OT
2	Surface Closer	R7500 / PR7500	689	NO
4	Kick Plate	K1050 8" high CSK BEV	US32D	RO
2	Stop	As Required		RO
2	Gasketing	S88		PE

Hollow Metal Frames & Doors - Application:
-Existing frame to remain: field verify existing frame conditions to accept new hardware specified.
-Hollow Metal Frames: Bondo, finish smooth, primer, and paint remaining prep holes on frame from previous door hardware.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 9.0

EXISTING OPENING (NEW DOORS/HMF) - Pair x Fixed Mullion: Rim Exit Device (classroom) x Door Closer x Wall Hold

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
2	Rim Exit Device, Classroom	(12) 43 *16 8813 ETL	US32D	SA
2	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	PR7500	690	NO
4	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Door Stop & Holder	490	US26D	RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 10.0

EXISTING OPENING (NEW DOORS/HMF) - Pair: CVR Exit Device (classroom) x Door Closer x Wall Hold

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
2	Conc Vert Rod Exit, Classroom	(12) 43 *16 NB 8613 ETL	US32D	SA
4	Cylinder	Type as Req'd (as specified)		OT
2	Surface Closer	PR7500	690	NO

4	Kick Plate	K1050 8" high CSK BEV	US32D	RO
2	Door Stop & Holder	490	US26D	RO
1	Gasketing	S88		PE
1	Gasket Astragal	S772		PE

Application:
-Field verify existing conditions and field modify existing frame, as required, to accept new hardware specified.
-Field verify hinge weight/size and kick plate quantity.

*=use cylinder dogging at all non-rated door openings.

Set: 11.0

EXISTING OPENING (WD/HMF): Rim Exit Device (classroom) x Door Closer

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Rim Exit Device, Classroom	(12) 43 *16 8813 ETL	US32D	SA
2	Cylinder	Type as Req'd (as specified)		OT
1	Push Plate	70C-RKW (as req'd)	US26D	RO
1	Surface Closer	R7500 / PR7500 x TBGN	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.
-Push plate used behind lever trim to help cover any remaining screw holes.

*=use cylinder dogging at all non-rated door openings.

Set: 11.1

EXISTING OPENING (NEW DOOR/HMF): Rim Exit Device (classroom) x Door Closer x Wall Hold

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Rim Exit Device, Classroom	(12) 43 *16 8813 ETL	US32D	SA
2	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	R7500 / PR7500	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Door Stop & Holder	490	US26D	RO
1	Gasketing	S88		PE

Application:

-Field verify existing conditions and field modify existing frame, as required, to accept new hardware specified.
-Field verify hinge weight/size and kick plate quantity.

*=use cylinder dogging at all non-rated door openings.

Set: 11.2

EXISTING OPENING (WD/HMF): Rim Exit Device (classroom) x Door Closer x Wall Hold

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Rim Exit Device, Classroom	(12) 43 *16 8813 ETL	US32D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Push Plate	70C-RKW (as req'd)	US26D	RO
1	Surface Closer	R7500 / PR7500 x TBGN	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Door Stop & Holder	490	US26D	RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.
-Push plate used behind lever trim to help cover any remaining screw holes.

*=use cylinder dogging at all non-rated door openings.

Set: 12.0 – Not Used

Set: 12.1

EXISTING OPENING (WD/HMF): Mortise Exit Device (classroom) x Overhead Stop x EL Door Closer Hold (thru-bolts) x Door Release

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK	
1	Cylinder	Type as Req'd (as specified)		OT	
1	Push Plate	70C-RKW (as req'd)	US26D	RO	
1	Surf Overhead Stop	9-X36	630	RF	
1	Closer	71__SZ x 24VDC x TBGN	689	NO	⚡
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO	
1	Gasketing	S88		PE	
1	Door Release	TS-18		AK	⚡
1	Power Supply	AQL4-R8E1		SU	⚡

Application:

-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.
-Push plate used behind lever trim to help cover any remaining screw holes.

-7100 Safe Zone closer to be set for continuous hold open using the "SELECTIVE HOLD OPEN ADJUSTMENT"
-Door release to be used to close door or manually pulling door will release hold open closer.
-7100 Safe Zone closer to be tied to fire alarm system.

Set: 13.0

EXISTING OPENING (HMD/HMF): Rim Exit Device (classroom) x Door Closer (thru-bolts)

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Rim Exit Device, Classroom	(12) 43 *16 8813 ETL	US32D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	R7500 / PR7500 x TBGN	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Hollow Metal Frames & Doors - Application:
-Existing frame to remain: field verify existing frame conditions to accept new hardware specified.
-Hollow Metal Frames & Door: Bondo, finish smooth, primer, and paint remaining prep holes on frame from previous door hardware.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 13.1

EXISTING OPENING (HMD/HMF): Rim Exit Device (classroom) x Door Closer (thru-bolts) x Mag Hold

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Rim Exit Device, Classroom	(12) 43 *16 8813 ETL	US32D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	R7500 / PR7500 x TBGN	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Electromagnetic Holder	998M	689	RF
1	Gasketing	S88		PE

Hollow Metal Frames & Doors - Application:
-Existing frame to remain: field verify existing frame conditions to accept new hardware specified.
-Hollow Metal Frames & Door: Bondo, finish smooth, primer, and paint remaining prep holes on frame from previous door hardware.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 13.2

EXISTING OPENING (HMD/HMF): Rim Exit Device (classroom) x Door Closer (thru-bolts) x Mag Hold x Armor

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK	
1	Rim Exit Device, Classroom	(12) 43 *16 8813 ETL	US32D	SA	
1	Cylinder	Type as Req'd (as specified)		OT	
1	Surface Closer	R7500 / PR7500 x TBGN	689	NO	
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO	
1	Armor Plate	K1050 36" high CSK BEV	US32D	RO	
1	Electromagnetic Holder	998M	689	RF	⚡
1	Gasketing	S88		PE	

Hollow Metal Frames & Doors - Application:
-Existing frame to remain: field verify existing frame conditions to accept new hardware specified.
-Hollow Metal Frames & Door: Bondo, finish smooth, primer, and paint remaining prep holes on frame from previous door hardware.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 13.3

EXISTING OPENING (HMD/HMF): Rim Exit Device (storeroom) x Door Closer

Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK	
1 Filler Plates	As Required		OT	
1 Rim Exit Device	(12) 43 8806 ETL	US32D	SA	
1 Cylinder	Type as Req'd (as specified)		OT	
1 Surface Closer	R7500 / PR7500 x TBGN	689	NO	
1 Kick Plate	K1050 8" high CSK BEV	US32D	RO	
1 Stop	As Required		RO	
1 Gasketing	S88		PE	

Hollow Metal Frames & Doors - Application:
-Existing frame to remain: field verify existing frame conditions to accept new hardware specified.
-Hollow Metal Frames & Door: Bondo, finish smooth, primer, and paint remaining prep holes on frame from previous door hardware.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 14.0

EXISTING OPENING (WD/HMF) - Card Reader (DPS): Mortise Lock (storeroom) x EL Strike x Motion (RTE) Door Closer (thru-bolts)

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK	
1	Storeroom Lock	8204 LW1L	US26D	SA	
1	Cylinder	Type as Req'd (as specified)		OT	
1	Electric Strike	1600	630	HS	⚡
1	SMART Pac Bridge Rectifier	2005M3		HS	⚡
1	Surface Closer	R7500 / PR7500 x TBGN	689	NO	
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO	
1	Stop	As Required		RO	
1	Gasketing	S88		PE	
1	Position Switch	DPS		SU	⚡
1	Detector	SREX-100		AK	⚡
1	Power Supply	AQL4-R8E1		SU	⚡
1	Access Control Reader	By Security Contractor		OT	
1	Set Wiring Diagrams	Wiring Diagrams		00	

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Door normally closed and locked.
Entrance by presenting a valid card to card-reader.
Egress allowed at all times.
Loss of power maintains security from lock side, entrance by mechanical key only.
Door monitored for door ajar and forced open.

Set: 14.1 - NOT USED

Set: 14.2

EXISTING OPENING (WD/HMF) - Card Reader (DPS) - RLS: Mortise Lock (storeroom) x EL Strike x Motion (RTE) x Overhead Stop x Door Closer (thru-bolts)

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK	
1	Storeroom Lock	8204 LW1L	US26D	SA	
1	Cylinder	Type as Req'd (as specified)		OT	
1	Electric Strike	1600	630	HS	⚡
1	SMART Pac Bridge Rectifier	2005M3		HS	⚡
1	Surf Overhead Stop	9-X36	630	RF	
1	Drop Plate	as req'd	690	NO	

1	Surface Closer	R7500 / PR7500 x TBGN	689	NO	
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO	
1	Gasketing	S88		PE	
1	Position Switch	DPS		SU	⚡
1	Door Release	TS-18		AK	⚡
1	Detector	SREX-100		AK	⚡
1	Power Supply	AQL4-R8E1		SU	⚡
1	Access Control Reader	By Security Contractor		OT	
1	Set Wiring Diagrams	Wiring Diagrams		00	

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Door normally closed and locked.
Entrance by presenting a valid card to card-reader or remote release.
Egress allowed at all times.
Loss of power maintains security from lock side, entrance by mechanical key only.
Door monitored for door ajar and forced open.

Set: 14.3

EXISTING OPENING (WD/HMF) - Card Reader (DPS): Mortise Lock (storeroom) x Reuse EL Strike x Motion (RTE) Door Closer

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK	
1	Storeroom Lock	8204 LW1L	US26D	SA	
1	Cylinder	Type as Req'd (as specified)		OT	
1	Electric Strike	Reuse Existing Electric Strike		OT	
1	Surface Closer	R7500 / PR7500	689	NO	
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO	
1	Stop	As Required		RO	
1	Gasketing	S88		PE	
1	Position Switch	DPS		SU	⚡
1	Detector	SREX-100		AK	⚡
1	Power Supply	Reuse Existing Power Supply		OT	
1	Access Control Reader	By Security Contractor		OT	
1	Set Wiring Diagrams	Wiring Diagrams		00	

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.

-Use above new hardware, all other hardware to remain.

Door normally closed and locked.
Entrance by presenting a valid card to card-reader.
Egress allowed at all times.
Loss of power maintains security from lock side, entrance by mechanical key only.
Door monitored for door ajar and forced open.

Set: 15.0

EXISTING OPENING: Mortise Lock (storeroom) x Door Closer (thru-bolts)

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Storeroom Lock	8204 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	R7500 / PR7500 x TBGN	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 15.1

EXISTING OPENING: Mortise Lock (office) x Door Closer (thru-bolts)

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Office Lock	8205 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	R7500 / PR7500 x TBGN	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 16.0

EXISTING OPENING (HMD/HMF) - Monitored (DPS): Mortise Lock (storeroom) x Motion (RTE) x Door Closer (thru-bolts)

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Storeroom Lock	8204 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	PR7500 x TBGN	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE
1	Detector	SREX-100		AK

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 17.0

EXISTING OPENING: Mortise Lock (office) x NO DOOR CLOSER

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Office Lock	8205 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 17.1

EXISTING OPENING: Mortise Lock (storeroom) x NO DOOR CLOSER

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Office Lock	8205 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 17.2

EXISTING OPENING: Mortise Latch (passage) x Door Closer

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Passage Latch	8215 LW1L	US26D	SA
1	Surface Closer	R7500 / PR7500	689	NO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify hinge weight/size.
-Use above new hardware, all other hardware to remain.

Set: 17.3

EXISTING OPENING - Pair: Mortise Lock (office) x Door Closer

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Office Lock	8205 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	PR7500	690	NO
4	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE
1	Gasket Astragal	S772		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 17.4

EXISTING OPENING: Hvy Hinge x Mortise Latch (passage) x Door Closer

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Passage Latch	8215 LW1L	US26D	SA
1	Surface Closer	R7500 / PR7500	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify hinge weight/size.
-Use above new hardware, all other hardware to remain.

Set: 17.5

EXISTING OPENING - Pair: Hvy Hinge x Mortise Latch (Office) x Door Closer x Mag Hold

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Office Lock	8205 LW1L	US26D	SA
2	Surface Closer	R7500 / PR7500	689	NO
4	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Gasketing	S88		PE
1	Gasket Astragal	S772		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify hinge weight/size.
-Use above new hardware, all other hardware to remain.

Set: 17.6

EXISTING OPENING - Pair: Hvy Hinge x Mortise Latch (Office) x Door Closer x Mag Hold x Armor

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Office Lock	8205 LW1L	US26D	SA
2	Surface Closer	R7500 / PR7500	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
2	Armor Plate	K1050 36" high CSK BEV	US32D	RO
2	Electromagnetic Holder	998M	689	RF
1	Gasketing	S88		PE
1	Gasket Astragal	S772		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify hinge weight/size.
-Use above new hardware, all other hardware to remain.

Set: 17.7

EXISTING OPENING - Pair: Mortise Lock (office) x [NO DOOR CLOSER] x Armor

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Office Lock	8205 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
2	Armor Plate	K1050 36" high CSK BEV	US32D	RO
2	Stop	As Required		RO
1	Gasketing	S88		PE
1	Gasket Astragal	S772		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 18.0

EXISTING OPENING: Mortise Lock (Classroom Sec, T-Turn Cyl.) x Door Closer (thru-bolts)

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Classroom Sec Lock	V21 8238 VN1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Thumbturn Cylinder	CR1300-118	626	RU
1	Surface Closer	R7500 / PR7500 x TBGN	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Wall Stop	RM860 / RM861	US26D	RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 18.1

EXISTING OPENING: Mortise Lock (classroom) x NO DOOR CLOSER

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Classroom Lock	8237 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 19.0

EXISTING OPENING: Mortise Lock (utility) x Door Closer (as req'd, thru-bolt)

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Utility Lock	8231 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	as req'd x TBGN	689	NO
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 20.0

EXISTING OPENING: Mortise Lock (classroom) x Door Closer (as req'd, thru-bolts)

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Classroom Lock	8237 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	as req'd x TBGN	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new

hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 20.1

EXISTING OPENING - Pair: Mortise Lock (classroom) x Door Closer

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Classroom Lock	8237 LW1L	US26D	SA
2	Cylinder	Type as Req'd (as specified)		OT
2	Surface Closer	PR7500	690	NO
4	Kick Plate	K1050 8" high CSK BEV	US32D	RO
2	Stop	As Required		RO
1	Gasketing	S88		PE
1	Gasket Astragal	S772		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 21.0

EXISTING OPENING: Mortise Lock (Institutional Privacy) x Door Closer (as req'd, thru-bolts)

	Hinge	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Institutional Privacy Lock	V21 8267 VN1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	as req'd x TBGN	689	NO
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 21.1

EXISTING OPENING - Card Reader: Mortise Lock (storeroom) x EL Strike x Door Closer (as req'd, thru-bolts)

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK	
1	Storeroom Deadbolt Lock	V21 8251 VN1L	US26D	SA	
1	Cylinder	Type as Req'd (as specified)		OT	
1	SMART Pac Bridge Rectifier	2005M3		HS	⚡
1	Electric Strike	1600-CS-DLMS	630	HS	⚡
1	Surface Closer	as req'd x TBGN	689	NO	
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO	
1	Stop	As Required		RO	
1	Gasketing	S88		PE	
1	Power Supply	AQL4-R8E1		SU	⚡
1	Access Control Reader	By Security Contractor		OT	
1	Set Wiring Diagrams	Wiring Diagrams		00	

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Door normally closed, latched, and secure - free egress at all times.
Manual entrance is allowed by presenting a valid card to card-reader then pulling lever for entry.
Deadbolt is projected by inside lever-turn, which changes indicator status from vacant to occupied.
Projected deadbolt denies entrance of using a valid card to card-reader.
Emergency entrance is allowed with mechanical key.
Turning inside lever handle will simultaneously retract deadbolt and latch unlocking outside handle changing indicator status from occupied to vacant.
Free egress at all times.

Set: 22.0

Exterior - 2-Card Reader (DPS) - Pair: EL SVR Exit Device (storeroom) x Door Closer w/ Spring Stop

	Hinge (qty per spec)	T4A3386 (size per spec, NRP as applicable)	US32D	MK	
2	Electric Power Transfer	EL-CEPT		SU	⚡
2	Surface Vert Rod Exit	(12) 43 56 NB8706 ETL	US32D	SA	⚡
2	Cylinder	Type as Req'd (as specified)		OT	
2	Surface Closer	UNI7500	689	NO	
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO	
1	Threshold	252x__FG		PE	
1	Rain Guard	346_		PE	
2	Sweep	345_PK		PE	
1	Astragal	18041_NB		PE	
1	Kerf Weather Seal	by frame manufacturer		CR	
2	ElectroLynx Harness	QC-C3000_		MK	⚡
2	ElectroLynx Harness	QC-C00_		MK	⚡

2	Position Switch	DPS		SU
1	Power Supply	AQL4-R8E1		SU
2	Access Control Reader	By Security Contractor		OT
1	Set Wiring Diagrams	Wiring Diagrams		00

Application:
-lever on one door leaf only.

Door normally closed and locked.
Entrance by presenting a valid card to card-reader.
Egress allowed at all times.
Loss of power, activation of fire alarm, or sprinkler system maintains security from lock side, entrance by mechanical key only.
Door monitored for door ajar and forced open.
Room side card-reader for audit trail purposes, and for shunting door-ajar/forced-open alarm within access control system.

Set: 22.1

Exterior - Card Reader (DPS) - Pair: EL Rim Exit Device (storeroom, RTE) x Rem Mullion x Door Closer w/ Spring Stop

	Hinge (qty per spec)	T4A3386 (size per spec, NRP as applicable)	US32D	MK
2	Electric Power Transfer	EL-CEPT		SU
1	Mullion	L980S	PC	SA
1	Mounting Kit	98-2579 (for steel mullion)		SA
1	Rim Exit Device	(12) 43 55 56 8806 ETL	US32D	SA
1	Rim Exit Device, Exit Only	(12) LD 43 55 8810 EO	US32D	SA
2	Cylinder	Type as Req'd (as specified)		OT
2	Surface Closer	UNI7500	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Threshold	252x__FG		PE
1	Gasketing	5110		PE
1	Rain Guard	346_		PE
2	Sweep	345_PK		PE
1	Astragal	18041_NB		PE
1	Kerf Weather Seal	by frame manufacturer		CR
2	ElectroLynx Harness	QC-C3000_		MK
2	ElectroLynx Harness	QC-C00_		MK
2	Position Switch	DPS		SU
1	Power Supply	AQL4-R8E1		SU
1	Access Control Reader	By Security Contractor		OT
1	Set Wiring Diagrams	Wiring Diagrams		00

Application:
-lever on one door leaf only.

Door normally closed and locked.
Entrance by presenting a valid card to card-reader.
Egress allowed at all times.
Loss of power, activation of fire alarm, or sprinkler system maintains security from lock side, entrance by mechanical key only.
Door monitored for door ajar and forced open.

Set: 23.0

Exterior: Rim Exit Device (nightlatch, CD) x Door Closer

	Hinge (qty per spec)	T4A3386 (size per spec, NRP as applicable)	US32D	MK
1	Rim Exit Device, nightlatch	16 43 8804	US32D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Vandal Resistant Trim	VRT26 C	US32D	RO
1	Surface Closer	PR7500	689	NO
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Wall Stop	RM860 / RM861	US26D	RO
1	Threshold	252x__FG		PE
1	Rain Guard	346_		PE
1	Sweep	345_PK		PE
1	Kerf Weather Seal	by frame manufacturer		CR

Set: 24.0

Exterior: Rim Exit Device (nightlatch, CD) x Door Closer w/ Spring Stop

	Hinge (qty per spec)	T4A3386 (size per spec, NRP as applicable)	US32D	MK
1	Rim Exit Device, nightlatch	16 43 8804	US32D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Vandal Resistant Trim	VRT26 C	US32D	RO
1	Surface Closer	UNI7500	689	NO
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Threshold	252x__FG		PE
1	Rain Guard	346_		PE
1	Sweep	345_PK		PE
1	Kerf Weather Seal	by frame manufacturer		CR

Set: 25.0

Exterior - Rim Exit Device (exit only) x Door Closer w/ Spring Stop

	Hinge (qty per spec)	T4A3386 (size per spec, NRP as applicable)	US32D	MK
1	Rim Exit Device, Exit Only	(12) 43 8810 EO	US32D	SA

1	Surface Closer	UNI7500	689	NO
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Threshold	252x__FG		PE
1	Rain Guard	346_		PE
1	Sweep	345_PK		PE
1	Kerf Weather Seal	by frame manufacturer		CR

Set: 26.0

Exterior - Pair: Rim Exit Device (exit only) x Rem Mullion x Door Closer w/ Spring Stop

	Hinge (qty per spec)	T4A3386 (size per spec, NRP as applicable)	US32D	MK
1	Mullion	L980S	PC	SA
1	Mounting Kit	98-2579 (for steel mullion)		SA
2	Rim Exit Device, Exit Only	43 8810 LD EO	US32D	SA
2	Cylinder	Type as Req'd (as specified)		OT
2	Surface Closer	UNI7500	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Threshold	252x__FG		PE
1	Gasketing	5110		PE
1	Rain Guard	346_		PE
2	Sweep	345_PK		PE
1	Astragal	18041_NB		PE
1	Kerf Weather Seal	by frame manufacturer		CR

Set: 27.0

EXISTING OPENING: Mortise Lock (Institutional Privacy) x Existing Automatic Operator

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Institutional Privacy Lock	V21 8267 VN1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Electric Strike	EXISTING		
1	Door Operator	EXISTING		
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for hinge weight/size and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 28.0 - NOT USED

Set: 29.0

EXISTING OPENING: Cylindrical Lock (storeroom) x Door Closer (as req'd, thru-bolts)

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Storeroom Lock	10XG04 LL	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	as req'd x TBGN	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 29.1

EXISTING OPENING - Pair: Cylindrical Lock (storeroom) x NO DOOR CLOSER

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Storeroom Lock	10XG04 LL	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
2	Stop	As Required		RO
1	Gasketing	S88		PE
1	Gasket Astragal	S772		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Set: 30.0

EXISTING OPENING: Cylindrical Lock (office) x NO DOOR CLOSER

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Entry/Office Lock	10XG05 LL	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:

-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify hinge weight/size.
-Use above new hardware, all other hardware to remain.

Set: 31.0 - NOT USED

Set: 32.0 - NOT USED

Set: 33.0

EXISTING OPENING: Cylindrical Lock (privacy) x NO DOOR CLOSER

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Privacy Lock	10XU65 LL	US26D	SA
1	Stop	As Required		RO
1	Gasketing	S88		PE

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify hinge weight/size.
-Use above new hardware, all other hardware to remain.

Set: 34.0 - NOT USED

Set: 34.1

EXISTING OPENING (WD/HMF) - Card Reader (DPS): Cylindrical Lock (storeroom) x EL Strike x Motion (RTE) Door Closer (thru-bolts)

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK	
1	Storeroom Lock	10XG04 LL	US26D	SA	
1	Cylinder	Type as Req'd (as specified)		OT	
1	Electric Strike	1600	630	HS	⚡
1	SMART Pac Bridge Rectifier	2005M3		HS	⚡
1	Surface Closer	R7500 / PR7500 x TBGN	689	NO	
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO	
1	Stop	As Required		RO	
1	Gasketing	S88		PE	
1	Position Switch	DPS		SU	⚡
1	Detector	SREX-100		AK	⚡
1	Power Supply	AQL4-R8E1		SU	⚡
1	Access Control Reader	By Security Contractor		OT	
1	Set Wiring Diagrams	Wiring Diagrams		00	

Application:
-Field verify existing conditions and field modify existing door and frame, as required, to accept new hardware specified.
-Field verify for door closer mounting type, hinge weight/size, and kick plate quantity.
-Use above new hardware, all other hardware to remain.

Door normally closed and locked.
Entrance by presenting a valid card to card-reader.
Egress allowed at all times.
Loss of power maintains security from lock side, entrance by mechanical key only.
Door monitored for door ajar and forced open.

Set: 35.0

Exterior: Storeroom Lock x Door Closer (thru-bolts)

	Hinge (qty per spec)	T4A3386 (size per spec, NRP as applicable)	US32D	MK
1	Storeroom Lock	8204 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	R7500 / PR7500 x TBGN	689	NO
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Wall Stop	RM860 / RM861	US26D	RO
1	Threshold	252x__FG		PE
1	Rain Guard	346_		PE
1	Sweep	345_PK		PE
1	Kerf Weather Seal	by frame manufacturer		CR
1	Latch Protector	320-RKW	US32D	RO

Set: 36.0

Exterior: Storeroom Lock x Door Closer w/ Spring Stop

	Hinge (qty per spec)	T4A3386 (size per spec, NRP as applicable)	US32D	MK
1	Storeroom Lock	8204 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	UNI7500	689	NO
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Threshold	252x__FG		PE
1	Rain Guard	346_		PE
1	Sweep	345_PK		PE
1	Kerf Weather Seal	by frame manufacturer		CR
1	Latch Protector	320-RKW	US32D	RO

Set: 37.0

Cont. Hinge x CVR Exit Device (passage) x Overhead Stop x Door Closer x Mag Hold Open

2	Continuous Hinge	FM300	630	MR	
2	Conc Vert Rod Exit, Passage	(12) 43 NB 8415 ETL	US32D	SA	
2	Surface Closer	PR7500	690	NO	
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO	
2	Electromagnetic Holder	998M	689	RF	⚡
1	Gasketing	S88		PE	
1	Gasket Astragal	S772		PE	
1	Astragal	(door manufacturer's heavy duty standard)		00	

Set: 37.1

Cont. Hinge x Rim Exit Device (passage) x Fixed Mullion x Overhead Stop x Door Closer

2	Continuous Hinge	FM300	630	MR	
2	Rim Exit Device, Passage	(12) 43 AD8515 ETL	US32D	SA	
2	Surface Closer	PR7500	690	NO	
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO	
2	Stop	As Required		RO	
1	Gasketing	S88		PE	
1	Gasket Astragal	S772		PE	
1	Astragal	(door manufacturer's heavy duty standard)		00	

Set: 37.2

Cont. Hinge x Rim Exit Device (passage) x Fixed Mullion x EL Strike x Overhead Stop x (1) Door Closer x (1) Automatic Operator

2	Continuous Hinge	FM300	630	MR	
2	Rim Exit Device, Passage	(12) 43 AD8515 ETL	US32D	SA	
1	Electric Strike	9400-LBM	613E	HS	⚡
1	Automatic Opener	60xx	690	NO	⚡
2	Door Switch	505		NO	⚡
2	Surface Closer	PR7500	690	NO	
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO	
2	Stop	As Required		RO	
1	Gasketing	S88		PE	
1	Gasket Astragal	S772		PE	
1	Astragal	(door manufacturer's heavy duty standard)		00	
1	Power Supply	AQL4-R8E1		SU	⚡
1	Set Wiring Diagrams	Wiring Diagrams		00	

Set: 37.3

Cont. Hinge x CVR Exit Device (passage) x Overhead Stop x Door Closer

2	Continuous Hinge	FM300	630	MR
2	Conc Vert Rod Exit, Passage	(12) 43 NB 8415 ETL	US32D	SA
2	Surface Closer	PR7500	690	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
2	Stop	As Required		RO
1	Gasketing	S88		PE
1	Gasket Astragal	S772		PE
1	Astragal	(door manufacturer's heavy duty standard)		00

Set: 38.0

Mortise Lock (Classroom Sec, T-Turn Cyl.) x NO DOOR CLOSER

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
1	Classroom Sec Lock	V21 8238 VN1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Thumbturn Cylinder	CR1300-118	626	RU
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Wall Stop	RM860 / RM861	US26D	RO
1	Gasketing	S88		PE

Set: 39.0 - NOT USED

Set: 40.0

Pair: CVR Exit Device (classroom) x Door Closer x Mag Hold

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
2	Conc Vert Rod Exit, Classroom	(12) 43 *16 NB 8613 ETL	US32D	SA
4	Cylinder	Type as Req'd (as specified)		OT
2	Surface Closer	R7500 / PR7500	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Electromagnetic Holder	998M	689	RF
1	Gasketing	S88		PE
1	Gasket Astragal	S772		PE

*=use cylinder dogging at all non-rated door openings.

Set: 40.1

Exterior - Card Reader (DPS) - Pair: EL CVR Exit Device (RTE) x Door Closer

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK	
2	Electric Power Transfer	EL-CEPT		SU	⚡
2	Conc Vert Rod Exit	(12) NB 43 55 56 8606 ETL	US32D	SA	⚡
2	Cylinder	Type as Req'd (as specified)		OT	
2	Surface Closer	R7500 / PR7500	689	NO	
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO	
2	Wall Stop	RM860 / RM861	US26D	RO	
1	Threshold	252x__FG		PE	
1	Gasketing	S88		PE	
1	Rain Guard	346_		PE	
2	Sweep	345_PK		PE	
1	Astragal	18041_NB		PE	
1	Gasket Astragal	S772		PE	
1	Kerf Weather Seal	by frame manufacturer		CR	
2	ElectroLynx Harness	QC-C3000_		MK	⚡
2	ElectroLynx Harness	QC-C00_		MK	⚡
2	Position Switch	DPS		SU	⚡
1	Power Supply	AQL4-R8E1		SU	⚡
1	Access Control Reader	By Security Contractor		OT	
1	Set Wiring Diagrams	Wiring Diagrams		00	

Door normally closed and locked.
Entrance by presenting a valid card to card-reader.
Egress allowed at all times.
Loss of power maintains security from lock side, entrance by mechanical key only.
Door monitored for door ajar and forced open.

Set: 40.2

Pair: CVR Exit Device (classroom) x Door Closer x Seals x Wall Mount Hold

	Hinge (qty per spec)	T4A3786 (size per spec, NRP as applicable)	US26D	MK
2	Conc Vert Rod Exit, Classroom	(12) 43 *16 NB 8613 ETL	US32D	SA
2	Cylinder	Type as Req'd (as specified)		OT
2	Surface Closer	R7500 / PR7500	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
2	Door Stop & Holder	490	US26D	RO
1	Astragal	18041_NB		PE
1	Gasket Astragal	S772		PE
1	Gasketing	S773		PE

2	Door Bottom	2343AV		PE

*=use cylinder dogging at all non-rated door openings.

Set: 41.0

Rim Exit Device (passage) x Door Closer

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Rim Exit Device, Passage	(12) 43 8815 ETL	US32D	SA
1	Surface Closer	R7500 / PR7500	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Wall Stop	RM860 / RM861	US26D	RO
1	Gasketing	S88		PE

Set: 42.0

Exterior - Pair: SVR Exit Device (storeroom) x Door Closer w/ Spring Stop

	Hinge (qty per spec)	T4A3386 (size per spec, NRP as applicable)	US32D	MK
2	Surface Vert Rod Exit	(12) 43 NB8706 ETL	US32D	SA
2	Cylinder	Type as Req'd (as specified)		OT
2	Surface Closer	UNI7500	689	NO
2	Latch Cover Kick Plate	BFLG1050	US32D	RO
2	Latch Guard Cover	BFRC	US32D	RO
1	Threshold	252x__FG		PE
1	Rain Guard	346_		PE
2	Sweep	345_PK		PE
1	Astragal	18041_NB		PE
1	Gasket Astragal	S772		PE
1	Kerf Weather Seal	by frame manufacturer		CR

Set: 43.0

Storeroom Lock x Overhead Stop

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Storeroom Lock	8204 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surf Overhead Stop	9-X36	630	RF
3	Silencer	608		RO

Set: 44.0 - NOT USED

Set: 44.1

Storeroom Lock x Overhead Stop

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Storeroom Lock	8204 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surf Overhead Stop	9-X36	630	RF
3	Silencer	608		RO

Set: 45.0

Classroom Lock x Overhead Stop

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Classroom Lock	8237 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surf Overhead Stop	9-X36	630	RF
1	Surface Closer	as req'd x TBGN	689	NO
1	Gasketing	S88		PE

Set: 45.1

Classroom Lock x Door Closer

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Classroom Lock	8237 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	R7500 / PR7500	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Wall Stop	RM860 / RM861	US26D	RO
1	Gasketing	S88		PE

Set: 45.2

Pair: Storeroom Lock x Door Closer

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Flush Bolt	2805 / 2905	US26D	RO
1	Storeroom Lock	8204 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
2	Mounting Bracket	2601	Black	RO
1	Coordinator	26xx	US28	RO
2	Surface Closer	R7500 / PR7500	689	NO
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO
2	Wall Stop	RM860 / RM861	US26D	RO

1	Gasketing	S88		PE
1	Gasket Astragal	S772		PE
1	Overlapping Astragal	"Z" Type by door manufacturer		00

Set: 45.3

(ALD/ALF) Classroom Lock x Door Closer w/ Spring Stop

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Classroom Lock	8237 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Surface Closer	CPS7500	689	NO
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO
1	Door Silencer/Seal	by Door & Frame Manufacturer		OT

Set: 45.4

Classroom Lock x NO DOOR CLOSER

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Classroom Lock	8237 LW1L	US26D	SA
1	Cylinder	Type as Req'd (as specified)		OT
1	Wall Stop	RM860 / RM861	US26D	RO
1	Gasketing	S88		PE

Set: 47.0

Office Lock

	Hinge (qty per spec)	TA2714 (size per spec, NRP as applicable)	US26D	MK
1	Entry/Office Lock	10XG05 LL	US26D	SA
1	Wall Stop	RM860 / RM861	US26D	RO
1	Gasketing	S88		PE

Set: 48.0 - NOT USED

Set: 100.0

Inventory

100	Silencer	608		RO

END OF SECTION

SECTION 08 80 00 - GLAZING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Glass glazing for interior and exterior windows and doors.

1.2 SYSTEM DESCRIPTION

A. System performance to achieve continuity of building enclosure air barrier and vapor retarder with glass and glazing materials of this section.

B. Glass Thickness: Select minimum thickness in accordance with ASTM E1300 to resist specified design loads.

C. Structural Design: Design in accordance with applicable code for most critical combination of wind, snow, seismic, and dead loads.

D. Exterior Glass Deflection: Maximum of 1/175 of glass edge length or 3/4 inch, whichever is less with full recovery of glazing materials.

E. Interior Glass Deflection: Maximum differential deflection for two adjacent unsupported edges when 50 plf force is applied to one panel at any point up to 42 inches above finished floor less than thickness of glass.

F. Thermal and Solar Optical Performance: Measured or calculated in accordance with the following:
   1. U-Values: NFRC 100.
   2. Solar Heat Gain Coefficients: NFRC 200.
   3. Solar Optical Properties: NFRC 300.

1.3 SUBMITTALS

A. Product Data:
   1. Glass: Provide structural, physical, and thermal and solar optical performance characteristics, size limitations, special handling or installation requirements.

B. Samples: Submit two samples, illustrating glass, coloration.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual for glazing installation methods.

B. Apply label from agency approved by authority having jurisdiction to identify each fire rated glass lite.

1.5 WARRANTY

A. Furnish ten year manufacturer warranty including coverage for sealed glass units from seal failure, interpane dusting, misting, and replacement of defective glass.

PART 2 PRODUCTS

2.1 GLAZING MANUFACTURERS

A. PPG

B. Pilkington

C. Old Castle

2.2 FLOAT GLASS MATERIALS

A. Annealed Glass: ASTM C1036, Type 1 transparent flat, Quality Q3, float glass.

1. Furnish annealed glass except where heat strengthened or tempered glass is required to meet specified performance requirements.

B. Tempered Glass: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind FT fully tempered, Condition A uncoated, float glass with horizontal tempering.

2.3 FLOAT GLASS PRODUCTS

A. Clear Glass: Annealed, Tempered float glass as specified; Class 1 clear.
1. Clear annealed glass (FG-CA)
2. Clear tempered glass (FG-CT).
3. Minimum Thickness: 1/4 inch.

B. Tinted Glass: Annealed, Tempered float glass as specified; Class 2 tinted.
1. Tinted annealed glass (FG-TA).
2. Tinted tempered glass (FG-TT).
3. Minimum Thickness: 1/4 inch.
4. Tint: Bronze

C. Low E Glass: Annealed, Tempered float glass as specified; Class 2 tinted.
1. Tinted Low E annealed glass (FG-ETA).
2. Tinted Low E tempered glass (FG-ETT).
3. Minimum Thickness: 1/4 inch.
4. Tint: Bronze.
5. Solar Light Transmittance: 40 percent minimum.
6. Solar Heat Gain Coefficient: 0.40 maximum.

2.4 INSULATING GLASS PRODUCTS

A. Insulating Glass: ASTM E2190; factory assembled units consisting of sealed lites of glass separated by a dehydrated interspace. glass elastomer edge seal; place reflective film within unit; purge interpane space with dry hermetic air.
1. Total Unit Thickness: 1 inch unless otherwise indicated.
a. 1/4-inch outer pane thickness, bronze tinted
b. 1/2-inch air space – argon filled
c. 1/4-inch inner pane thickness, low E coated [Guardian Sunguard SuperNeutral 68]
2. Spacer: Chromatech warm edge spacer bar or Equal
3. Sealing System: Dual-Seal
4. Insulating Glass Unit Edge Seal Construction: Aluminum, thermally broken, as required to meet thermal performance requirements of the opening.

2.5 ACOUSTIC GLASS PRODUCTS

A. Pilkington Optiphon or Equal
1. Double Insulated Glazing, laminated acoustic glass with asymmetric structure, safety glazing, 4mm – 16 mm – Pilkington Optiphon 6,8
a. Total thickness 26.8 mm
b. Acoustic Edge Seal
c. Fit Metal Frame / stop for new doors.

2.6 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
1. EPDM, ASTM C 864.
2. Silicone, ASTM C 1115.
3. Thermoplastic polyolefin rubber, ASTM C 1115.

2.7 GLAZING SEALANTS

A. Elastomeric Glazing Sealants: Materials compatible with adjacent materials including glass, and glazing channels.

B. Pre-Formed Glazing Tape: Butyl-based elastomeric tape, Size to suit application.

2.8 GLAZING ACCESSORIES

A. Setting Blocks: Elastomeric material recommended by glass manufacturer, 80 to 90 Shore A durometer hardness.

B. Spacer Shims: Elastomeric material recommended by glass manufacturer, 50 to 60 Shore A durometer hardness.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings for glazing are correctly sized, within tolerance, and glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.2 PREPARATION

A. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

B. Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

A. Perform installation in accordance with GANA Glazing Manual.
   1. Glazing Sealants: Comply with ASTM C1193.

B. Exterior Wet/Dry Method (Preformed Tape and Sealant) Installation:
   1. Cut glazing tape to length and set against permanent stops. Seal corners by butting tape and dabbing with compatible butyl sealant.
   2. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapor seal.
   3. Place setting blocks at **1/3** points.
   4. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.
   5. Fill gap between glazing and stop with elastomeric glazing sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.
   6. Apply cap bead of elastomeric glazing sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

C. Interior Dry Method (Tape and Tape) Installation:
   1. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
   2. Place setting blocks at 1/3 points.
   3. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
   4. Place glazing tape on free perimeter of glazing in same manner described above.
   5. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
   6. Knife trim protruding tape.

3.4 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.5 SCHEDULE

A. Exterior doors / Sidelights / Storefronts: 1 inch insulated, low-E, tinted glass. All glazing to be tempered

B. Interior Windows / Doors: 1/4 inch, clear, tempered glass.
   1. Provide rated glazing per Section 08 81 17 at locations indicated on Drawings.
   2. Provide acoustic glazing where noted on Door Schedule.

END OF SECTION

SECTION 08 81 17 – FIRE RATED GLAZING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire rated glazing materials for interior windows and doors.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E2010-01: Standard Test Method for Positive Pressure Fire Tests of Window Assemblies.

B. American National Standards Institute (ANSI):
   1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

C. Consumer Product Safety Commission (CPSC):
   1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

D. Glass Association of North America (GANA):
   1. GANA – Glazing Manual.
   2. FGMA – Sealant Manual.

E. National Fire Protection Association (NFPA):
   1. NFPA 80: Fire Doors and Windows.
   2. NFPA 252 – Fire Tests of Door Assemblies.
   3. NFPA 257 – Fire Tests of Window Assemblies.

F. Underwriters Laboratories, Inc. (UL):
   1. UL 9 – Fire Tests of Window Assemblies.
   2. UL 10B – Fire Tests of Door Assemblies.
   3. UL 10C – Positive Pressure Fire Tests of Door Assemblies.

1.3 SYSTEM DESCRIPTION

A. Type D-20: Performance Requirements: Provide a fire rated glazing manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.
   1. Fire Rating: 20 minutes without hose stream.
   2. Fire protective, safety rated, specialty tempered glass tested in accordance with NFPA 80, NFPA 252, NFPA 257, UL 9, UL 10B and UL 10C.
   3. Listings and Labels:
      a. Fire rated glazing shall be under current follow-up service by a nationally recognized independent testing laboratory approved by OSHA and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

B. Type D-H-60: Performance Requirements: Provide a fire rated glazing manufactured, fabricated, and installed to maintain performance criteria stated by manufacturer without defects, damage, or failure.
   1. Fire Rating: 60 minutes with hose stream.
   2. Fire protective, safety rated clear glazing tested in accordance with NFPA 80, NFPA 252, UL 10B and UL 10C.
   3. Testing Laboratory: Fire test shall be conducted by a nationally recognized independent testing laboratory.
   4. Listings and Labels:
      a. Fire rated glazing shall be under current follow-up service by a nationally recognized independent testing laboratory approved by OSHA and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

C. Type D-H-90: Performance Requirements: Provide a fire rated glazing manufactured, fabricated, and installed to maintain performance criteria stated by manufacturer without defects, damage, or failure.
   1. Fire Rating: 90 minutes with hose stream.
   2. Fire protective, safety rated clear glazing tested in accordance with NFPA 80, NFPA 252, UL 10B and UL 10C.
   3. Testing Laboratory: Fire test shall be conducted by a nationally recognized independent testing laboratory.
   4. Listings and Labels:
      a. Fire rated glazing shall be under current follow-up service by a nationally recognized independent testing laboratory approved by OSHA and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

D. Type D-H-T-W-60: Performance Requirements: Provide a fire rated glazing manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage, or failure.
   1. Fire Resistive Rated Glazing System
   2. Fire Rating: 60 minutes with hose stream.
   3. Fire resistive, safety rated glazing tested in accordance with ASTM E119, NFPA 80, NFPA 251, NFPA 252, NFPA 257, UL 9, UL 10B, UL 10C and UL 263.
   4. Testing Laboratory: Fire test shall be conducted by a nationally recognized independent testing laboratory.

E. Glass Thickness: Select minimum thickness in accordance with ASTM E1300 to resist specified design loads.

F. Interior Glass Deflection: Maximum differential deflection for two adjacent unsupported edges when 50 plf force is applied to one panel at any point up to 42 inches above finished floor less than thickness of glass.

1.4 SUBMITTALS

A. Product Data:
   1. Glass: Provide structural, physical, and thermal and solar optical performance characteristics, size limitations, special handling or installation requirements.
   2. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.
   3. Product Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.

B. Samples: Submit two samples, illustrating glass, coloration.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual for glazing installation methods.

B. Apply label from agency approved by authority having jurisdiction to identify each fire rated glass lite.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials per manufacturer requirements

B. Deliver materials to specified destination in manufacturer or distributor's packaging, undamaged, complete with installation instructions.

C. Store off ground, under cover, protected from weather and construction activities.

1.7 WARRANTY

A. Furnish five year manufacturer warranty for all fire rated glazing and components.

PART 2 PRODUCTS

2.1 FIRE RATED GLAZING MANUFACTURERS

A. SaftiFirst, Safety and Fire Technology,
   1. Type D-20: SuperLite I 20 minute Fire Protective Glazing [basis of design]
   2. Type D-H-60: SuperLite X-60 60 minute Fire Protective Glazing [basis of design]
   3. Type D-H-90: SuperLite X-90 90 minute Fire Protective Glazing [basis of design]
   4. Type D-H-T-W-60: SuperLite II-XL 60 [basis of design]

B. Nippon Electric Glass Company / Technical Glass Products, Pilkington Pyrostop, FireGlass

C. Saint-Gobain, Vetrotech, Contraflam 60

D. Approved Equal

2.2 PERFORMANCE REQUIREMENTS

A. Fire-rated glass ceramic clear and wireless glazing material listed for use in impact safety-rated locations with fire rating requirements ranging from 20 to 90 minutes with required hose stream test.

B. Passes positive pressure test standards UL 10C.

2.3 FIRE PROTECTION RATED GLAZING – TYPE D-20

A. Type D-20: 20 minute specialty tempered glazing without hose stream.

B. Design Requirements:
   1. Thickness: Must be 1/4”.
   2. Weight: Must weigh 3.0 lbs./sq. ft.
   3. Solar Heat Gain Coefficient: Must provide 0.82 SHGC.
   4. Sound Transmission Rating: Must provide STC 28 rating.
   5. Appearance: Must be specialty tempered float glass.
   6. Visible Light Transmission: Must meet 0.88 for clear tempered.
   7. Fire Rating: Must be fire rated to 20 minutes without hose stream test.
   8. Impact Safety Resistance: Must meet CPSC 16 CFR 1201 Cat. I (150 ft. lbs.; limited to 1,296 sq. in.) & II (400 ft. lbs.; up to maximum size tested).

C. Manufacturer’s Fire Rated Glazing Material:
   1. Each piece of fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory, fire rating period and safety glazing standards.
   2. Glazing material installed in Hazardous Locations, subject to human impact, shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80: CPSC 16 CFR 1201, Category I & II

D. Glazing Accessories: Manufacturer recommended fire rated glazing accessory as follows:
   1. Glazed with EPDM tape or other flame resistant gasket material and calcium silicate setting blocks.

2.4 FIRE PROTECTION RATED GLAZING – TYPE D-H-60

A. Type D-H-60: 60 minute specialty tempered glazing with hose stream

B. Design Requirements:
   1. Thickness: 3/4 inch
   2. Weight: 9 lbs./sq. ft.
   3. Sound Transmission Rating: Must meet 38 STC.

4. Appearance: clear, wireless and tint-free.
5. Visible Light Transmittance: Must meet 0.81.
6. Fire Rating: 45/60/90 minutes with hose stream.
7. Impact Safety Resistance: Available in CPSC 16 CFR Cat. I or II versions.

C. Manufacturer's Fire Rated Glazing Material:
1. Each piece of fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory, fire rating period and safety glazing standards.
2. Glazing material installed in Hazardous Locations, subject to human impact, shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80:
a. CPSC 16 CFR 1201, Cat. I or II

D. Glazing Accessories: Manufacturer recommended fire rated glazing accessory with listed and labeled vision lite kits installed.

2.5 FIRE PROTECTION RATED GLAZING – TYPE D-H-90

A. Type D-H-60: 90 minute specialty tempered glazing with hose stream

B. Design Requirements:
1. Thickness: 3/4 inch.
2. Weight: 9 lbs./sq. ft.
3. Sound Transmission Rating: Must meet 38 STC.
4. Appearance: clear, wireless and tint-free.
5. Visible Light Transmittance: Must meet 0.81.
6. Fire Rating: 45/60/90 minutes with hose stream.
7. Impact Safety Resistance: Available in CPSC 16 CFR Cat. I or II versions.

C. Manufacturer's Fire Rated Glazing Material:
1. Each piece of fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory, fire rating period and safety glazing standards.
2. Glazing material installed in Hazardous Locations, subject to human impact, shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80:
a. CPSC 16 CFR 1201, Cat. I or II

D. Glazing Accessories: Manufacturer recommended fire rated glazing accessory with listed and labeled vision lite kits installed.

2.6 FIRE RESISTIVE RATED GLAZING

A. Type D-H-T-W-60: 60 minute fire protective specialty tempered glazing with fire resistive qualities

B. Properties:
1. Make-Up inboard and outboard lit of clear tempered glass protecting a clear, fire resistant, intumescent interlayer.
2. Thickness: 1-3/8 inch overall.
3. Weight: 14 lbs./sq. ft.
4. Appearance: tint-free, optically clear fire resistive glazing.
5. Approximate Visible Transmission: 78 percent.
6. Fire-rating: fire rated to 60 minutes with hose stream, meet ASTM E-119.
7. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).
8. Surface Finish:
a. Standard Grade is polished for a surface quality that is comparable to alternative fire-rated ceramics marketed as having a premium finish.
9. Positive Pressure Test: UL 10C; passes.

C. Maximum sheet sizes based on surface finish:
   1. Standard: 48 inches by 96 inches.

D. Labeling: Permanently label each piece of glazing with manufacturer information, UL logo and fire rating in sizes up to 4,952 sq. in.

E. Fire Rating: Fire rating classified and labeled by UL for fire rating scheduled at opening locations on drawings, when tested in accordance with ASTM E2010-01, NPFA 252 and NFPA 257.

F. Glazing Accessories: Manufacturer recommended fire rated glazing accessory as follows:
   1. Glazed with EPDM tape or other flame resistant gasket material and calcium silicate setting blocks.

2.7 FIRE RATED ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

A. Refer to Section 08 88 13.

B. Glazing shall be installed in an equally rated framing system, and as approved by the Fire Rated Glazing Manufacturer. Obtain single source for Fire Rated Glazing and Framing System.

2.8 ACCESSORIES

A. Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable.

B. Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.

C. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.9 FABRICATION

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings for glazing are correctly sized, within tolerance, and glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

B. Examine glass framing for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
   2. Minimum required face or edge clearances.
   3. Observable edge damage or face imperfections.

C. Do not proceed with glazing until unsatisfactory conditions have been corrected.

D. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.2 INSTALLATION [GLAZING]

A. Comply with referenced FGMA standards and instructions of manufacturers of glass, glazing sealants, and glazing compounds.

B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.

C. Set units of glass in each series with uniformity of pattern, draw, bow, and similar characteristics.

D. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.

E. Place setting blocks located at quarter points of glass with edge block no more than 6 inches from corners.

F. Glaze vertically into labeled fire-rated metal frames or partition walls with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.

G. Place glazing tape on free perimeter of glazing in same manner described above.

H. Install removable stop and secure without displacement of tape.

I. Install in vision panels in fire-rated doors to requirements of NFPA 80.

J. Install so that appropriate UL markings remain permanently visible.

3.3 CLEANING

A. Remove glazing materials from finish surfaces.

B. Clean glass and adjacent surfaces.

C. Protect glass from contact with contaminating substances resulting from construction operations. Remove any such substances by method approved by glass manufacturer.

3.4 SCHEDULE

A. Refer to door / window schedule.

END OF SECTION

SECTION 08 81 17 – FIRE RATED ALUMINUM FRAMED STOREFRONTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire rated aluminum framing system for fire resistive glazing systems, full vision fire rated doors, sidelites, windows.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E119 Methods for Fire Tests of Building Construction and Materials.
   2. ASTM E152 Methods of Fire Tests of Door Assemblies.
   3. ASTM E163 Methods for Fire Tests of Window Assemblies.
   4. ASTM E2074: Standard Test Method for Fire Tests of Door Assemblies, including Positive Pressure Testing of Side-hinged and Pivoted Swinging Door Assemblies.
   5. ASTM E2110-1: Standard Test for Positive Pressure of Fire Tests of Window Assemblies.
   6. ASTM E283-04: Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
   7. ASTM 547-00: Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Difference.
   8. ASTM E331-00: Standard Test Method for Metal Curtain Walls and Doors by Uniform Static Air Pressure Difference.
   9. ASTM E330-02: Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
   10. ASTM F 588-04: Test Method for Resistance of Window Assemblies to Forced Entry Excluding Glazing.

B. National Fire Protection Association (NFPA):
   1. NFPA 80: Fire Doors and Windows.
   2. NFPA 251: Fire Tests of Building Construction and Materials.
   3. NFPA 252: Fire Tests of Door Assemblies.
   4. NFPA 257: Fire Tests of Window Assemblies.

C. Underwriters Laboratories, Inc. (UL):
   1. UL 9: Standard for Safety of Fire Tests of Window Assemblies.
   2. UL 10B: Standard for Safety of Fire Tests of Door Assemblies.
   3. UL 10C: Standard for Safety of Positive Pressure Fire Tests of Door Assemblies.
   4. UL 263: Fire Tests of Building Construction and Materials.
   5. UL 752-2005: Standard for Safety for Bullet-Resisting Equipment.

D. American National Standards Institute (ANSI):
   1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

E. Consumer Product Safety Commission (CPSC):
   1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

F. Glass Association of North America (GANA):
   1. GANA – Glazing Manual.
   2. FGMA – Sealant Manual.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Fire Rating: must meet 60 minutes as specified.
   2. Fire Resistive Wall Assembly Certifications: must meet 60 minute fire resistive wall assemblies tested in accordance with ASTM E119, NFPA 251, UL 263 and ULC-S101.

3. Fire Resistive, Temperature Rise Door Assembly Certifications: must meet 60 minute fire resistive temperature rise door assemblies tested in accordance with NFPA 252, UL 10B, UL 10C and CAN4 S104. Must meet 250 degrees F/450 degrees F temperature rise door requirements.
4. Fire Protective Door Assembly Certifications: must meet 20-45 minute fire protective door assemblies shall be tested in accordance with NFPA 80, NFPA 252, ASTM E152, ASTM E2074, UL 10B, UL 10C and CAN4-S104.
5. Air Infiltration: must meet <0.01 cfm/ft2
6. Uniform Load Deflection Test Pressure: up to +/- 50.0 psf
7. Uniform Load Structural Test Pressure: up to +/- 75.0 psf
8. Forced Entry Resistance: must meet ASTM F588 Type D
9. Testing Laboratory: Fire test must be conducted by a nationally recognized independent testing laboratory.

B. Listings and Labels:
1. Fire resistive, temperature rise framing system shall be under current follow-up service by a nationally recognized independent laboratory approved by OSHA and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

C. Appearance:
1. Fire rated wall/door assembly shall have a neat finished appearance with minimum joints at decorative cover intersections.

1.4 SUBMITTALS

A. Shop Drawings: Submit shop drawings showing layout, profiles and product components.

B. Samples: Submit samples for finishes, colors and textures.

C. Product Data: Submit latest edition of manufacturer's product data providing product descriptions, technical data and installation instructions.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual for glazing installation methods.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials per manufacturer requirements

B. Deliver materials to specified destination in manufacturer or distributor's packaging, undamaged, complete with installation instructions.

C. Store off ground, under cover, protected from weather and construction activities.

1.7 WARRANTY

A. Furnish five year manufacturer warranty for all fire rated glazing and components.

PART 2 PRODUCTS

2.1 FIRE RATED WALL ASSEMBLY MANUFACTURERS

A. SaftiFirst, Safety and Fire Technology,
1. GPX Architectural Series [basis of design]

B. Approved Equal

C. Fire rated glass and framing must be provided by a single-source, US manufacturer.

2.2 FRAMING MATERIALS

A. Fire resistive, temperature rise framing system rated for 60 minutes.

B. Properties:

1. Window/Wall Frame thickness: 2-1/2" Standard.
2. Fire resistive aluminum door capable of accommodating concealed hardware.
3. Internal framing: Internal tube steel framing shall conform to ASTM A501. Formed steel retainers shall be galvanized conforming to ASTM A527.
4. Insulation: The framing system shall insulate against the effects of fire, smoke and heat transfer from either side. The perimeter of the framing system to the rough opening shall be firmly packed with mineral wool fire stop insulation or appropriately rated intumescent sealant.
5. Fasteners: Type recommended by manufacturer. No exposed fasteners allowed.
6. Glazing accessories: The glazing material perimeter shall be separated from the perimeter framing system with approved flame retardant glazing tape. The SuperLite® glazing panel shall be caulked continuously around the edge to the tube steel frame utilizing neutral cure silicone. Silicone setting blocks recommended.

2.3 GLAZING MATERIALS

A. Refer to Section 08 81 17.

2.4 FABRICATION

A. Assemblies shall be furnished knocked down for field assembly and will be glazed in the field or unitized (should configurations and job site conditions allow).

B. Door assemblies shall be factory prepared for field mounting of hardware.

C. Fabrication Dimensions: Fabricate to approved dimensions. The general contractor shall guarantee dimensions within required tolerance. Obtain approved shop drawings prior to fabrication.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designing finishes.

B. Covers shall be chemically cleaned and pretreated; then, finished:
   1. Dark Bronze Anodized [match windows and storefront in building as closely as possible]

C. Protect finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.

D. Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

2.6 DOOR HARDWARE FOR DOORS

A. Coordinate Door Hardware with Section 08 71 00.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data including product technical bulletins and installation instructions.

3.2 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, have been previously installed under other sections, and are acceptable for product installation in accordance with manufacturer's instructions. Openings shall be plumb, square and within allowable tolerances. The Architect/Engineer shall be notified of any conditions that jeopardize the integrity of the proposed fire wall/door framing system. Do not proceed until such conditions are corrected.

3.3 INSTALLATION

A. Fire wall/door installation shall be by a licensed contractor and in strict accordance with the approved shop drawings and in accordance with the manufacturer's instructions.

3.4 CLEANING AND PROTECTION

A. Protect glass from contact with contaminating substances resulting from construction operations. Remove such substances by method approved by manufacturer.

B. Wash glass on both faces not more than four days prior to date schedule for inspections intended to establish date of Substantial Completion. Wash glass by method recommended by glass manufacturer.

C. Remove temporary coverings and protection of adjacent work areas.

D. Remove construction debris from project site and legally dispose of debris.

3.5 SCHEDULE

A. Refer to door / window schedule.

END OF SECTION

SECTION 09 20 00 - NON-STRUCTURAL COLUMN COVERS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Non-Structural Metal Column Covers and accessories at interior locations.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's technical data.

B. Shop Drawings: Submit shop drawings showing dimensions, sizes, thicknesses, materials, and finishes, attachments, and relationship to adjacent work.

1.3 PERFORMANCE REQUIREMENTS

A. Select stud thickness to resist minimum 5 psf uniform load and maximum 1/360 deflection.

1.4 QUALITY ASSURANCE

A. Manufacturer: Firm with manufacturing and delivery capacity required for the project, shall have successfully completed at least ten projects within the past five years, utilizing systems, materials and techniques as herein specified.

B. Fabricator must own and operate its own manufacturing facilities for all metal components. “Stick Built” or “Kit of Parts Systems” consisting of components from a variety of manufacturers will not be considered or accepted.

C. Manufacturer/Fabricator must own and operate its own Painting and Finishing facility to assure single source responsibility and quality control.

1.5 DELIVERY, STORAGE & HANDLING

A. All material shall be protected during fabrication, shipment, site storage and erection to prevent damage to the finished work from other trades. Store column covers inside a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Decorative, Non-Structural Metal Column Covers
   1. Gordon Interior Specialties
   2. Equal

2.2 MATERIALS

A. eConnect[1] Metal Column Covers / Enclosures shall be a complete Gordon, Inc. system. All secondary posts, anchors, clips and extrusions are to be provided as complete package of this work. No exposed fasteners for metal closures are allowed.

B. General: Provide metals free from surface blemishes where exposed to view in finished unit. Surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable. All metal shall be of the highest grade, commercial type.

C. Material shall be the following:
   1. Stainless Steel Type 304 or 304L or 316 or 316L, complying with ASTM A240 [Brushed #4], 16 gauge minimum

2.3 FABRICATION

A. Height of Covers / Enclosures shall be up to 12'-0" without horizontal joints.

B. Column Covers / Enclosures shall have either a closed or reveal horizontal or vertical joint, as shown on the architectural drawings. All other details including base and ceiling details shall be fabricated in accordance with the architectural drawings.

C. Column Covers / Enclosures shall be manufactured true to geometry as shown on plan view of the architectural drawings with manufacturing tolerances.

D. Column Covers / Enclosures shall be manufactured in round (full, three-quarter, half, quarter), configurations as indicated on drawings.

E. Diameter should be a minimum of 18" for stainless steel.

F. eConnect[1] system:
   1. Covers / Enclosures shall be fabricated with return flanges at the vertical joints for structural strength.
   2. eConnect[1] connection components shall be provided and factory attached to the column covers at specified intervals to allow for complete accessibility without tools or exposed fasteners. A clearance of ¾" is required at the top for installation.
   3. In those cases where access is restricted to authorized personnel, a locking method at the top will be provided.
   4. All covers shall be removable, demountable, and re-usable without exposed fasteners.

2.4 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install Column Covers / Enclosures in accordance with manufacturer's written installation instructions and shop drawings.

B. Column Covers / Enclosures shall be erected plumb, level, square, true to line, securely anchored, and in proper alignment and relationship to work of other trades.

C. Column Covers / Enclosures shall be inspected before installation to be free from dents, scratches, and other defects.

3.2 CLEANING

A. Removal of protective covering shall occur immediately after installation to prevent adhesive transfer.

B. Clean all surfaces following installation.

C. Maintenance per manufacturer's finish maintenance instructions.

3.3 PROTECTION

A. Protection of column covers from damage by other trades after installation to be provided by general contractor.

END OF SECTION

SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Gypsum board and joint treatment.

1.2 SUBMITTALS

A. Product Data: Submit data on gypsum board, accessories.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with:
   1. ASTM C840.
   2. GA-201 - Gypsum Board for Walls and Ceilings.
   3. GA-214 - Recommended Specification: Levels of Gypsum Board Finish.
   4. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.
   5. GA-600 - Fire Resistance Design Manual.

B. Furnish framing materials in accordance with SSMA - Product Technical Information.

C. Fire Rated Wall and Floor Construction: Rating as indicated on Drawings.
   1. Tested Rating: Determined in accordance with ASTM E119.
   2. Fire Rated Partitions: Listed assembly by UL.
   3. Fire Rated Ceilings and Soffits: Listed assembly by UL.

D. Surface Burning Characteristics:
   1. Textile Wall Coverings: Comply with one of the following:
      a. Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Manufacturers:
   1. United States Gypsum Co. [basis of design]
   2. BPB Americas Inc.
   3. G-P Gypsum Corp.
   4. National Gypsum Co.
   5. Certainteed.

2.2 COMPONENTS

A. Gypsum Board Materials: ASTM C1396/C1396M; Type X fire resistant where indicated on Drawings.
   1. GB-1: Standard Gypsum Board: 5/8 inch thick, maximum available length in place; ends square cut, tapered and beveled edges.
   2. GB-2: High-Impact / Impact-Resistant Gypsum board: 5/8 inch thick, maximum available length in place; ends square cut, tapered and beveled edges.
   3. GB-3: Moisture Resistant Gypsum Board: 5/8 inch thick, maximum available length in place; ends square cut, tapered and beveled edges.

2.3 ACCESSORIES

A. Acoustic Insulation: ASTM C665, preformed glass fiber, friction fit type, unfaced,
   1. 3 inch thick in new 3 5/8 inch metal stud walls.

2. 6 inch thick in new 6 inch metal frame walls.

B. Gypsum Board Accessories: ASTM C1047; metal; corner beads, edge trim, and expansion joints.
   1. Metal Accessories: Galvanized steel.
   2. Edge Trim: Type LC, L, or U bead as appropriate for conditions

C. Joint Materials: ASTM C475/C475M, GA-201 and GA-216, reinforcing tape, joint compound, and water.

D. Fasteners: ASTM C1002, GA-216; length to suit application.

E. Gypsum Board Screws: ASTM C954, ASTM C1002; length to suit application.
   1. Screws for Steel Framing: Type S.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions are ready to receive work.

3.2 INSTALLATION

A. Gypsum Board:
   1. Install gypsum board in accordance with GA-216.
   2. Fasten gypsum board to furring or framing with screws.
   3. Place control joints consistent with lines of building spaces as directed by Architect.
   4. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.
   5. Seal cut edges and holes in gypsum board as appropriate for the condition.

B. Joint Treatment:
   1. Finish in accordance with GA-214 for all new work.
      a. Level 4: All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener head and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges.
         1) This level is to be used at areas to receive flat paints.
      b. Level 5: All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. A thin skim coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, applied to the entire surface. The surface shall be smooth and free of tool marks and ridges.
         1) This level is to be used at areas to receive eggshell and semi-gloss and gloss paint and areas subject to severe lighting, where indicated.
   2. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   3. Feather coats onto adjoining/existing surfaces so camber is maximum 1/32 inch.
   4. Taping, filling, and sanding is not required at concealed surfaces**.**

C. Tolerances: Maximum Variation from Flat Surface: 1/8 inch in 10 feet in any direction.

3.3 SCHEDULE

A. New Gypsum Board Wall Finishes: GB-2: Level 5 finish.

B. New Gypsum Board Ceiling Finishes: GB-1: Level 4 finish.

C. New Gypsum Board Ceiling Finishes at Toilet Rooms, Wet Areas: GB-3: Level 5 finish.

D. Existing Walls / Ceilings: Repair existing gypsum board / plaster finishes where required by work and/or damaged. Restore to like new condition.

END OF SECTION

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SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Metal stud framing and accessories at interior locations.

1.2 SYSTEM DESCRIPTION

A. Interior Walls: Metal stud framing system with insulation as specified in Section 07 21 00, interior gypsum board as specified in Section 09 21 16.

B. Maximum Allowable Deflection: 1: 180 span.

C. Wall System:
1. Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
2. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.3 PERFORMANCE REQUIREMENTS

A. Select stud thickness to resist minimum 5 psf uniform load and maximum 1/360 deflection.

1.4 QUALITY ASSURANCE

A. Perform Work according to ASTM C754.

B. Form, fabricate, install, and connect components according to NAAMM ML/SFA 540.

C. Furnish framing materials according to SSMA - Product Technical Information.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Framing System Components: ASTM C645.

B. Studs: ASTM A653/A653M, non-load bearing rolled steel, channel shaped, punched for utility access, as follows:
1. Depth / Thickness:
   a. 3 5/8 inches x 20 gauge
   b. 6 inches x 20 gauge
   c. 6 inches x 16 gauge [corridor wall infill at interior vestibule doors]
   d. Unless otherwise noted on the drawings, or as required to suit conditions to meet deflection requirements.

C. Tracks and Headers: Same material and thickness as studs, bent leg retainer notched to receive studs.

D. Furring Channels: ASTM A653 G40
1. Cold Rolled Channels: 16 gauge with 1/2 inch wide flanges, 3/4 inch deep.
2. Hat Channels: ASTM C645-07: 25 gauge, 7/8 inch deep

E. Channel Bridging:
1. 16 gauge, 1-1/2 inch x 1/2 inch flange
2. Clip angles: 1-1/2 inch x 1-1/2 inch, galvanized steel

F. Furring and Bracing Members: Of same material as studs; thickness to suit purpose.

G. Fasteners: ASTM C1002; Type S, GA-216; length to suit application.

H. Anchorage Devices: Power actuated.

I. Grid Suspension System of Interior Ceilings: ASTM C645-07, manufacturer's standard direct-hung grid suspension system composed of main beams and cross furring members that interlock forming a modular support system.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Hangers, Tie Wires, Carrying Channels, and Furring Channels as required for suspended ceiling systems.
   1. Design load shall be 5 times the imposed load by construction per ASTM E488.

B. Grid Suspension System of Interior Ceilings: ASTM C645-07, manufacturer's standard direct-hung grid suspension system composed of the main beams and cross furring members that interlock to form a modular supporting network.
   1. Contractor’s Option for gypsum board ceilings where appropriate.

2.3 FABRICATION

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

C. Fit and assemble in largest practical sections for delivery to Site, ready for installation.

2.4 SHOP FINISHING

A. Studs: Galvanize to G40 coating class.

B. Tracks and Headers: Galvanize to G40 coating class.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify rough-in utilities are in proper location.

3.2 INSTALLATION

A. Align and secure top and bottom runners at 24 inches o.c.

B. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.

C. Install studs vertically at 16 inches o.c.

D. Align stud web openings horizontally.

E. Secure studs to tracks using fasteners. Do not weld.

F. Stud splicing not permissible.

G. Fabricate corners using minimum of three studs.

H. Double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings.

I. Brace stud framing system rigid.

J. Coordinate erection of studs with requirements of door frames, window frames, and openings; install supports and attachments.

K. Coordinate installation of FRT wood bucks, anchors, and wood blocking with electrical and mechanical Work to be placed within or behind stud framing.

L. Blocking: Secure FRT wood blocking or steel channels to studs.

M. Refer to Drawings for indication of partitions extending to finished ceiling only and for partitions extending through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Install extended leg ceiling runners.

N. Coordinate placement of insulation in stud spaces after stud frame erection.

3.3 ERECTION TOLERANCES

A. Maximum Variation from Indicated Position: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb: 1/8 inch in 10 feet.

3.4 SCHEDULES

A. Refer to wall types and sections on drawings.

END OF SECTION

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SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Acoustic tile.
   2. Acoustic panels.
   3. Suspended metal grid ceiling system and perimeter trim.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data.

B. Samples: Submit ceiling tile and suspension system.

1.3 QUALITY ASSURANCE

A. Surface Burning Characteristics: Comply with the following when tested in accordance with NFPA 286.
   1. During 40 kW Exposure: No flame spread to ceiling.
   2. During 160 kW Exposure: No flame spread to perimeter of tested sample and no flashover.
   3. Total Smoke Release: Maximum 1,000 cu m.

B. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

PART 2 PRODUCTS

2.1 SUSPENDED ACOUSTICAL CEILINGS

A. Manufacturers:
   1. Armstrong [Basis of Design].
   2. United States Gypsum Company.

B. Performance / Design Criteria:
   1. Provide system capable of supporting imposed loads with deflection limited to 1/360 of span.

2.2 COMPONENTS

A. Acoustic Tiles: ASTM E1264 conforming to the following:
   1. Armstrong 1713 School Zone Fine Fissured Square Lay-in [basis of design], match building standard
   2. Nominal Size: 24 x 24 inches.
   3. Thickness: 3/4 inches.
   4. Surface Finish: Non-directional fissured.
   5. Edge: Square.
   6. Color: White.
   7. NRC: 0.70

B. Grid:
   1. Non-Fire Rated Grid: ASTM C635, standard duty, non-fire rated, exposed T configuration; components die cut and interlocking.
   2. Accessories: Stabilizer bars, clips, splices, edge moldings required for suspended grid system.
   3. Grid Materials: Commercial quality cold rolled steel with galvanized coating.
   4. Exposed Grid Surface Width: 15/16 inch.
   5. Perimeter Molding Width: Match grid width.
   6. Grid Finish: White color .

7. Support Channels and Hangers: Galvanized steel, size and type to suit application and ceiling system flatness requirements specified.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify layout of hangers does not interfere with other work.

3.2 INSTALLATION

A. Suspension System: New Ceilings
   1. Install suspension system in accordance with ASTM C635, ASTM C636 and as supplemented in this section.
   2. Install suspension system in accordance with ASCE 7, ASTM E580/E580M and CISCA for Seismic Zone 3-4.
   3. Coordinate location of hangers with other work. Where components prevent regular spacing of hangers, reinforce system to span extra distance.
   4. Hang system independent of walls, columns, ducts, pipes and conduit.
   5. Locate system on room axis leaving equal border units; according to reflected plan.
   6. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths.

B. Suspension System: Modifications to Existing Ceilings:
   1. Install new T-bars to sub-divide existing 24x48 ceiling system to become 24x24 ceiling system. Repair, prep and paint existing suspension system to remain.
   2. Modify existing ceilings as required by proposed work for new devices, etc.

C. Acoustic Units:
   1. Install acoustic units level, free from damage, scuffs, scars, twist, warp or dents.

D. Tolerances: Variation from Flat and Level Surface: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 65 00 - RESILIENT FLOORING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes resilient tile flooring; resilient base; thresholds

1.2 REFERENCES

A. ASTM International:
   1. ASTM F1344 - Standard Specification for Rubber Floor Tile.
   2. ASTM F1861 - Standard Specification for Resilient Wall Base.

B. National Fire Protection Association:
   1. NFPA 253 - Standard Method of Test for Critical Radiant Flux for Floor Covering Systems Using a Radiant Heat Energy Source.

C. South Coast Air Quality Management District:
   1. SCAQMD Rule 1113 - Architectural Coatings.
   2. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

1.3 SUBMITTALS

A. Shop Drawings: Indicate seaming plan, custom patterns and inlay designs.

B. Product Data: Submit data describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Samples:
   1. Submit manufacturer's complete set of color samples for initial selection.
   2. Submit **two** samples, illustrating color and pattern for each resilient flooring product specified.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning

1.5 QUALITY ASSURANCE

A. Surface Burning Characteristics:
   1. Floor Finishes and Stair Coverings: Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.
   2. Base Material: Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.

B. Accessibility: Flooring shall comply with accessibility requirements ICC/ANSI A117.1.
   1. Exceed Federal Standards and ADA requirements for slip-resistance.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
   1. Manufacturers Qualifications: Flooring product manufacturer will have a technical installation representative available at the job site at the start of the installation to insure there are no conditions which will compromise the installation of the material and that the material is being installed according to industry standards, practices and manufacturers guidelines. The manufacturer’s technical representative will document and confirm that the substrate, material, and installation are in compliance with manufacturer’s guidelines and accepted industry standards and practices.

a. Any noticed defect with the product or installation system will require the response of the manufacturer's technical field service personnel on site to determine cause, correction or replacement.

B. Installer: Company specializing in performing Work of this section with minimum ten years documented experience.
   1. An installer is "qualified" if trained by the manufacturer or a certified INSTALL [International Standards and Training Alliance] resilient floor covering installer.

1.7 MOCKUP

A. Provide a mockup of the floor installation in an approximate 200 SF area showing the color and pattern of the floor, layout, seams, etc.

B. Provide a mockup of each type of floor / floor pattern as indicated.

C. Coordinate locations with Owner and RDA.

D. Approved mockups may be left in place.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by Tarkett, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

1.9 PROJECT CONDITIONS / ENVIRONMENTAL REQUIREMENTS

A. Install resilient products after other finishing operations, including painting, have been completed. If that is not possible due to the compressed schedule, provide all required protection of the floor system after installation until turnover of the space.

B. Maintain ambient temperatures within range recommended by the manufacturer, but not less than 65 deg F or more than 85 deg F in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

C. Maintain the ambient relative humidity between 40% and 60% during installation.

D. Until Substantial Completion, maintain ambient temperatures within range recommended by the manufacturer, but not less than 55 deg F or more than 85 deg F.

1.10 EXTRA MATERIALS

A. Furnish an additional 5% of each type of floor, base, and accessories.

B. Document attic stock, properly label, and turn over to Owner.

1.11 WARRANTY

A. Provide five [5] year manufacturer warranty for all resilient flooring, base, and accessories.

PART 2 PRODUCTS

2.1 TILE FLOORING

A. Manufacturers:
   1. Tarkett North America [Basis of Design]

B. Rubber Tile: ASTM F1344; Class I-B- Homogenous Composition of 100% synthetic rubber: Tarkett MicroTone Speckled Rubber Tile [Floor Type F-3]

1. Size: 24 x 24 inch.
2. Overall Thickness: 0.125 inch.
3. Colors: CUSTOM color mix as approved by Architect and Owner.
   a. Floor installation to be comprised of a +/- [6] color scheme as indicated on the drawings [F-1A areas]. Final color selection, tile mix, and pattern will be determined by Architect.
   b. Contractor / Manufacturer shall include all costs for creating custom colors for all tile selections. Contractor shall assume minimum of 300 SF per each color of tile.
4. Surface Texture:
   a. Hammered at all floors unless specifically noted otherwise
   b. Raised Round at treads, ramps or other areas if specifically noted.
5. Test data:
   a. Hardness (ASTM D2240): ≥ 85 Shore A
   b. Abrasion Resistance (ASTM D3389): Passes
   c. Thickness Tolerance (ASTM F386): Passes
   d. Resistance to Chemicals (ASTM F925): Passes
   e. Static Load Resistance (ASTM F970): 250 psi
   f. Resistance to Heat (ASTM F 1514): $\Delta E \leq 8$
   g. Size/Squareness Tolerance (ASTM F2055): Passes
   h. Dimensional Stability (ASTM F2199): Passes
   i. Static Coefficient of Friction (ASTM D 2047): ≥ 0.8 SCOF, exceed ADA requirements for slip-resistance.
   j. Flammability (ASTM E648, Critical Radiant Flux): Class 1 (≥ 0.45 W/cm^2)

2.2 RESILIENT BASE

A. Manufacturers:
   1. Tarkett North America [Basis of Design]
   2. Nora by Interface
   3. Mondo Contract Flooring
   4. Approved Equal.

B. Base: ASTM F1861 Type TP – Thermoplastic, Rubber; coved style:
   1. Height: 4 inch.
   2. Thickness: 0.125 inch thick.
   3. Finish: Satin or Matte.
   4. Length: 4 foot sections.
   5. Outside Corners: Premolded or precut. Corners shall be a minimum of 4 inches in length each direction.
   6. Inside Corners: Job formed

2.3 ACCESSORIES

A. Transition Moldings and Edge Strips, same material as flooring or metal as applicable. Refer to drawings.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated and coordinate with substrate.

B. Primer: A primer may be required and must be verified by the manufacturer.

C. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
   1. Adhesives shall be approved by manufacturer for use over concrete substrates with maximum RH of 85 percent (ASTM F2170) and maximum pH of 9.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Verify concrete floors are dry to maximum moisture content as recommended by manufacturer, and exhibit negative alkalinity, carbonization, and dusting.

E. Verify floor and wall surfaces are free of substances capable of impairing adhesion of new adhesive and finish materials.

3.2 PREPARATION

A. Contractor shall provide all required field verification of conditions, quantity take-offs, layout confirmations, etc. as applicable to the work.

B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
   1. Prepare concrete substrates in accordance with ASTM F 710.

C. Prohibit traffic until filler is cured.

D. Clean substrate.

E. Apply primer as required to prevent "bleed-thru" or interference with adhesion by substances cannot be removed.

F. Do not install resilient products until they are same temperature as the space where they are to be installed.
   1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.

C. Install tile to a pattern as indicated or as recommended by the manufacturer for the conditions. Allow minimum 1/2 full size tile width at room or area perimeter.

D. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

E. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.

F. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

G. Install flooring in recessed floor access covers. Maintain floor pattern.

H. Install feature strips and floor markings where indicated. Fit joints tightly.

I. Roll flooring with a weighed roller per the manufacturer.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
   1. Prohibit traffic on resilient flooring for 48 hours after installation.
   2. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.

D. Wait 72 hours after installation before performing initial cleaning.

E. A regular maintenance program must be started after the initial cleaning.

3.5 SCHEDULE

A. Refer to Drawings.

END OF SECTION

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SECTION 09 65 13 - RESILIENT BASE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes rubber base.

1.2 SUBMITTALS

A. Samples:
   1. Submit manufacturer's complete set of color samples for initial selection.
   2. Submit three samples, 2x2 inch in size illustrating color and pattern for each resilient flooring product specified.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit maintenance instruction and data.

1.4 QUALITY ASSURANCE

A. Surface Burning Characteristics:
   1. Base Material: Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.1 RESILIENT BASE

A. Manufacturers:
   1. Roppe Corp., #139 Deep Navy [basis of design, match building standard]
   2. Approved Equal

B. Base: ASTM F1861; Type TP, Rubber; top set coved:
   1. Height: 4 inch.
   2. Thickness: 0.125 inch thick.
   3. Finish: Matte.
   4. Length: Roll.
   5. Outside Corners: Premolded or precut. Corners shall be a minimum of 4 inches in length each direction.
   6. Inside Corners: Job formed

2.2 ACCESSORIES

A. Primers and Adhesives: Waterproof, types recommended by floor material manufacturer.

2.3 MOLDINGS / TRANSITION STRIPS

A. Moldings and Edge Strips: Metal; extruded aluminum with mill finish of height required by finish floor materials, and in maximum lengths to minimize running joints.
   1. Schluter or Equal. Size / type to suit conditions.

B. Moldings and Transition Strips: Rubber, extruded rubber as required by floor materials, and in maximum lengths to minimize running joints.

1. Roppe or Equal: Size / type to suit conditions.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean substrate.

B. Apply primer as required to prevent "bleed-thru" or interference with adhesion by substances that cannot be removed.

3.2 INSTALLATION

A. Adhere base tight to wall and floor surfaces.

B. Fit joints tightly and make vertical. Miter internal corners. Install pre-molded interior and exterior corners.

C. Remove excess adhesive from surfaces without damage.

3.3 SCHEDULE

A. Base:
   1. 4” rubber base at areas indicated on drawings. Provide pre-molded inside and outside corners as applicable.

B. Moldings and Transition Strips:
   1. Metal: all locations except for those adjacent to carpet flooring.
   2. Carpet: Rubber

END OF SECTION

SECTION 09 67 00 - FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Fluid-applied flooring and base; divider strips and accessories; and integral colored finish system.

1.2 SUBMITTALS

A. Product Data: Describe physical and performance characteristics; sizes, patterns and colors available.

B. Manufacturer’s Certificate: Certify products meet or exceed specified requirements.

C. Manufacturer's Installation Instructions: Special procedures, perimeter conditions requiring special attention.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.4 QUALITY ASSURANCE

A. Surface Burning Characteristics:
   1. Floor Finishes: Class I, minimum 0.45 watts/sq cm when tested according to NFPA 253.

B. Manufacturer: Company specializing in manufacturing products specified in this Section with five years' experience.

C. Installer: Company specializing in performing Work of this Section with five years' experience and approved by manufacturer.

D. Floor System Thickness Verifications:
   1. At Owner’s discretion, the Contractor shall take [2] 1 inch random cores per 1,000 SF through the system into the substrate to verify proper system thickness. Cored areas less than the specified thickness shall be removed and replaced or increased in thickness by the installing contractor in a manner that does not affect the performance or integrity of the system. Cored areas which comply with the recommended system thickness shall be built-up to match the surrounding surface elevation prior to applying the top coats.
   2. Cores taken and patched will be noticeable. Cores shall be taken from areas where they will not impact the finished aesthetic of the system.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Maintain minimum temperature in storage area of 55 degrees F.

B. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials, or in accordance with manufacturer requirements

C. Moisture Testing for Concrete Slab: Test existing and new concrete floor slabs for moisture as part of the prep work for the new epoxy floor system. Follow the directives of the epoxy floor system manufacturer if the moisture content exceeds the maximum threshold.

1.6 MOCK UP

A. Apply mockup to verify selections made as part of sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution for each flooring type.
   1. Apply full-thickness mockup system at no less than 25 SF of floor area, including a section of base.

2. Approved mockups may become part of the completed Work.

PART 2 PRODUCTS

2.1 FLUID-APPLIED FLOORING

A. Epoxy Resin Coating System: Manufacturers:
   1. SIKA [Basis of Design]

B. Field Color Pigment Additive
   1. Sikafloor Epoxy Color Additive-N [Basis of Design – Border / Base]
      a. Color: SF264 Basalt Gray
   2. Sikafloor Metallic FX Decorative Metallic Effect Smooth Floor System [Basis of Design Field]
      a. Color: P1020 Dolphin

C. Decorative Vinyl Flakes:
   1. Sika Decorative Flakes – [3] color mix, colors / mockup as approved by Owner.

D. Quartz Broadcast:
   1. Sikafloor Decorative Quartz – colors / mockup as approved by Owner.

2.2 COMPONENTS

A. Metallic Finish Floor System [Floor Type F-1]: Epoxy Resin Coating System, low odor, 100% solids epoxy floor coating system with a urethane top coat.
   1. Moisture Tolerant Primer: SIKA SikaFloor-1610
      a. Two Component, high solids, red transparent epoxy primer. Specially formulated to perform as s moisture tolerant primer.
   2. Base Coat: Sikafloor-217 with SikaFloor Epoxy Color Additive-N [color match to border color]
   3. Intermediate Coat: Sikafloor-217
      a. Low odor, 100% solids, epoxy resin coating system for high build coatings.
      b. Pigmented using:
         1) Borders / Base: Field pigmented with SikaFloor Epoxy Color Additive-N
         2) Field: Field pigmented with Sikafloor Decorative Metallic Effect Smooth Floor System
   4. Top Coat: Sikafloor-315, clear
      a. Provide aluminum oxide or glass bead wear aggregate for increased traction and abrasion resistance where noted on drawings. Provide mockup of finish for review and approval by the Owner prior to installation.

B. Quartz Finish Floor System [Floor Type F-4]: Epoxy Resin Coating System, low odor, 100% solids epoxy floor coating system with a urethane top coat.
   1. Moisture Tolerant Primer: SIKA SikaFloor-1610
      a. Two Component, high solids, red transparent epoxy primer. Specially formulated to perform as a moisture tolerant primer.
   2. First Body Coat: Sikafloor-217 + Sikafloor Decorative Quartz
   3. Second Body Coat: Sikafloor-217 + Sikafloor Decorative Quartz
   4. Intermediate Coat: Sikafloor-217
   5. Top Coat: Sikafloor-315 N, clear, semi-gloss finish

C. Decorative Vinyl Flake Finish Floor System [Floor Type F-5]: Epoxy Resin Coating System, low odor, 100% solids epoxy floor coating system with a urethane top coat.
   1. Moisture Tolerant Primer: SIKA SikaFloor-1610
      a. Two Component, high solids, red transparent epoxy primer. Specially formulated to perform as s moisture tolerant primer.
   2. First Body Coat: Sikafloor-264 + Sika Decorative Flakes
      a. Pigmented, two part low viscosity, epoxy coating / binder for broadcast overlayments.

b. Broadcast Decorative Flakes to Rejection.
3. Second Body Coat: Sikafloor-217
4. Intermediate Coat: Sikafloor-217
5. Top Coat: Sikafloor-315 N, clear, semi-gloss finish

2.3 ACCESSORIES

A. Control Joint and Divider Strips: Extruded anodized aluminum, height to match flooring thickness, with anchoring features. Locate as recommended by manufacturer. Field confirm conditions with Owner / Architect to address variations in the floor thickness. Alternate: butt floor systems together with clean lines. Provide mockup as applicable to the conditions.

B. Base / Fillet Strips: Molded of flooring resin material or material compatible with flooring.

C. Subfloor Filler: type recommended by flooring material manufacturer.

D. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify floor surfaces are smooth and flat with maximum variation as specified and are ready to receive Work.

B. Verify concrete floors have cured minimum 28 days [or per manufacturer requirements], exhibit negative alkalinity, carbonization, and dusting, and are acceptable to flooring manufacturer.

C. Verify floor and lower wall surfaces are free of substances capable of impairing adhesion of adhesive and finish materials.

D. Moisture Testing for Concrete Slab: Test existing and new concrete floor slabs for moisture as part of the prep work for the new epoxy floor system. Follow the directives of the epoxy floor system manufacturer if the moisture content exceeds the maximum threshold.

3.2 PREPARATION

A. Prepare surfaces as required by manufacturer, remove all laitance, grease, curing compounds, bond inhibiting materials, waxes, and other contaminants.

B. Cracks: evaluate the existing cracks in the concrete to determine the required repairs prior to the application of the flooring system. Refer to manufacturer requirements. Provide all crack repair necessary.

C. Surface Preparation: Remove all surface contamination, loose or weakly adherent particles, laitance, grease, oil, curing compounds, paint, dust and debris by blast track method or approved mechanical means. If surface is questionable try a test patch. Create a minimum surface profile for the system specified in accordance with the methods described in ICRI No. 03732 to achieve profile numbers as follows:
1. Thin film, to 10 mils: CSP-1 to CSP-3.
2. Thin and medium films, 10 to 40 mils: CSP-3 to CSP-5.
3. Self-leveling mortars, to 3/16 inch: CSP-4 to CSP-6.
4. Mortars and laminates, to 1/4 inch or more: CSP-5 to CSP-9.

D. Remove and dress all sub-floor ridges and bumps. Fill low spots [including gouges in the floor slab from removal of tile, etc.], cracks, joints, holes, and other defects with sub-floor filler.

E. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above surface level. Prohibit traffic until filler is cured.

F. Clean substrate.

G. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.3 INSTALLATION

A. Install floor system to manufacturer requirements including prep, application procedures, application rates, cure times, etc.

B. Accurately saw cut substrate to install control joints and/or divider strips as applicable to the system, and where recommended by manufacturer.
   1. Install strips straight and level at locations indicated.

C. Install fillet strips at base of walls where flooring is to be extended up wall as base as required by site conditions.

D. Apply each coat of flooring within thickness range required by manufacturer.

E. Install resinous floor over properly prepared concrete surface in strict accordance with the manufacturer's directions.
   1. Install the primer / base coats over thoroughly cleaned and prepared concrete.
   2. Install intermediate coat with integral color additive / broadcast flakes / quartz as outlined.
   3. Install topcoat over intermediate coat[s].

F. Note: Contractor shall change applicator roller at intervals not exceeding 1,000 SF or as otherwise recommended by manufacturer.
   1. Roller shall not break down or leave fibers in the floor system.

G. Contractor to provide and maintain barriers to minimize the construction dust in the work area of the floor application. Contractor to take all measures necessary to ensure a quality installation free of contaminants.
   1. If HEPA Air Scrubbers are required to remove airborne contaminants, this will be executed via a field change at an additional cost.

H. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
   1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
   2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
   3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.

I. Sealant: Saw cut resinous floor topping at expansion joints in concrete slab where applicable. Fill saw cuts with sealant prior to final seal coat application. Follow manufacturer's written recommendations.

J. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.

K. Slip Resistant Finish: Provide grit for slip resistance, coordinate requirements with Owner.

L. Finish to smooth level surface.

M. Install cove base where indicated on drawings.

3.4 PROTECTION

A. Protect finish floor after installation to prevent damage to the floor system.

B. Do not allow construction equipment onto floor system that will damage the floor.

END OF SECTION

SECTION 09 68 00 - CARPETING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Carpet tile, fully adhered.
   2. Accessories.

1.2 SUBMITTALS

A. Shop Drawings: Indicate layout of joints, direction of carpet pile, location of edge moldings.

B. Product Data: Describe physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples:
   1. Two carpet tile samples illustrating color and pattern design for each carpet color selected.

D. Manufacturer's Instructions: Special procedures, perimeter conditions requiring special attention.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include suggested schedule for cleaning.

1.4 QUALITY ASSURANCE

A. Surface Burning Characteristics:
   1. Floor Finishes: Comply with one of following:
      a. Class II, minimum 0.22 watts/sq cm when tested according to NFPA 253.
      b. CPSC 16 CFR 1630 and ASTM D 2859.

B. Installer: Company specializing in performing Work of this Section with five years' experience.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Store materials in area of installation for 48 hours prior to installation.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Materials:
   1. Furnish 100 SF of carpet tiles of each color and pattern selected.

PART 2 PRODUCTS

2.1 CARPET TILE

A. Manufacturers:
   1. Shaw
   2. Approved Equal.

2.2 COMPONENTS

A. Carpet Tile [Floor Type F-6]: **multi-level pattern loop carpet, ShawContract diffuse + disperse No rules #59575 24x24,** manufactured in one color dye lot.
   1. Tile Size: 24x24 inch, nominal.
   2. Fiber: ecosolution Q nylon
   3. Dye Method: 100% solution dyed
   4. Primary Backing: synthetic
   5. Secondary Backing: ecoworx tile
   6. Gauge: 1/12 inch
   7. Stitches: 9 per inch

8. Finished Pile Thickness: 0.092 inches.
9. Yarn Pile Average Density: 6261 per CY.
10. Total Thickness: 0.230 inches
11. Yarn Tufted Weight: 16.0 oz/SY minimum
12. Color: as selected from full range of colors, multicolor
13. Pattern: quarter turn.

2.3 ACCESSORIES

A. Sub-Floor Filler: latex Type recommended by flooring material manufacturer.

B. Moldings, Transitions, and Edge Strips: Rubber, profiles as required, color as selected by Architect.

C. Stair Nosing: Rubber type, color as selected by Architect

D. Contact Adhesive: As recommended by carpet manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify floor surfaces are smooth and flat within tolerances specified and are ready to receive Work.

3.2 PREPARATION

A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

C. Clean substrate.

3.3 INSTALLATION – CARPET TILE

A. Install carpet tile according to CRI Carpet Installation Standard.

B. Do not mix carpet from different cartons unless from same dye lot.

C. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

D. Install carpet tile in square pattern, with pile direction alternating to next unit, set parallel to building lines.

E. Locate change of color or pattern between rooms under door centerline.

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.

END OF SECTION

SECTION 09 90 00 - PAINTING AND COATING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes surface preparation and field application of paints, stains, varnishes, and other coatings.

B. Paint/Stain all exposed surfaces that are not pre-finished items, finished metal surfaces, operating parts, labels, or materials obviously intended to be left exposed such as brick and tile.
   1. CMU
   2. Steel and iron
   3. Galvanized metal
   4. Gypsum board.
   5. Interior Wood Doors

C. Unless otherwise indicated do not paint concealed surfaces.
   1. Do not paint cabling, and protect communication cabling from overspray. Paint voids the warranty of cable and if painted shall be replaced at the painting contractor's expense.

D. Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats. Primer and finish coat shall be factory applied, finish coat shall be field applied.

E. Extra Materials: Deliver to Owner any leftover paint materials, properly labeled.

F. Minimum surface temperature of 50 degrees required for all coating systems.

G. Store all materials in tightly closed containers when not in use, away from heat, electrical equipment, sparks and open flames. Use approved bonding and grounding procedures. Keep out of the reach of children and residents.

H. Transfer materials to approved containers with complete and appropriate labeling.

1.2 SUBMITTALS

A. Product Data and Color Samples: Provide product data on each coating system component indicating VOC and environmental requirements. Coordinate coating systems for each material/substrate.

B. Provide draw down samples of each coating for final review and approval by Owner.

1.3 QUALITY ASSURANCE

A. Conform to all work place safety regulations for storage, mixing, application, and disposal of all paint related materials.

B. Surface Burning Characteristics:
   1. Fire Retardant Finishes: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.4 REFERENCES AND REGULATIONS:

A. Standards: Comply with applicable provisions and recommendations of the following, except when otherwise shown or specified:
   1. OSHA Safety Standards for the Construction Industry
   2. SSPC Volume 1, Good Painting Practice,
   3. SSPC Volume 2, Systems and Specifications, Surface Preparation Guide and Paint Application Specifications of the Steel Structures Painting Council.
   4. SSPC and NACE Painter Safety Guidelines, latest editions.

B. Requirements of Regulatory Agencies, conform with the following:

1. Clean Air Act (CAA)
2. Clean Water Act (CWA)
3. Toxic Substances Control Act (TSCA)

1.5 ENVIRONMENTAL REQUIREMENTS

A. Store and apply materials in environmental conditions required by manufacturer's instructions.

1.6 MOCKUP

A. Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections and demonstrate aesthetic effects and set quality standards for materials and execution.

PART 2 PRODUCTS

2.1 PAINTS AND COATINGS

A. Manufacturers:
   1. Sherwin Williams [basis of design]

B. Colors: As selected from a full range of manufacturer’s offerings, including premium colors.

C. Contractor shall provide for a minimum of the following for each residence:
   1. Interior Finishes: minimum of 4 colors – ceiling, walls, accent wall, and trim.

D. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.
   1. Lead: Measurable lead content in either the pigment or binder will not be permitted.
   2. The finish coats shall match colors selected.

E. Finish Quality:
   1. Finishes shall exhibit a high quality, commercial grade appearance of uniform thickness.
   2. Finishes shall be free of runs, sags, drips, waves, orange peel, festoons, dry spray, cloudiness, spotting, ropiness, brush marks, roller marks, fish eyes or other surface imperfections, voids, discontinuities, pinholes, holidays and overspray.
   3. Final coat shall be uniform in texture, color and gloss, and shall provide an acceptable match with the approved drawdown sample sheet.

2.2 INTERIOR COATINGS

A. Interior Block Filler: SW Pro Industrial Heavy Duty Block Filler B42W00150
   1. Commercial Strength Interior block filler with excellent filling properties
   2. VOC: <50 g/L, 0.42 lb/gal
   3. Volume Solids: 50% +/- 2%

B. Interior Epoxy: SW Water Based Catalyzed Epoxy B70W00211
   1. Two Component water based, catalyzed, acrylic epoxy resin coating for high performance use.
   2. VOC: 143 g/L, 1.19 lb/gal
   3. Volume Solids: 38% +/- 2%

C. Interior Latex Primer: SW ProMar 200 Zero VOC Wall Primer B28W02600
   1. Interior Latex Primer
   2. VOC: maximum 0g/L; 0.0 lb/gal
   3. Volume Solids: 26 +/- 2%

D. Interior Latex: SW ProMar 200 Zero VOC Semi-Gloss B31-2600 Series.
   1. Interior Latex Semi-Gloss Acrylic
   2. VOC: maximum 0g/L; 0.0 lb/gal

3. Volume Solids: 39 +/- 2%

E. Interior Acrylic Primer: SW Pro Industrial DTM Acrylic Primer B66W1
   1. Interior Acrylic Primer
   2. VOC: <150 g/L, 1.25 lb/gal
   3. Volume Solids: 46% +/- 2%

F. Interior Acrylic Finish: SW DTM Acrylic Finish B66W01151 Series
   1. Interior Acrylic Coating
   2. VOC: <50 g/L, 0.42 lb/gal
   3. Volume Solids: 40% +/- 2%

G. Interior Waterborne Acrylic Dry-Fall: SW Waterborne Acrylic Dryfall B42W00082 Series
   1. Interior Dry-Fall Paint
   2. VOC: <50 g/L; 0.42 lb/gal
   3. Volume Solids: 33% +/- 2%

H. Wood Conditioner: Sherwin Williams Min-Wax Pre-Stain Wood Conditioner
   1. VOC: 350 g/L
   2. Volume Solids: 10.24%

I. Wood Stain: Sherwin Williams Min-Wax Performance Series Tintable Wood Stain 250 VOC.
   1. VOC: 250 g/l; 2.08 lb/gal.
   2. Volume Solids: 76% - 37% +/- 2%

J. Sanding Sealer: Sherwin Williams Min-Wax Performance Series Fast-Dry Sanding Sealer
   1. VOC: 542 g/L
   2. Volume Solids: 39% +/- 2%

K. Satin Varnish: Sherwin Williams Min-Wax Fast-Drying Polyurethane 350 VOC.
   1. VOC: maximum 350 g/l
   2. Volume Solids: 53.0-57.0%

2.3 PRE-CLEANING AND SURFACE PREPARATION PRODUCTS

A. Pre-cleaning Agents
   1. SW No Rinse Prepaint Cleaner
   2. Krud Kutter
   3. Potable water

B. Pre-cleaning (Power Wash) Equipment
   1. Capacity to continuously deliver 3-5 gpm at 2,500 psig of 180-200 degree F hot water.
   2. Cleaning system shall affect the 32-ounce per gallon dilution.
   3. Manufacturer: Alkota, Model 565T with model 520 water heater or approved equal.
   4. Power wash with 15 degree tip capable of delivering hot water at 2500 psig.

C. Power Tool Surface Preparation Media:
   1. Scotch Brite No. 07451 by 3 M Corporation, Surface Conditioning disc.
      a. Texture: A Medium
      b. Maximum Speed: 18,000 RPM
   2. Clean ‘N" Strip Disco No CSD2 by 3 M Corporation
      a. Texture: Course
      b. Maximum Speed: 8,000 RPM

PART 3 EXECUTION

3.1 SURFACE PREPARATION

A. Comply with paint manufacturer's written instructions for surface preparation, environmental and substrate conditions, product mixing, and application.

B. Perform all surface preparation in accordance with SSPC specifications, guidelines and good painting practices.

C. Remove all loose and peeling paint by power tool cleaning, hand tool cleaning and power washing per ASTM-D4259.

D. Remove all dirt, grease, oil and other foreign material by 180-200 degree F hot water pressure cleaning with chemical injection of an emulsifying cleaner, Great Lakes No Rinse Cleaner at 32 oz. per gallon or equal.

E. Seal all stains from water, smoke, ink, pencil, grease, etc. with SW Prep-Rite Interior Latex Primer or equal.

F. Remove all rust and mill scale using 3M Clean and Strip non-woven plastic disks. SSPC-SP-3.

G. Fill all cracks, voids and crevices with caulk after priming the surface.

H. Do not paint until surface is thoroughly dry and in sound condition.

3.2 APPLICATION

A. Examination and Verification of Condition: Contractor shall verify the areas and conditions under which the work is to be performed and notify the Owner in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until satisfactory conditions have been corrected. Do not coat over chalk, dirt, scale, moisture, oil, surface contaminants, coatings that have exceeded the manufacturer's re-coat guidelines, or conditions otherwise detrimental to the formation of a durable high quality coating system.

B. Comply with manufacturer's instructions and SSPC Good Paint Practices Volumes 1 and 2.

C. Comply with OSHA regulations, State of Ohio and Federal laws, ordinances, and guidelines.

D. Follow manufacturer's requirements for temperature and humidity at time of application.

E. Refer to SDS sheets before using any product.

F. All surfaces must be thoroughly dry before coating applications.

G. Apply coatings using brush or roller only.

3.3 INTERIOR PAINT APPLICATION SCHEDULE

A. Gypsum Board Substrates:
   1. Gypsum board ceilings:
      a. Interior Latex Primer: SW ProMar 200 Zero VOC Primer at 1.3 MILS DFT per coat, one coat.
      b. Interior Latex: SW ProMar 200 Zero VOC FLAT Interior Latex at 1.7 MILS DFT per coat, two coats.
   2. Gypsum board walls and ceilings in bathrooms/wet areas:
      a. Interior Latex Primer: SW ProMar 200 Zero VOC Primer at 1.3 MILS DFT per coat, one coat.
      b. Interior Latex: SW ProMar 200 Zero VOC Semi-Gloss Interior Latex with M-1 mildew inhibitor at 1.6 MILS DFT, two coats.
   3. Gypsum board/wood walls in all other areas:
      a. Interior Latex Primer: SW ProMar 200 Zero VOC Primer at 1.3 MILS DFT per coat, one coat.
      b. Interior Latex: SW ProMar 200 Zero VOC Semi-Gloss Interior Latex at 1.6 MILS DFT, two coats.

B. CMU walls / substrates:

1. Block Filler: SW Pro Industrial Heavy Duty Block Filler: 8.0 – 10.5 MILS DFT, one coat. All new walls, where required at existing walls. [ensure prior adhesion of new finish coating system, provide primer / block filler as required]
2. Interior Epoxy: SW Water Based Catalyzed Epoxy at 2.5-3.0 MILS DFT per coat, two coats.

C. Exposed Steel Structure:
1. Interior Primer: SW DTM Acrylic Primer or Pro-Cryl Primer at 2.5-5.0 MILS DFT, one coat
2. Dry-Fall System: SW Waterborne Acrylic Dry-Fall at 2.0-3.0 MILS DFT, two coats.

D. Exposed Galvanized Steel [Roof Decking, exposed ductwork, etc]:
1. Interior Primer: Per manufacturer requirements
2. Dry-Fall System: SW Waterborne Acrylic Dry-Fall at 2.0-3.0 MILS DFT, two coats.

E. Steel Substrates [hollow metal doors, frames, miscellaneous metal surfaces, access panels]:
1. Interior Primer: SW DTM Acrylic Primer at 2.5-5.0 MILS DFT, one coat, where required for spot priming / bare metal conditions.
2. Interior Acrylic: SW Pro Industrial DTM Acrylic Semi-Gloss Interior Coating at 2.5-4.0 MILS DFT, two coats.

F. Steel Substrates [existing acoustic ceiling grid system]:
1. Interior Acrylic: SW Pro Industrial DTM Acrylic Semi-Gloss Interior Coating at 2.5-4.0 MILS DFT, two coats.

G. Stained Interior Finish Carpentry / Wood Doors
1. Wood Conditioner: SW Min-Wax Pre-Stain Wood Conditioner, One Coat
2. Wood Stain: SW Min-Wax Performance Series Tintable Wood Stain 250 VOC, One Coat [Custom Color match to Chappell Door – Heritage Brown stain finish]
3. Sealer: SW Min-Wax Performance Series Fast-Dry Sanding Sealer, one coat.
4. Satin Varnish: SW Min-Wax Fast-Dry Polyurethane, two coats.

3.4 CLEAN UP

A. Clean site and remove debris and empty cans daily. Remove all paint from adjacent surfaces. Clean spills and splatters immediately.

B. Clean hands and tools immediately after use with soap and water for water based products and with mineral spirits for oil based products.

C. Follow manufacturer’s safety recommendations when using mineral spirits.

3.5 ENVIRONMENTAL REQUIREMENTS

A. Store and apply materials in environmental conditions required by manufacturer's instructions.

END OF SECTION

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SECTION 10 11 00 - VISUAL DISPLAY UNITS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Magnetic Markerboards, Tackboards, Projector Screens, and Tack Strips.

1.2 SUBMITTALS

A. Shop Drawings: Indicate wall elevations, dimensions, joint locations, and special anchor details.

B. Product Data: Data on markerboards, tackboards, tackboard surface covering, and trim and accessories.

C. Samples: Two samples illustrating materials and finish, color and texture of markerboard, tackboard, and tackboard surfacing.

1.3 QUALITY ASSURANCE

A. Flame-resistant Fabric: Passes when tested according to NFPA 701, Test 1 or Test 2.

B. Porcelain Enamel Institute: PEI-1002, Manual and Performance Specifications for Porcelain Enamel Writing Surfaces.

1.4 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.5 WARRANTY

A. Furnish lifetime of the building manufacturer warranty for visual display boards.
   1. Include coverage of markerboard surface from discoloration due to cleaning, crazing, flaking, or cracking, and or staining.

B. Furnish 1 year manufacturer warranty for tackboards.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:
   1. Claridge Products [basis of design]
   2. Marsh Industries
   3. Best-Rite Manufacturing
   4. K-Pro / Educational Equipment Corp.
   5. Nelson Adams NACO
   6. AARCO
   7. Approved Equal

2.2 MARKERBOARDS

A. Magnetic, Porcelain-Enamel Markerboard Assembly: Balanced, high-pressure, factory laminated markerboard assembly of 3-ply construction consisting of backing sheet, core material, and enamel face sheet. Claridge LCS Deluxe, Type 4, Whiteboard #100 white
   1. Face Sheet: 3-coat porcelain-enamel face sheet with high gloss finish.
   2. Core: 7/16” MDF
   3. Backing Sheet: Steel
   4. Frame edges using mitered extruded aluminum J-shaped channels trim with satin anodized finish.
   5. Panel Sizes as indicated on drawings / schedule.

B. Melamine and high-pressure laminate markerboard assemblies are not acceptable.

2.3 MARKERBOARDS FOR PROJECTION

A. Magnetic, Porcelain-Enamel Markerboard Assembly: Balanced, high-pressure, factory laminated markerboard assembly of 3-ply construction consisting of backing sheet, core material, and enamel face sheet. Claridge Aspire Series, Type 4, Whiteboard #100 white. [MB-6 on drawings]
   1. Face Sheet: 3-coat porcelain-enamel face sheet with high gloss finish.
   2. Core: 7/16" MDF
   3. Backing Sheet: Steel
   4. Frame edges using mitered extruded aluminum J-shaped channels trim with satin anodized finish. Frame may not be thicker than 3 mm in front of the face of the board.
   5. Mounted on Z-bar hangers – 3 or 4 rows as recommended by manufacturer.
   6. Panel Sizes as indicated on drawings / schedule.
   7. Board must be able to maintain flatness required for projection. 5 mm max. deviation from flatness per manufacturer.
   8. No marker tray at these boards.

2.4 TACKBOARDS

A. Vinyl-Fabric Faced Tack Assembly: Vinyl fabric factory-laminated to cork underlay on +/- 1/4 inch thick hardboard backing system; 15 oz/linear yard total weight, Class A with flame spread 25 or less, smoke developed index of 50 or less. Frame edges using mitered extruded aluminum J-shaped channels with satin anodized finish.
   1. Color and Pattern: Claridge Fabricork, Viewpoint Pattern, KE592 Gentleman Gray

2.5 COMPONENTS

A. Aluminum Frames and Trim: Fabricated from not less than 0.062 inch thick extruded aluminum of size and shape indicated/required. Clear anodized finish.
   1. Factory Applied Trim: Manufacturer's standard; where boards exceed maximum manufactured lengths, provide snap-on trims with no visible screws or exposed joints for field fabrication.
   2. Limit projection of frame from board surface to 3/8 inch or less.

B. Marker Tray: Manufacturer's standard, continuous
   1. Box Type: Extruded aluminum with slanted front, grooved tray, and cast-aluminum end closures. Full length of markerboard.

C. Magnetic Marker Tray: Manufacturer's standard, magnetic chalktray with ribbed section and smoothly curved ends.
   1. Length: 12 inches
   2. Provide one per elevation.

D. Display / Map Rail: None

2.6 TACK STRIP

A. Tack Strip:
   1. MATERIALS PROVIDED BY OWNER, INSTALLED BY CONTRACTOR
   2. Owner supplied via "School Fix It Catalog / Decker Equipment" 2" aluminum tack strip rail x 92 inches long, part #MR88D Blue, Plastic End caps, Part #GRY61ES2, Vinyl Blend cork, 24 foot roll, blue, Part #CCR224. Mounted with screws underneath the cork.
   3. Provide an allowance of an additional [20] 92 inch long tack strips with the appropriate end caps to be installed in locations as directed by Owner in addition to the areas indicated on the drawings
      a. All locations to be field verified.

2.7 ELECTRIC PROJECTION SCREEN

A. Elite Screens, Evanesce Series 120 inch electric projection screen, widescreen
   1. Recessed, in-ceiling aluminum housing
   2. Matte white project surface with AcousticPro UHD screen surface.
   3. Black masking borders
   4. 132 inch in 16:10 format
   5. 180 degree viewing angle
   6. 4K UHD ready

2.8 ACCESSORIES

A. Adhesives: Type used by manufacturer.

2.9 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Visual Display Boards: Factory-assemble visual display boards, unless otherwise indicated.
   1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.

C. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.
   1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.
   2. Provide manufacturer's standard vertical-joint hidden spline system between abutting sections of markerboards.
      a. H-trim is not acceptable.
   3. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards of combination units.
   4. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

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

2.10 ALUMINUM FINISHES

A. Comply with NAAMM Metal Finishes Manual for Architecural and Metal Products for recommendations for applying and designating finishes.

B. Class II, Clean Anodized Finish: AA-M12C22A31, etched, medium matte, anodized coating. Class II, clear coating, comply with AAMA 611.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrates and conditions for compliance with manufacturer requirements for installation, surface conditions.

B. Prepare substrates as required to receive visual display wall covering as required by manufacturer’s written instructions to achieve a smooth, dry, clean, structurally sound, uniform surface.

3.2 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trims, and accessories necessary for a complete installation. Install per manufacturer's requirements with the proper clips, spacing of clips, etc.
   1. Mount Magnetic Marker Boards intended for projection on Z-bar hangers per manufacturer to maintain flatness required.
   2. Frames of visual display surfaces shall be installed tight to the wall without gaps.

B. Follow all required manufacturer's installation requirements.

3.3 CLEANING

A. Attach one cleaning label to visual display surface in each room.

B. Cover marker board surfaces with protective cover, taped to frame, and remove at Substantial Completion.

END OF SECTION

SECTION 10 14 00 - SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Interior signs.

PART 2 PRODUCTS

2.1 INTERIOR SIGNS

A. Interior Signage – provided and installed by Owner. Contractor to coordinate as applicable.

B. Contractor to provide temporary signage as needed to obtain final inspections for building permits.

END OF SECTION

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SECTION 12 20 00 – WINDOW SHADES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Motor-Operated Fabric Interior Roller Window Shades with single rollers.

1.2 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product specified, including:
   1. Preparation instructions and recommendations.
   2. Installation and maintenance instructions.
   3. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
   4. Storage and handling requirements and recommendations.
   5. Mounting details and installation methods.
   6. Typical wiring diagrams including integration of motor controllers with building management system, audiovisual and lighting control systems as applicable.

B. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.

C. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings, field verified window dimensions, quantities, type of shade, controls, fabric, and color, and include opening sizes and key to typical mounting details.

D. Selection Samples: For each finish product specified, one complete set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shade fabric sample and aluminum finish sample as selected, representing actual product, color, and patterns. Mark face of material to indicate interior faces.

F. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

G. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

H. Standard manufacturer’s defect warranty: Standard manufacturer’s warranty documents indicating compliance with requirements of Section 1.9 below.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of ten years experience in manufacturing products comparable to those specified in this section.

B. NFPA Flame-Test: Passes NFPA 701. Materials tested shall be identical to products proposed for use. Show complete manufacturer data (name,location,contact) and certification from manufacturer that the fabrics sourced for this project comply with the test data provided.

C. Shading system shall be UL listed. Provide documentation and proper labeling.

D. Mock-Up: Provide a mock-up of one of each type roller shade assembly specified for evaluation of mounting, appearance and accessories.
   1. Locate mock-up in window(s) designated by Architect.
   2. Do not proceed with remaining work until mock-up is accepted by Architect.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with labels intact.

B. Label containers and shades according to Window Shade Schedule.

C. Store products in manufacturer's unopened packaging until ready for installation.

1.5 SEQUENCING

A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.6 PROJECT CONDITIONS

A. Install roller shades after finish work and ambient temperature, humidity and ventilation conditions are maintained at levels recommended for project upon completion.

1.7 WARRANTY

A. Hardware and Shade Fabric: Manufacturer’s standard twenty-five year limited warranty.

B. Motors and Controls: Manufacturer’s standard five year limited warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements herein:
   1. Draper, Inc. [basis of design]
   2. MechoShade Systems
   3. Hunter Douglas Contract
   4. Approved Equal

2.2 MOTORIZED WINDOW SHADES

A. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated on drawings, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
   1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Electric Motor: Manufacturer's standard, tubular, enclosed in roller.
      a. Electrical Characteristics: Single phase, 110 V, 60 Hz, unless otherwise noted.
   3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades.
      a. Keyed Control Station: Keyed, momentary-contact, three-position switch-operated control station with open, close, and off functions. Provide two keys per station.
      b. Color: As selected from manufacturer's full range of colors including premium finishes.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
   1. Roller Drive-End Location: Right side of inside face of shade.
   2. Direction of Shadeband Roll: Regular, from back of roller, unless otherwise noted.

3. Shadeband-to-Roller Attachment: Removable spline fitting integral channel in tube.
4. Fabric Length: 6 inches greater than opening height minimum.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Roller-Coupling Assemblies: Coordinate with operating mechanism and designed to join up to three incline rollers that are operated by one roller drive-end assembly.

E. Shadebands:
1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
a. Type: Manufacturer's standard.
b. Color and Finish: As selected from manufacturer's full range of colors, including premium finishes.

F. Installation Accessories:
1. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
a. Height: Manufacturer's standard in height required to enclose roller and shadeband when shade is fully open, but not less than 4 inches.
2. Endcap Covers: To cover exposed endcaps.

2.3 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.01, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg. F.
1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or –floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:3, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion or sag of material.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate requirements for blocking and structural supports to ensure adequate means for installation of window shades.

B. Coordinate requirements for power supply conduct, and wiring required for window shade motors and controls.

3.3 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Install the following items to conceal roller and operating mechanism. Do not use exposed fasteners.
   1. End caps.

C. Electrical Connections: Connect motorized operators to building electrical system.

3.4 ADJUSTING/TESTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

B. Test window shades to verify that operating mechanism, fabric retainer, and other operating components are functional. Correct deficiencies.

C. Test motorized window shades to verify that controls limit switches, interface to other building systems, and other operating components are functional. Correct deficiencies.

3.5 CLEANING AND PROTECTION

A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION

SECTION 12 31 00 - MANUFACTURED CASEWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Lockers – Manufactured lockers and accessories – provided and installed by Owner

1.2 SUBMITTALS

A. Shop Drawings will be provided from the Owner's Vendor to the Contractor.

1.3 COORDINATION

A. Contractor will be required to coordinate all aspects of the items provided by Owner.

PART 2 PRODUCTS – NOT APPLICABLE

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of support framing and anchors.

3.2 INSTALLATION

A. Contractor to provide all required utility rough ins and all utility connections. Coordination with Owner's Vendor is required.

END OF SECTION

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SECTION 12 35 53 – LABORATORY CASEWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Science Lab Casework - Manufactured steel cabinets; casework; laboratory countertops; laboratory sinks, ledges, supporting structures, casework hardware, and miscellaneous components and equipment as indicated.
   2. Furnish and deliver all utility service outlet accessory fittings [water, laboratory gas, etc], electrical receptacles and switches as listed in these specifications, equipment schedules, and drawings, as mounted on the laboratory furniture. All plumbing and electrical fittings, not preinstalled in equipment, shall be packaged separately and properly marked for delivery to the appropriate contractor.
   3. Furnish and deliver, for installation by the mechanical contractor, all laboratory sinks, cup sinks or drains, drain troughs, overflows and sink outlets with integral tailpieces, which occur above the floor, and where these items are part of the equipment or listed in the specifications, equipment schedules, and drawings. All tailpieces shall be furnished less the couplings required to connect them to the drain piping system.
   4. Furnish service strip supports where specified, and set in place, service tunnels, service turrets, supporting structures and reagent racks of the type shown on the drawings.

1.2 QUALITY ASSURANCE

A. General Performance: Provide certification that furniture shall meet the performance requirements described in SEFA 8.

B. Finish Performance: Provide independent test lab certification that furniture shall meet the performance requirements described in these specifications.

1.3 SUBMITTALS

A. Manufacturer's Data:
   1. Submit manufacturer's data and installation instructions for each type of casework.
   2. Certification: Letter from particle board manufacturers certifying materials contain less than 1 percent asbestos by content.

B. Samples: Provide samples of the casework and countertops, including available finishes.

C. Shop Drawings: Submit shop drawings for laboratory casework assemblies showing plans, elevations, ends, cross-sections, service run spaces, location and type of service fittings.
   1. Indicate types and sizes of cabinets.
   2. Indicate locations of hardware and keying of locks.
   3. Indicate locations and types of service fittings.
   4. Indicate locations of blocking and reinforcements required for installing laboratory casework.
   5. Include details of utility spaces showing supports for conduits and piping.
   6. Include details of support framing system.
   7. Include details of exposed conduits, if required, for service fittings.
   8. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
   9. Include coordinated dimensions for laboratory equipment specified in other Sections. Coordinate shop drawings with other work involved.

D. Provide rough-in drawings for mechanical and electrical services when required

1.4 COORDINATION

A. Coordinate installation of laboratory casework with installation of fume hoods and other laboratory equipment.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, utility rough-in and wet work are complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with manufactured casework by field measurements before fabrication.
   1. Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating laboratory casework without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 WARRANTY

A. Provide a 5 year manufacturer warranty for all casework, countertops, and equipment.

PART 2 PRODUCTS

2.1 SCIENCE LAB CASEWORK

A. Manufacturer:
   1. Kewaunee Scientific Corporation, Research Collection Steel Laboratory Furniture [basis of design]
   2. Approved Equal.

B. It is the intent of this specification to have a single source responsibility for all casework components, countertops, equipment, and accessories.

2.2 CABINET MATERIAL

A. Steel: Cabinet bodies, drawer bodies, shelves, drawer heads and door assemblies shall be fabricated from cold rolled steel.

2.3 DRAWER AND DOOR STYLE:

A. Overlay – Square Edge Drawer and door, when closed, shall rest against face of cabinet shell, creating a 3/4 inch overlay front with 1/8 inch reveal. The outer drawer and door head shall have a channel formation on all four sides to eliminate sharp raw edges of steel. The top front corners of the door shall be welded and ground smooth.

2.4 MATERIALS

A. General Requirements: It is the intent of this specification to provide a high quality steel cabinet specifically designed for the laboratory environment.

B. Steel:

1. Cold Rolled Steel: Cold rolled sheet steel shall be prime grade 12, 14, 16, 18 and 20 gauge U.S. Standard; roller leveled, and shall be treated at the mill to be free of scale, ragged edges, deep scratches or other injurious effects.

C. Composition Core Plywood Composition core plywood shall be 3-ply and shall be compliant with ANSI A208.1-199, and/or ANSI A208.2-1994

D. Hardware and Trim:
   1. Drawer and Door Pulls:
      a. Drawer and door pulls shall be mounted on 4" centers, offering a comfortable hand grip, and be securely fastened to doors and drawers.
         1) 3/8 inch diameter, stainless steel with brushed satin finish [Pull Style 4]
   2. Sliding Door Pulls: Sliding door pulls shall be Aluminum-Recessed – Pull Style 9. Finger holes or slots machined into doors will not be acceptable.
   3. Hinges:
      a. Overlay Hinges: Overlay style cabinets shall use:
         1) Overlay 5-Knuckle Hinges: 5-Knuckle hinges made of Type 304 stainless steel .089 thick, 2-1/2" high, with brushed satin finish, and shall be the institutional type with a five-knuckle bullet-type barrel. Hinges shall be attached to both door and case with two screws through each leaf. Welding of hinges to door or case will not be accepted. Doors under 36" in height shall be hung on one pair of hinges, and doors over 36" in height shall be hung on three hinges.
   4. Drawer Slide:
      a. Heavy duty, full extension, soft-close, self-closing, zinc plated, ball bearing slides, rated for 100 pound loads
   5. Locks:
      a. Pin Tumbler: Locks when shown or called for shall be a pin tumbler with heavy duty interchangeable cylinder. Exposed lock noses shall be dull nickel (satin) plated and stamped with identifying numbers. Locks shall have capacity of at least 2000 primary key changes, and the capacity to be Master Keyed, Grand-master Keyed, Sub-master Keyed, and Mason Keyed.
   6. Catches – For steel casework with 5-knuckle hinges:
      a. Positive Catch: A two-piece heavy-duty cam action positive catch Main body of the catch shall be confined within an integral cabinet top or divider rail, while latching post shall be mounted on the hinge side of door. Polyethylene roller type catches are not acceptable.
   7. Elbow Catches: Elbow catches and strike plates shall be used on left hand doors of double door cases where locks are used, and are to be burnished cast aluminum, with bright brass finish.
   8. Shelf Adjustment Clips: Shelf adjustment clips shall be die formed, nickel-plated steel.
   9. Leg Shoes: Leg shoes shall be a pliable, black vinyl material and shall be provided on all table legs, unless otherwise specified, to conceal leveling device. Use of a leg shoe, which does not conceal leveling device, will not be acceptable.
   10. Base Molding: rubber base will be provided by others.
   11. Label Holders: Label holders, where shown or called for, shall be self adhesive type aluminum with satin finish and designed for 2-1/2" x 1-1/8" cards, unless otherwise specified.
   12. Number Plates: Number plates, where shown or called for, shall be self-adhesive type aluminum with indented black lettering.
   13. Sink Supports: Sink supports shall be the hanger type, suspended from end panels of sink cabinet by four 1/4" dia. rods, threaded at bottom end and offset at top to hang from two full-depth reinforcements, welded to the top of end panels. Two 3/4" x 1-1/2" x 12 gauge channels shall be hung on the threaded rods to provide an adjustable sink cradle for supporting sinks.
   14. Support Struts

a. Support struts shall consist of two 16 gauge channel uprights fastened top and bottom by two adjustable 12 gauge "U" shaped spreaders, each, 1-1/2" x length required, formed from galvanized steel. Struts shall be furnished to support drain troughs, and to support worktop at plumbing space under fume hood superstructures or other heavy loads. Support struts can be furnished with hangers at extra cost when specified, to support mechanical service piping and drain lines.

2.5 CABINET CONSTRUCTION

A. Steel Cabinet Construction:
   1. General:
      a. The steel furniture shall be of modern design and shall be constructed in accordance with the best practices of the Scientific Laboratory Equipment Industry.
      b. All cabinet bodies shall be flush front construction with intersection of vertical and horizontal case members, such as end panels, top rails, bottoms and vertical posts in same plane without overlap. Exterior corners shall be spot welded with heavy back up reinforcements.
      c. Each cabinet shall be complete so that units can be relocated at any subsequent time without requiring field application of finished ends or other such parts.
      d. All cabinets shall have a cleanable smooth interior. Bottoms shall be formed down on sides and back to create easily cleanable corners with no burrs or sharp edges.
      e. Cabinets shall be designed using a standardized grid pattern to allow reconfiguration of doors and drawers.
   2. Steel Gauges: Gauges of steel used in construction of cases shall be 18 gauge, except as follows:
      a. Leveling bolt reinforcements 12 gauge.
      b. Top and intermediate front horizontal rails, apron rails, hinge reinforcements, and reinforcement gussets, 16 gauge.
      c. Drawer assemblies, door assemblies, bottom, bottom back rail, toe space rail, and adjustable shelves, 20 gauge.

B. Base Cabinets:
   1. End uprights shall be formed into not less than an L formation at top, bottom, back and a 3/4" wide front C formation. A pilaster shall be added to the inside front of the upright for cabinet and hinge reinforcement and shall be perforated for the support of drawer channels, intermediate rails, hinge screws, and shelf adjustment holes.
   2. A 7/8" high top horizontal rail shall interlock with the flange at top of end panels for strength, but shall be flush at face of unit. Top rails not flush with face of end uprights are not acceptable.
   3. Intermediate rails shall be provided between doors and drawers but shall not be provided between drawers unless made necessary by locks in drawers. Intermediate rails shall be recessed behind doors and drawer fronts and designed so that security panels may be added as required.
   4. Intermediate vertical uprights shall be furnished to enclose cupboards when used in a unit in combination with a half width bank of drawers.
   5. Cabinet bottom shall be formed of one piece of steel, except in corner units, and shall be formed down on sides and back to create a square edge transition welded to cabinet end panels. Front edge shall include a C formation to form a 7/8 inch high bottom front rail and shall be flush with face of end uprights. Cabinet bottom front rails not flush with face of end uprights are not acceptable.
   6. Toe space rail shall extend up and forward to engage bottom panel to form a smooth surfaced fully enclosed toe space, 3 inch deep x 4 inch high.
   7. Back construction shall be one piece with integral channel formed for maximum strength and welded to back of top and bottom flanges of end uprights.

8. Each bottom corner of base cabinets shall have a 3/8"-16 leveling bolt, 2-1/2" long capable of supporting 500 lbs. Access to the leveling bolts shall be through plug buttons in the cabinet bottom. Access to leveling bolts through toe space or leveling bolts requiring special tools to adjust are not acceptable.
9. Adjustable shelves shall be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear and formed down 3/4" at each end. Shelves over 42" long shall be further reinforced with a channel formation welded to underside of shelf. Shelves shall be adjustable on not more than 1" increments.
10. Steel Door assembly (two-piece) for solid panel swinging doors shall consist of an inner and outer door pan. Outer door pan shall be formed at all four sides. The corners on the pull side of the outer door pan shall be welded and ground smooth to prevent exposure of sharp edges of steel at these critical points. Inner door pan shall be flanged at all four sides with hinge reinforcements welded in place. The door assembly shall be 3/4" thick and contains sound deadening material. Door assemblies shall be painted prior to assembly and shall be punched for attaching pulls. Inner pan formation of door shall be indented for in-field installation of locks when required.
11. Doors shall be readily removable and hinges easily replaceable. Hinges shall be applied to the cabinet and door with screws. Welding of hinges to either cabinet or door will not be acceptable.
12. Drawer Assemblies: (Choose One)
    a. Drawer bodies shall be made in one-piece construction including the bottom, two sides, back and front. They shall be fully coved at interior bottom on all four sides for easy cleaning. The top front of the inner drawer body shall be offset to interlock with the channel formation in drawer head providing a 3/4" thick drawer head.
13. Knee space panels, where shown or specified, shall be 20 gauge, finished same as casework cabinets, and easily removable for access to mechanical service areas.

C. Special Purpose Storage Cabinets:
    1. Acid Storage Fume Hood Cabinets: Acid storage fume hood cabinets shall utilize the same gauges of steel and construction features as other base cabinets except they shall be completely lined with a one piece polyethylene corrosion resistant liner. The liner shall be 1/4" thick, molded into a seamless tub, including top, sides and bottom, with a 1" lip at the bottom front to contain spills. Tubs shall include integral cleats at both ends and back to support an optional shelf. Each door shall have a set of louvers at the top and bottom, and have a 1/8" sheet polyethylene liner. Where specified, each cabinet shall be vented into the fume hood with a 1-1/2" vent pipe allowing a positive airflow directly into the fume hood exhaust system. When specified or shown on drawings, cabinet shall include a full-depth phenolic resin.
    2. Solvent Storage Cabinets: Solvent storage cabinets shall be specifically designed for the storage of flammable and combustible liquids. Construction shall be based upon the requirements listed by UFC, OSHA and NFPA No. 30 - 1993, and cabinets shall be FM approved and labeled. The bottoms, top, sides and doors shall be fabricated of 18 gauge steel and shall be all double panel construction with a 1-1/2" air space between panels. All joints shall be welded, or screwed, to provide a rigid enclosure. The doors shall swing on full-length stainless steel piano hinges and shall be fully insulated. The doors are self-closing and synchronized so that both doors will always fully close. The right hand door is equipped with a three-point latching system that automatically engages when the doors close. Each door is equipped with a fusible-link hold-open feature that will ensure the door closes should the temperature outside the cabinet exceed 165 degrees Fahrenheit. Units 24" long have only one door, self-closing, and equipped with a three-point latching system and hold-open feature. A 2" deep liquid tight pan that covers the entire bottom of the cabinet shall be furnished to contain liquid leaks and spills. A second pan shall be provided to serve as a full-depth adjustable shelf. Two, 2” diameter, diametrically opposed vents with spark screens shall be provided in the back of the cabinet as well as a grounding screw. The cabinet shall

have interior finish same as exterior. The cabinet shall be labeled: "FLAMMABLE - KEEP FIRE AWAY".

D. Upper Cabinet Construction:
   1. Upper cabinets shall have a completely finished interior same as exterior and shall be designed so that no mounting hardware is visible when installed.
   2. End uprights shall be formed at front, bottom and back to provide maximum strength and rigidity. Front edge of end upright shall be 3/4" wide. A pilaster shall be added to the inside front of the upright for cabinet and hinge reinforcement and shall be perforated for hinge screws and shelf adjustment holes.
   3. Cabinet tops shall be formed with a 7/8" high C formation at the front edge and turned down at the back to engage a wall hanging rail.
   4. Cabinet flush bottoms shall be formed with a 7/8" high C formation at the front edge.
   5. Cabinet false bottoms shall be formed down on all four edges and shall be removable.
   6. Cabinet backs shall be welded to the top, bottom and ends. Backs shall be perforated for shelf adjustment holes. Holes shall be enclosed by end uprights.
   7. Adjustable shelves shall be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear, formed down 3/4" at each end. Shelves over 42" long shall be further reinforced with a channel formation welded to underside of shelf. Shelves shall be adjustable on not more than 1" increments.
   8. Glazed doors shall be 3/4" thick and consist of an inner and outer door pan welded together to form a single unit. Outer door pan shall be 18 gauge steel, formed into a channel or flanged shape at all four sides. It shall be pierced and formed to create a 3" wide frame with a beveled edge around the glass opening in the center of the door. Inner door pan shall be 18 gauge steel, flanged at all four sides, and pierced for a glass opening in center of the door. Glass shall be held in place by a rubber or vinyl gasket around the entire edge of the glass. Doors shall be glazed with: (Choose one)
      a. 1/8" tempered glass
   9. Solid panel doors shall consist of an inner and outer door pan. Outer door pan shall be formed into a channel or flanged shape at all four sides. The corners on the pull side of the outer door pan shall be welded and ground smooth to prevent exposure of sharp edges of steel at these critical points. Inner door pan shall be flanged at all four sides with hinge reinforcements welded in place. The door assembly shall be 3/4" thick and contains sound deadening material.
   10. Sliding doors shall be suspended from the top in a roll formed steel track fastened to the cabinet top and shall glide on nylon rollers. Track shall be so designed to prevent accidental removal of doors.
   11. Swinging doors under 36" high shall be hung on one pair of hinges, doors over 36" high shall be hung on three hinges.
   12. Plate glass doors shall operate on an extruded aluminum track at the bottom of the cabinet, and in an extruded aluminum channel at the top. The bottom of each glass door shall be furnished with a continuous aluminum shoe the full length of the door, which shall be equipped with two nylon rollers that operate on the extruded aluminum track. The aluminum shoes on the bottom of the plate glass doors shall be equipped with pulls for operation of the doors, and also to prevent bypassing of the doors. Plate glass doors shall close against rubber bumpers. Plate glass doors shall be: 1/4 inch tempered glass

E. Steel Full Height Cabinet Construction:
   1. Full height storage cabinets shall have a completely finished interior same as exterior.
   2. End uprights shall be formed at front, bottom and back to provide maximum strength and rigidity. Front fascia of upright shall be 1-1/4" wide with inside edge formed in a channel 1/2" x 3/8". A full height box reinforcement shall be fitted to the channel, formed to provide a recessed strike for door and to reinforce the cabinet. The backside of the reinforcement shall be perforated with shelf adjustment holes spaced at not more than 1" centers. Back of

upright shall be formed in a 2-1/2" formation. 16 gauge hinge reinforcement shall be welded to inner side of front uprights.

3. Cabinet tops shall be formed into a channel shape at front with flange at rear and sides for electro-welding cabinet top to cabinet back and ends. Front fascia channel shall be strengthened with electro-weld reinforcements.
4. Cabinet bottoms for storage cabinets shall be formed down on sides and back to create a square edge transition welded to cabinet end panels, and front edge shall be offset to create a seamless door recess rabbet for dust stop. Cabinet bottoms shall be formed to provide a flush 1" face rail with a return flange to give a 9/16" deep x 5" high toe space. All cabinets shall have a cleanable smooth interior.
5. Toe space rails shall interlock in back of bottom rail and with end panel to provide a welding plate, and shall extend to the floor with a flange turned back and up for support.
6. Cabinet backs shall be welded to the top, bottom and ends. Backs shall be perforated for shelf adjustment holes on not more than 1" centers. Holes shall be enclosed by a formation in cabinet back and enclosed by end uprights.
7. Adjustable shelves shall be formed down 3/4", returned back 7/8" and up 1/4" into a channel formation front and rear; formed down 3/4" at each end. Shelves over 42" long shall be further reinforced with a channel formation electro-welded to underside of shelf. Shelves shall be adjustable on not more than 1" increments.
   a. Adjustable shelves shall include a lip that extends 1/2 inch above the front edge.
8. Glazed doors shall be 3/4” thick and consist of an inner and outer door pan welded together to form a single unit. Outer door pan shall be 18 gauge steel, formed into a channel or flanged shape at all four sides. It shall be pierced and formed to create a 3” wide frame with a beveled edge around the glass opening in the center of the door. Inner door pan shall be 18 gauge steel, flanged at all four sides, and pierced for a glass opening in center of the door. Door glazing shall be held in place by a rubber or vinyl gasket around the entire edge of the glass. Doors shall be glazed with: 1/8" tempered glass
9. Solid panel doors shall consist of inner and outer pan formations mechanically assembled after painting. All full height solid panel doors shall be further reinforced by a full-height channel formation welded to inner pan. Doors shall be 3/4" thick and contain sound deadening material.
10. Sliding doors shall be suspended from the top in a roll formed steel track welded to cabinet top and shall glide on nylon rollers. Track shall be so designed to prevent accidental removal of doors.
11. Swinging doors under 36" high shall be hung on one pair of hinges, doors over 36" high shall be hung on three hinges.

F. Filler and Closure Panels: Provide where indicated and as needed to close spaces between cabinets and walls, ceilings, and associated equipment. Fabricate from the same gauge metal as cabinets / cabinet fronts. Match adjacent finishes unless otherwise indicated.
   1. Provide utility-space closure panels at spaces between base cabinets where utility space would otherwise be exposed, including spaces below countertops.
   2. Provide closure panels at ends of utility spaces where utility space would otherwise be exposed.
   3. Provide knee-space panels (modesty panels) at spaces between base cabinets, where indicated. Fabricate from same material and with same finish as exposed cabinet backs.

G. Apron and Leg Assembly Construction:
   1. In general, freestanding tables and/or apron and leg assemblies consist of welded leg assemblies connected to aprons by mechanical fasteners.
   2. Table apron rails shall be formed of 16-gauge steel. The rails shall be 4" high, formed top and bottom into a channel formation. Where drawers occur, the apron rails shall provide the required opening.

3. Table legs shall be 2" square welded tubing. Securely welded to bottom end shall be a 14-gauge die formed gusset with four flanges. A threaded clinch nut shall accommodate a 3/8" 16 x 2-1/2" long leveling bolt. Leg shoes shall be provided on all table legs, unless otherwise specified, to conceal leveling bolts. Use of leg shoe which does not conceal leveling device will not be acceptable.
4. Stretchers shall be constructed of 18-gauge steel and furnished where indicated on drawings. They shall be formed into a 2-7/64" x 1-1/2" channel formation, and secured to table legs by a die-formed clip of 16-gauge steel. Clips shall be welded at ends of channel.

2.6 PERFORMANCE REQUIREMENTS

A. Steel Casework Construction Performance:
   1. Base cabinets shall be constructed to support at least a uniformly distributed load 200 pounds per square foot of cabinet top area, including working surface without objectionable distortion of interference with door and drawer operation.
   2. Base cabinet leveling bolts shall support 500 pounds per corner, at 1-1/2" projection of the leveling bolt below the cabinet bottom.
   3. Each adjustable and fixed shelf 4 feet or shorter in length shall support an evenly distributed load of 40 pounds per square foot up to a maximum of 200 pounds, with nominal temporary deflection, but without permanent set.
   4. Full extension soft-close, self-closing ball bearing zinc plated drawer slide shall be rated for 100 pound loads.
   5. Swinging doors on floor-mounted inset style casework shall support 200 pounds suspended at a point 12" from hinged side, with door swung through an arc of 160 degrees. Weight load test shall allow only a temporary deflection, without permanent distortion or twist. Door shall operate freely after test and assume a flat plane in a closed position.

B. Steel Paint System Finish and Performance Specification:
   1. Steel Paint System Finish:
      a. After Cold Rolled Steel and Textured Steel component parts have been completely welded together and before finishing, they shall be given a pre-paint treatment to provide excellent adhesion of the finish system to the steel and to aid in the prevention of corrosion. Physical and chemical cleaning of the steel shall be accomplished by washing with an alkaline cleaner, followed by a spray treatment with a complex metallic phosphate solution to provide a uniform fine grained crystalline phosphate surface that shall provide both an excellent bond for the finish and enhance the protection provided by the finish against humidity and corrosive chemicals.
      b. After the phosphate treatment, the steel shall be dried and all steel surfaces shall be coated with a chemical and corrosion-resistant, environmentally friendly, electrostatically applied powder coat finish. All components shall be individually painted, ensuring that no area be vulnerable to corrosion due to lack of paint coverage. The coating shall then be cured by baking at elevated temperatures to provide maximum properties of corrosion and wear resistance.

2.7 WORKSURFACES / COUNTERTOPS

A. Epoxy: Factory-molded, modified epoxy-resin formulation with smooth, nonspecular finish.
   1. Manufacturers:
      a. KemResin – Epoxy Resin Tops [basis of design]
   2. Physical Properties:
      a. Flexural Strength: Not less than 10,000 psi.
      b. Modulus of Elasticity: Not less than 2,000,000 psi.
      c. Hardness (Rockwell M): Not less than 100.
      d. Water Absorption (24 Hours): Not more than 0.02 percent.
      e. Heat Distortion Point: Not less than 260 deg F.

3. Chemical Resistance: Epoxy-resin material shall have the following ratings when tested with indicated reagents according to NEMA LD 3, Test Procedure 3.4.5:
    a. No Effect: Acetic acid (98 percent), acetone, ammonium hydroxide (28 percent), benzene, carbon tetrachloride, dimethyl formamide, ethyl acetate, ethyl alcohol, ethyl ether, methyl alcohol, nitric acid (70 percent), phenol, sulfuric acid (60 percent), and toluene.
    b. Slight Effect: Chromic acid (60 percent) and sodium hydroxide (50 percent).

2.8 COUNTERTOPS AND SINKS

A. Countertops, General: Provide units with smooth surfaces in uniform plane free of defects. Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1 inch, with continuous drip groove on underside 1/2 inch from edge.

B. Sinks, General: Provide sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume.

C. Outlets: Provide with strainers and tailpieces, NPS 1-1/2 (DN 40), unless otherwise indicated.

D. Overflows: For each sink except cup sinks, provide overflow of standard beehive or open-top design with separate strainer. Height 2 inches less than sink depth. Provide in same material as strainer.

E. Epoxy Countertops and Sinks**:**
    1. Countertop Fabrication: Fabricate with factory cutouts for sinks, holes for service fittings and accessories, and with butt joints assembled with epoxy adhesive and concealed metal splines.
        a. Countertop Configuration: Raised (marine) edge, 1-inch minimum thickness, with integral or applied raised edge having beveled or rounded edge and corners, and with integral coved or applied backsplash.
    2. Sink Fabrication: Molded in 1 piece with smooth surfaces, coved corners, and bottom sloped to outlet; 1/2-inch minimum thickness.
        a. Provide with polypropylene strainers and tailpieces.
        b. Provide sinks for drop-in installation with 1/4-inch thick lip around perimeter of sink.
        c. Provide integral sinks in epoxy countertops, bonded to countertops with invisible joint line.
        d. Provide manufacturer's recommended adjustable support system for table- and cabinet-type installations.

F. Cup Sinks: Epoxy.
    1. Provide with stainless-steel strainers and integral tailpieces.

G. Drain Troughs: Epoxy
    1. Sloped at minimum of 1/8 inch per foot, coved radius corners
    2. No longitudinal joints permitted.

2.9 LABORATORY ACCESSORIES

A. Burette Rods: Aluminum or stainless-steel rods, 1/2 inch in diameter and 18 inches long, threaded on 1 end to fit tapered plug adapter for flush socket receptacle. Provide with tapered plug adapter and receptacle.

B. Upright Rod Assembly and Metal Crossbar: Aluminum or stainless steel. Two vertical rods and 1 horizontal crossbar, 3/4 inch in diameter and 36 inches long, unless otherwise indicated; 2 flush socket receptacles and 2 crossbar clamps. Ends of vertical rods are tapered to fit receptacles; all other rod ends are rounded.

C. Pegboards: Provide one of the following, unless otherwise noted:

1. Polypropylene, epoxy, or phenolic-composite pegboards with removable polypropylene pegs and stainless-steel drip troughs with drain outlet.

D. Germicidal Cabinet: Sanitizes goggles and/or eyewear.
   1. Cabinet: 24 gauge white enameled steel cabinet with interlocking doors with tamper-resistant latches than can be locked.
   2. Performance: No direct UV radiation escapes from cabinet when in use and the cabinet shuts off automatically if double doors are opened.
   3. Underwriters Laboratories Inc. Listed.
   4. Properties
      a. Universal rack holds 6 goggles or 5 goggles per level on 3 shelves.
      b. Wall or shelf mountable with a 7 foot grounded electrical cord.
      c. Germicidal lamp with 20 year limited warranty.
      d. Cabinet Dims: 32 inches high by 24.5 inches wide by 9.5 inches deep.
   5. Basis-of-Design: Sellstrom; Model 2000 monitor germicidal cabinet.

2.10 WATER AND LABORATORY GAS SERVICE FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Broen Inc.
   2. Chicago Faucet Company
   3. WaterSaver Faucet Co.

B. Service Fittings: Provide units that comply with SEFA 7, "Laboratory and Hospital Fixtures - Recommended Practices." Provide fittings complete with washers, locknuts, nipples, and other installation accessories. Include wall and deck flanges, escutcheons, handle extension rods, and similar items.
   1. Provide units with features (for example, pins in the bottoms of gas turrets) that comply with "Vandal-Resistant Faucets and Fixtures" recommendations in SEFA 7 and resist turning in place (to prevent loosening of joints between fittings and supply lines).

C. Materials: Fabricated from cast or forged red brass unless otherwise indicated.
   1. Reagent-Grade Water Service Fittings: Polypropylene, PVC, or PVDF for parts in contact with water.
   2. Natural gas cocks (shut-off valves) shall be provided with built-in check valves.

D. Finish: Acid- and solvent-resistant powder coating complying with requirements in SEFA 7 for corrosion-resistant finishes.
   1. Provide chemical-resistant powder coating in laboratory casework manufacturer's standard metallic brown, aluminum, white or other color as approved by A/E.

E. Water Valves and Faucets: Provide units complying with ASME A112.18.1, with renewable seats, designed for working pressure up to 80 psig (550 kPa).
   1. Vacuum Breakers: Provide ASSE 1035 vacuum breakers on water fittings with serrated outlets.
   2. Aerators: Provide aerators on water fittings that do not have serrated outlets.
   3. Self-Closing Valves: Provide self-closing valves where indicated.
   4. "Ball Values" Paragraph below is suitable for fuel gas, compressed air, and vacuum. Ball values are standard with most manufacturers and are recommended for applications for use by people with disabilities.

F. Ground-Key Cocks: Tapered core and handle of one-piece forged brass, ground and lapped, and held in place under constant spring pressure. Provide units designed for working pressure up to 40 psig, with serrated outlets.

G. Needle Valves: Provide units with renewable, self-centering, floating cones and renewable seats of stainless steel or Monel metal, with removable serrated outlets.

1. Provide units designed for working pressure up to 100 psig.

H. Hand of Fittings: Furnish right-hand fittings unless fitting designation is followed by "L."

I. Handles: Provide three- or four-arm, forged-brass handles for valves unless otherwise indicated.
   1. Provide lever-type handles for ground-key cocks. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
   2. Provide lever-type handles for ball valves. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when value is fully open.

J. Service-Outlet Identification: Provide color-coded plastic discs with embossed identification, secured to each service-fitting handle to be tamper resistant. Comply with SEFA 7 for colors and embossed identification.

2.11 ELECTRICAL SERVICE FITTINGS

A. Service Fittings, General: Provide units complete with metal housings, receptacles, terminals, switches, pilot lights, voice and data communication outlets, device plates, accessories, and gaskets required for mounting on laboratory casework.
   1. Refer to Division 27 for voice and data communication outlets.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of support framing and anchors.

B. Ensure that all building conditions are conducive to the installation of the laboratory casework and accessories, including coordination of applicable utility rough ins and connections.

3.2 INSTALLATION

A. Preparation: Prior to beginning installation of casework, check and verify that no irregularities exist that would affect quality of execution of work specified.

B. Coordination: Coordinate the work of the Section with the schedule and other requirements of other work being prepared in the area at the same time both with regard to mechanical and electrical connections to and in the fume hoods and the general construction work.

C. Performance:
   1. Casework:
      a. Set casework components plumb, square, and straight with no distortion and securely anchor to building structure. Shim as required using concealed shims.
      b. Bolt continuous cabinets together with joints flush, tight and uniform, and with alignment of adjacent units within 1/16" tolerance.
      c. Secure wall cabinets to solid supporting material, not to plaster, lath or gypsum board.
      d. Abut top edge surfaces in one true plane. Provide flush joints not to exceed 1/8".
   2. Worksurfaces:
      a. Where required due to field conditions, scribe to abutting surfaces.
      b. Only factory prepared field joints, located per approved shop drawings, shall be permitted. Secure the joints in the field, where practical, in the same manner as in the factory.
      c. Secure worksurfaces to casework and equipment components with materials and procedures recommended by the manufacturer.

D. Adjust and Clean:
   1. Repair or remove and replace defective work, as directed by owner and/or his representative upon completion of installation.
   2. Adjust doors, drawers and other moving or operating parts to function smoothly.
   3. Clean shop finished casework; touch up as required.

4. Clean worksurfaces and leave them free of all grease and streaks.
5. Casework to be left broom clean and orderly.

3.3 PROTECTION

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

B. Advise Owner of procedures and precautions for protection of material, installed laboratory casework and fixtures from damage by work of other trades.

END OF SECTION

SECTION 12 48 13 - ENTRANCE FLOOR MATS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Entrance Carpet Tile.

1.2 SUBMITTALS

A. Product Data: Indicate mat characteristics, component dimensions.

B. Samples: Two samples, illustrating pattern, color, finish, edging.

1.3 WARRANTY

A. Lifetime Limited Warranty, including face wear, moisture barrier, wick-back, delamination, tuft bind, unraveling, and static protection.

B. Stain Resistance Warranty: 15 years

PART 2 PRODUCTS

2.1 FLOOR MATS

A. Manufacturers:
1. Tarkett Assertive Action 04837 Smelter 26211 [Basis of Design]
2. Interface
3. Shaw
4. Approved Equal

2.2 COMPONENTS

A. Carpet Mat [Floor Type F-10]: cut and loop pile, tufted, 1/10” gauge, Pile height; 0.095 inch pile thickness, 2430000 oz/cy pile density, solution dyed with synthetic non-woven backing, 24 inch x 24 inch modular tiles; color as selected.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install mats surface-applied to existing concrete flooring after cleaning / prep of existing concrete slab.

B. Provide all required transition strips at door thresholds at exterior doors and to new concrete finish flooring system at hallway / adjacent spaces.

END OF SECTION

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SECTION 220523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Applications.
B. General requirements.
C. Ball valves.
D. Butterfly valves.
E. Check valves.
F. Gate valves.

1.02 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.
B. EPDM: Ethylene propylene copolymer rubber.
C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
D. NRS: Non-rising stem.
E. OS&Y: Outside screw and yoke.
F. PTFE: Polytetrafluoroethylene.
G. RS: Rising stem.
H. SWP: Steam working pressure.
I. TFE: Tetrafluoroethylene.

1.03 REFERENCE STANDARDS

A. API STD 594 - Check Valves: Flanged, Lug Wafer, and Butt-Welding 2017.
B. ASME B1.20.1 - Pipe Threads, General Purpose (Inch) 2013 (Reaffirmed 2018).
C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 2020.
D. ASME B16.34 - Valves — Flanged, Threaded, and Welding End 2020.
E. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings 2004 (Reapproved 2019).
F. ASTM A536 - Standard Specification for Ductile Iron Castings 1984 (Reapproved 2019)e1.
G. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings 2017.
H. MSS SP-67 - Butterfly Valves 2017, with Errata.
I. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends 2011.
J. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends 2018.
K. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service 2010a.
L. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves 2019.
M. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .
N. NSF 61 - Drinking Water System Components - Health Effects 2020.
O. NSF 372 - Drinking Water System Components - Lead Content 2020.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Provide the following valves for the applications if not indicated on drawings:
   1. Shutoff: Ball, butterfly, gate.

B. Required Valve End Connections for Non-Wafer Types:
   1. Steel Pipe:
      a. 2 NPS (50 DN) and Smaller: Threaded ends.
      b. 2-1/2 NPS (65 DN) to 4 NPS (100 DN): Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.
   2. Copper Tube:
      a. 2 NPS (50 DN) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

C. Domestic, Hot and Cold Water Valves:
   1. 2 NPS (50 DN) and Smaller:
      a. Bronze and Brass: Provide with solder-joint or threaded ends.
      b. Bronze Swing Check: Class 125, bronze disc.
   2. 2-1/2 NPS (65 DN) and Larger:
      a. Iron, 2-1/2 NPS (65 DN) to 4 NPS (100 DN): Provide with threaded or flanged ends.
      b. Iron Single-Flange Butterfly: 200 CWP, EPDM seat, aluminum-bronze disc.
      c. Iron Swing Check: Class 125, metal seats.
      d. Iron Gate: Class 125, NRS.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
   1. Handwheel: Valves other than quarter-turn types.

D. Valves in Insulated Piping: With 2 NPS (50 DN) stem extensions and the following features:
   1. Gate Valves: Rising stem.
   2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
   3. Butterfly Valves: Extended neck.

E. Valve-End Connections:
   1. Threaded End Valves: ASME B1.20.1.
   2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.

F. General ASME Compliance:

G. Valve Materials for Potable Water: NSF 61 and NSF 372.

H. Bronze Valves:
   1. Copper alloys containing more than 15 percent zinc are not permitted.

2.03 BRASS BALL VALVES

A. Two Piece, Full Port with Brass Trim:
   1. Comply with MSS SP-110.
   2. SWP Rating: 150 psig (1035 kPa).
   3. CWP Rating: 600 psig (4140 kPa).
   4. Body: Forged brass.
   5. Ends: Threaded.

6. Seats: PTFE.
7. Ball: Chrome-plated brass.

2.04 BRON□E BALL VALVES

A. Two Piece, Standard Port and Full Port with Bronze Trim:
   1. Comply with MSS SP-110.
   2. SWP Rating: 150 psig (1035 kPa).
   3. CWP Rating: 600 psig (4140 kPa).
   4. Body: Bronze.
   5. Ends: Threaded.
   6. Seats: PTFE.

2.05 IRON, SINGLE FLANGE BUTTERFLY VALVES

A. Lug type: Bi-directional dead-end service without use of downstream flange.
   1. Comply with MSS SP-67, Type I.
   2. CWP Rating: 200 psig (1380 kPa).
   3. Body: ASTM A126, cast iron or ASTM A536, ductile iron.
   4. Stem: One or two-piece stainless steel.
   5. Seat: EPDM.
   6. Disc: Coated ductile iron.

2.06 BRON□E SWING CHECK VALVES

A. Class 125: CWP Rating: 200 psig (1380 kPa).
   1. Comply with MSS SP-80, Type 3.
   2. Design: Horizontal flow.
   3. Body: Bronze, ASTM B62.
   4. Ends: Threaded as indicated.
   5. Disc: Bronze.

2.07 IRON SWING CHECK VALVES

A. Class 125:
   1. Comply with MSS SP-71, Type I.
   2. CWP Rating: 200 psig (1380 kPa).
   3. Design: Clear or full waterway.
   4. Body: ASTM A126, gray iron with bolted bonnet.
   5. Ends: Flanged as indicated.
   6. Trim: Composition.
   7. Seat Ring and Disc Holder: Bronze.
   8. Disc: PTFE.
   9. Gasket: Asbestos free.

2.08 IRON GATE VALVES

A. OS & Y:
   1. Comply with MSS SP-70, Type I.
   2. Class 125: CWP Rating: 200 psig: (1380 kPa).
   3. Body: ASTM A126, gray iron with bolted bonnet.
   4. Ends: Flanged.
   5. Trim: Bronze.
   6. Disc: Solid wedge.
   7. Packing and Gasket: Asbestos free.

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Install check valves where necessary to maintain direction of flow as follows:
   1. Swing Check: Install horizontal maintaining hinge pin level.

D. Provide chainwheels on operators for valves 4 NPS (100 DN) and larger where located 96 NPS (2400 DN) or more above finished floor, terminating 60 NPS (1520 DN) above finished floor.

END OF SECTION 220523

SECTION 220529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components for equipment, piping, and other plumbing work.

1.02 REFERENCE STANDARDS

1.03 QUALITY ASSURANCE

A. Comply with applicable building code.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Metal Channel (Strut) Framing Systems:
   1. Comply with MFMA-4.

C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

D. Thermal Insulated Pipe Supports:
   1. General Construction and Requirements:
      a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
      b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
      c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch (12.7 mm to 762 mm) iron pipes.
      d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by a 360 degree, PVC jacketing.
   2. PVC Jacket:
      a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
      b. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
      c. Thickness: 60 mil (1.524 mm).

E. Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.
   1. Material: ASTM A36/A36M carbon steel or ASTM A181/A181M forged steel.
   2. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

F. Riser Clamps:
   1. Provide copper plated clamps for copper tubing support.

2. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.

G. Pipe Hangers: For a given pipe run use hangers of the same type and material.
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
2. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

H. Intermediate Pipe Guides: Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.
1. Pipe Diameter 6 inches (150 mm) and Smaller: Provide minimum clearance of 0.16 inch (4 mm).
2. Pipe Diameter 8 inches (200 mm): Provide U-bolts with double nuts providing minimum clearance of 0.28 inch (7 mm).
3. Pipe Diameter 8 inches (200 mm): 0.625 inch (16 mm) U-bolt.

I. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
a. Comply with MFMA-4.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

G. Equipment Support and Attachment:
1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION 220529

SECTION 220553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe markers.

E. Ceiling tacks.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems 2020.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials 2017.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Piping: Pipe markers.

B. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.02 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch (6 mm).
   3. Background Color: Black.
   4. Plastic: Comply with ASTM D709.

2.03 TAGS

A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

B. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
   1. 3/4 to 1-1/4 inch (20-30 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 1/2 inch (15 mm) high letters.
   2. 1-1/2 to 2 inch (40-50 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 3/4 inch (20 mm) high letters.
   3. 2-1/2 to 6 inch (65-150 mm) Outside Diameter of Insulation or Pipe: 12 inch (300 mm) long color field, 1-1/4 inch (30 mm) high letters.

2.05 PIPE MARKERS

A. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

2.06 CEILING TACKS

A. Description: Steel with 3/4 inch (20 mm) diameter color coded head.

B. Color code as follows:
   1. HVAC Equipment: Yellow.
   2. Plumbing Valves: Green.
   3. Heating/Cooling Valves: Red.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

END OF SECTION 220553

SECTION 220719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

A. Manufacturers:
   1. CertainTeed Corporation
   2. Johns Manville Corporation
   3. Knauf Insulation
   4. Owens Corning Corporation

B. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
   2. Maximum Service Temperature: 650 degrees F (343 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

E. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

F. Inserts and Shields:
   1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert Location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.

G. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 078400.

END OF SECTION 220719

SECTION 221005
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, specialties, and connections for piping systems.
   1. Sanitary sewer.
   2. Chemical resistant sewer.
   3. Domestic water.
   4. Flanges, unions, and couplings.
   5. Valves.

1.02 RELATED REQUIREMENTS

A. Section 220553 - Identification for Plumbing Piping and Equipment.

B. Section 220719 - Plumbing Piping Insulation.

C. Section 330110.58 - Disinfection of Water Utility Piping Systems.

1.03 REFERENCE STANDARDS

A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.

B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.

C. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV 2016.

D. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings - DWV 2017.

E. ASME B31.9 - Building Services Piping 2020.

F. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators 2021.

G. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings 2021.

H. ASTM B32 - Standard Specification for Solder Metal 2020.

I. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.

J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.

K. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV) 2020.

L. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.

M. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.

N. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.

O. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2020.

P. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings 2020.

Q. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2021.

R. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2016.

S. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications 2017 (Revised 2018).

T. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2020.

U. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements 2015.

V. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements 2016.

W. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.

X. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .

Y. NSF 61 - Drinking Water System Components - Health Effects 2020.

Z. NSF 372 - Drinking Water System Components - Lead Content 2020.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

D. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

A. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

B. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, sovent.
   2. Joints: ASTM B32, alloy Sn50 solder.

2.04 CHEMICAL RESISTANT SEWER PIPING

A. PVC Pipe
   1. Piping shall be UL723 rated for use with chemical waste located within a return air plenum.
   2. Fittings: No-hub, socket fusion or electro-fusion.
   3. Joints: Stainless steel 300 bands for no-hub connections. Fusion joints shall conform to ASTM F1412 standards.
   4. Contractor shall obtain prior approval from the Architect/Engineer to use these materials.

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.

2.06 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
   1. Ferrous pipe: Class 150 malleable iron threaded unions.
   2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch (25 mm):
   1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.07 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.

B. Plumbing Piping - Drain, Waste, and Vent:
   1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.

C. Plumbing Piping - Water:
   1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
   2. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
   3. Hangers for Hot Pipe Sizes 2 Inches (50 mm) to 4 Inches (100 mm): Carbon steel, adjustable, clevis.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
   2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
   3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
   4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
   5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

2.08 BALL VALVES

A. Manufacturers:
   1. Apollo Valves
   2. Grinnell Products
   3. Nibco, Inc

B. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not exposed.

H. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

I. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   3. Provide copper plated hangers and supports for copper piping.

J. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

3.04 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with Section 330110.58.

B. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

END OF SECTION 221005

SECTION 221006
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drains.

B. Cleanouts.

C. Hose bibbs.

D. Hydrants.

E. Backflow preventers.

F. Double check valve assemblies.

G. Water hammer arrestors.

H. Mixing valves.

1.02 RELATED REQUIREMENTS

A. Section 221005 - Plumbing Piping.

B. Section 223000 - Plumbing Equipment.

C. Section 224000 - Plumbing Fixtures.

1.03 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor and Trench Drains 2019.

B. NSF 61 - Drinking Water System Components - Health Effects 2020.

C. NSF 372 - Drinking Water System Components - Lead Content 2020.

D. PDI-WH 201 - Water Hammer Arresters 2017.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company
   2. Josam Company
   3. Zurn Industries, LLC

B. Floor Drain:
   1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

C. Floor Sink:
   1. Lacquered cast iron body with dome strainer and seepage flange.

2.03 CLEANOUTS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company
   2. Josam Company
   3. Zurn Industries, LLC

B. Cleanouts at Interior Finished Floor Areas:

1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

2.04 WATER HAMMER ARRESTORS

A. Manufacturers:
   1. Jay R. Smith Manufacturing Company
   2. Watts Regulator Company, a part of Watts Water Technologies
   3. Zurn Industries, LLC

B. Water Hammer Arrestors:
   1. Stainless steel construction, piston type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

2.05 MIXING VALVES

A. Thermostatic Mixing Valves:
   1. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

D. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks or washing machine outlets.

END OF SECTION 221006

SECTION 221500
GENERAL-SERVICE COMPRESSED-AIR SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and pipe fittings.

B. Air compressor.

C. Air receiver and accessories.

D. Refrigerated air dryer.

E. Pressure reducing station.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 220553 - Identification for Plumbing Piping and Equipment: Identification of piping system.

1.03 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2016.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.

D. ASME B31.1 - Power Piping 2020.

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2020.

F. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2019.

G. ASTM B32 - Standard Specification for Solder Metal 2020.

H. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.

I. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.

J. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers catalog literature with capacity, weight, and electrical characteristics and connection requirements.

C. Operation Data: Submit for air compressor, air receiver, and accessories, aftercooler, refrigerated air dryer, and pressure reducing station.

D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for reciprocating air compressors.

PART 2 PRODUCTS

2.01 PIPE AND PIPE FITTINGS

A. Steel Pipe: ASTM A53/A53M, Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded or welded to ASME B31.1.

B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, solder, Grade Sn95.

2.02 COMPRESSOR

A. Manufacturers:
   1. Ingersoll Rand Compressed Air Solutions; [_____]

B. Reciprocating Compressors:
   1. Unit: Reciprocating compressor with positive displacement oil pump lubrication system, suction inlet screen, discharge service valves, on cast iron or welded steel base for motor and compressor with provision for V-belt adjustment.
   2. Automatic Capacity Reduction Equipment: Suction valve unloader with lifting mechanism operated by oil pressure. Provide for unloaded compressor start.
   3. Motor: Constant speed 1800 rpm with electronic overheating protection in each phase, full voltage starting.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

2.03 AIR DRYER

A. Manufacturers:
   1. Ingersoll Rand Compressed Air Solutions; [_____]: www.ingersollrandproducts.com/#sle.

B. Type: Self-contained mechanical refrigeration type complete with heat exchanger, refrigeration compressor, automatic controls, moisture removal trap, internal wiring and piping, and full refrigerant charge.

C. Air Connections: Inlet and outlet connections at same level, factory insulated.

D. Accessories: Air inlet temperature gauge, air inlet pressure gauge, on/off switch, high temperature light, power on light, refrigerant gauge, air outlet temperature gauge, air outlet pressure gauge.

E. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

F. Cord and Plug: Provide unit with 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.

2.04 AIR RECEIVER

A. Receiver: Vertical, built to ASME regulations for working pressure of 125 psi (862 kPa). Flange or screw inlet and outlet connections.

B. Fittings: Adjustable pressure regulator, safety valve, pressure gauge, drain cock, and automatic float actuated condensate trap.

2.05 PRESSURE REDUCING VALVE

A. Pressure Reducing Station: Consisting of automatic reducing valve and bypass, and low pressure side relief valve and gauge.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.

B. Install compressor unit on concrete housekeeping pad. Refer to Section 033000.

C. Connect condensate drains to nearest floor drain.

D. Install takeoffs to outlets from top of main, with shut off valve after takeoff. Slope takeoff piping to outlets.

E. Identify piping system and components. Refer to Section 220553.

END OF SECTION 221500

SECTION 224000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sinks.

B. Electric water coolers.

1.02 RELATED REQUIREMENTS

A. Section 221005 - Plumbing Piping.

B. Section 221006 - Plumbing Piping Specialties.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2017).

C. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration 2008 (Reaffirmed 2013).

D. ASME A112.19.3 - Stainless Steel Plumbing Fixtures 2017, with Errata.

E. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices 2020.

F. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

G. NSF 61 - Drinking Water System Components - Health Effects 2020.

H. NSF 372 - Drinking Water System Components - Lead Content 2020.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 REGULATORY REQUIREMENTS

A. Comply with applicable codes for installation of plumbing systems.

2.03 SINKS

A. Sink Manufacturers:
   1. American Standard, Inc
   2. Kohler Company

B. Single Compartment Bowl: ASME A112.19.3; 20 gage, 0.0359 inch (0.91 mm) thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

C. Double Compartment Bowl: ASME A112.19.3; 20 gage, 0.0359 inch (0.91 mm) thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

2.04 ELECTRIC WATER COOLERS

A. Electric Water Cooler Manufacturers:

1. Elkay Manufacturing Company; [_____]
2. Haws Corporation; [_____]
3. Oasis International; [_____]

B. Water Cooler: Electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, stainless steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
   1. Capacity: 8 gallons per hour (30.3 liters per hour) of 50 degrees F (10 degrees C) water with inlet at 80 degrees F (27 degrees C) and room temperature of 90 degrees F (32 degrees C), when tested in accordance with ASHRAE Std 18.
   2. Electrical: 115 V, 60 Hertz compressor, 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.

C. Bottle Filler: Materials to match fountain.

2.05 BI-LEVEL, ELECTRIC WATER COOLERS

A. Bi-level, Electric Water Cooler Manufacturers:
   1. Elkay Manufacturing Company
   2. Oasis International

B. Water Cooler: Bi-level, electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, stainless steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
   1. Capacity: 8 gallons per hour (30.3 liters per hour) of 50 degrees F (10 degrees C) water with inlet at 80 degrees F (27 degrees C) and room temperature of 90 degrees F (32 degrees C), when tested in accordance with ASHRAE Std 18.
   2. Electrical: 115 V, 60 Hertz compressor, 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.

C. Bottle Filler: Materials to match fountain.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install components level and plumb.

B. Install and secure fixtures in place with wall supports and bolts.

3.04 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.05 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 224000

SECTION 230513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

B. Applications.

1.02 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators 2018.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
   3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

C. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.02 APPLICATIONS

A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not comply with these specifications.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION 230513

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SECTION 230519
METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gauges and pressure gauge taps.

B. Thermometers and thermometer wells.

1.02 RELATED REQUIREMENTS

A. Section 232113 - Hydronic Piping.

1.03 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments 2013.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers 2014 (Reapproved 2020).

C. UL 393 - Indicating Pressure Gauges for Fire-Protection Service Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

1.05 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 4-1/2 inch (115 mm) diameter.
   3. Mid-Scale Accuracy: One percent.
   4. Scale: Psi.

2.02 PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi (1034 kPa).

B. Needle Valve: Brass, 1/4 inch (6 mm) NPT for minimum 150 psi (1034 kPa).

2.03 DIAL THERMOMETERS

A. Thermometers - Fixed Mounting: Dial type bimetallic actuated; ASTM E1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
   1. Size: 5 inch (125 mm) diameter dial.
   2. Lens: Clear glass.
   3. Accuracy: 1 percent.
   4. Calibration: Degrees F.

2.04 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

2.05 TEST PLUGS

A. Test Plug: 1/4 inch (6 mm) or 1/2 inch (13 mm) brass fitting and cap for receiving 1/8 inch (3 mm) outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F (93 degrees C).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide instruments with scale ranges selected according to service with largest appropriate scale.

C. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

D. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

E. Locate test plugs adjacent thermometers and thermometer sockets.

END OF SECTION 230519

SECTION 230523
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Applications.

B. General requirements.

C. Ball valves.

D. Butterfly valves.

E. Check valves.

F. Gate valves.

1.02 RELATED REQUIREMENTS

A. Section 230553 - Identification for HVAC Piping and Equipment.

B. Section 230719 - HVAC Piping Insulation.

C. Section 232113 - Hydronic Piping.

1.03 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch) 2013 (Reaffirmed 2018).

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 2020.

C. ASME B31.9 - Building Services Piping 2020.

D. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings 2004 (Reapproved 2019).

E. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings 2017.

F. MSS SP-67 - Butterfly Valves 2017, with Errata.

G. MSS SP-68 - High Pressure Butterfly Valves with Offset Design 2017.

H. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service 2010a.

I. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves 2019.

J. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Provide the following valves for the applications if not indicated on drawings:
   1. Throttling (Hydronic): Butterfly and Ball.
   2. Isolation (Shutoff): Butterfly, Gate, and Ball.

B. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.

C. Heating Hot Water Valves:
   1. 2 NPS (50 DN) and Smaller, Brass and Bronze Valves:
      a. Threaded ends.
      b. Ball: Full port, two piece, brass trim.
      c. Swing Check: Bronze disc, Class 125.
      d. Gate: NRS, Class 125.
   2. 2-1/2 NPS (65 DN) and Larger, Iron Valves:
      a. 2-1/2 NPS (65 DN) to 4 NPS (100 DN): Flanged ends.

b. Ball: 2-1/2 NPS (65 DN) to 10 NPS (250 DN), Class 150.
c. Single-Flange Butterfly: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), aluminum-bronze disc, EPDM seat, 200 CWP.
d. Butterfly: High performance, single flange, Class 150.
e. Swing Check: 2-1/2 NPS (65 DN) to 12 NPS (300 DN), lever and spring closure control, Class 125.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:

D. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.

E. General ASME Compliance:
1. Building Services Piping Valves: ASME B31.9.

F. Bronze Valves:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

2.03 BRASS BALL VALVES

A. Two Piece, Full Port with Stainless Steel Trim:
1. Comply with MSS SP-110.
2. SWP Rating: 150 psig (1035 kPa).
3. CWP Rating: 600 psig (4140 kPa).
4. Body: Forged brass.
5. Ends: Threaded.
6. Seats: PTFE or TFE.
7. Ball: Chrome-plated brass.

2.04 BRON□E BALL VALVES

A. Two Piece, Full Port with Bronze or Brass Trim:
1. Comply with MSS SP-110.
2. SWP Rating: 150 psig (1035 kPa).
3. CWP Rating: 600 psig (4140 kPa).
4. Body: Bronze.
5. Ends: Threaded.
6. Seats: PTFE .

2.05 IRON BALL VALVES

A. Split Body, Full Port:
1. Comply with MSS SP-72.
2. CWP Rating: 200 psig (1380 kPa).
3. Body: ASTM A126, gray iron.
4. Ends: Flanged.
5. Seats: PTFE.
6. Stem: Stainless steel.
7. Ball: Stainless steel.

2.06 IRON, SINGLE FLANGE BUTTERFLY VALVES

A. Lug type: Bi-directional dead end service without downstream flange.
1. Comply with MSS SP-67, Type I.
2. CWP Rating: 200 psig (1680 kPa).
3. Body Material: ASTM A126 cast iron.
4. Stem: One or two-piece stainless steel.
5. Seat: EPDM.
6. Disc: Coated ductile iron.

2.07 HIGH-PERFORMANCE SINGLE FLANGE BUTTERFLY VALVES

A. Lug type: Bi-directional dead end service without downstream flange.
   1. Comply with MSS SP-68.
   2. Class 150: CWP Rating: 285 psig (1965 kPa) at 100 degrees F (38 degrees C).
   3. Body: Provide carbon steel or cast iron.
   4. Seat: Metal or reinforced PTFE.
   5. Offset stem: Stainless steel.
   6. Disc: Carbon steel.

2.08 BRON□E SWING CHECK VALVES

A. Class 125: CWP Rating: 200 psig (1380 kPa).
   1. Comply with MSS SP-80, Type 3.
   2. Body Design: Horizontal flow.
   3. Body Material: Bronze, ASTM B62.
   4. Ends: Threaded.
   5. Disc: Bronze.

2.09 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

2.10 BRON□E GATE VALVES

A. Rising Stem (RS):
   1. Comply with MSS SP-80, Type I.
   2. Body Material: Bronze with integral seat and union-ring bonnet.
   3. Ends: Threaded or solder joint.
   4. Stem: Bronze.
   5. Disc: Solid wedge; bronze.
   6. Packing: Asbestos free.
   7. Handwheel: Malleable iron or bronze.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Provide chainwheels on operators for valves 4 NPS (100 DN) and larger where located 96 NPS (2400 DN) or more above finished floor, terminating 60 NPS (1520 DN) above finished floor.

END OF SECTION 230523

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SECTION 230529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components for equipment, piping, and other HVAC/hydronic work.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping 2014 (Reapproved 2020).

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2018).

F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.

G. MFMA-4 - Metal Framing Standards Publication 2004.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   1. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   2. Comply with MFMA-4.

C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
   1. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch (13 mm) diameter.
      b. Piping up to 1 inch (27 mm) nominal: 1/4 inch (6 mm) diameter.
      c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch (10 mm) diameter.
      d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.

D. Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.
   1. Material: ASTM A36/A36M carbon steel or ASTM A181/A181M forged steel.
   2. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

E. Riser Clamps:
   1. Provide copper plated clamps for copper tubing support.
   2. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.

F. Pipe Hangers: For a given pipe run use hangers of the same type and material.
   1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
   2. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

G. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
   3. Steel: Use beam clamps, machine bolts, or welded threaded studs.
   4. Sheet Metal: Use sheet metal screws.
   5. Wood: Use wood screws.
   6. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
      a. Comply with MFMA-4.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

G. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION 230529

SECTION 230553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe markers.

E. Ceiling tacks.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Terminal Units: Tags.

B. Control Panels: Nameplates.

C. Piping: Stencilled painting.

D. Thermostats: Nameplates.

2.02 NAMEPLATES

A. Letter Color: White.

B. Letter Height: 1/4 inch (6 mm).

C. Background Color: Black.

D. Plastic: Comply with ASTM D709.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
   1. 3/4 to 1-1/4 inch (20-30 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 1/2 inch (15 mm) high letters.
   2. 1-1/2 to 2 inch (40-50 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 3/4 inch (20 mm) high letters.
   3. 2-1/2 to 6 inch (65-150 mm) Outside Diameter of Insulation or Pipe: 12 inch (300 mm) long color field, 1-1/4 inch (30 mm) high letters.

2.05 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

2.06 CEILING TACKS

A. Description: Steel with 3/4 inch (20 mm) diameter color coded head.

B. Color code as follows:
   1. HVAC Equipment: Yellow.
   2. Fire Dampers and Smoke Dampers: Red.

3. Heating/Cooling Valves: Red.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 099123 for stencil painting.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

END OF SECTION 230553

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic systems.

C. Measurement of final operating condition of HVAC systems.

1.02 RELATED REQUIREMENTS

A. Section 230800 - Commissioning of HVAC.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 110 - Methods of Testing Performance of Laboratory Fume Hoods 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems 2008, with Errata (2019).

C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems 2015, with Errata (2017).

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing 2002.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
   3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   5. Units of Measure: Report data in I-P (inch-pound) units only.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

2. Certified by one of the following:
   a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
   b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   3. Duct systems are clean of debris.
   4. Fans are rotating correctly.
   5. Fire and volume dampers are in place and open.
   6. Air coil fins are cleaned and combed.
   7. Air outlets are installed and connected.
   8. Hydronic systems are flushed, filled, and vented.
   9. Proper strainer baskets are clean and in place.
   10. Service and balance valves are open.

3.03 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.04 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

E. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

F. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

G. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

H. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

I. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure near the building entries.

J. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.06 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

3.07 SCOPE

A. Test, adjust, and balance the following:
   1. HVAC Pumps.
   2. Packaged Roof Top Heating/Cooling Units.
   3. Terminal Heat Transfer Units.
   4. Fans.
   5. Air Terminal Units.
   6. Air Inlets and Outlets.

3.08 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
   1. Manufacturer.
   2. HP/BHP.
   3. Phase, voltage, amperage; nameplate, actual, no load.

B. Pumps:
   1. Identification/number.
   2. Manufacturer.
   3. Size/model.
   4. Design flow rate, pressure drop, BHP.
   5. Actual flow rate, pressure drop, BHP.
   6. Total operating head pressure.

C. Exhaust Fans:
   1. Manufacturer.
   2. Model number.
   3. Serial number.
   4. Air flow, specified and actual.
   5. Total static pressure (total external), specified and actual.
   6. Inlet pressure.
   7. Discharge pressure.

D. Duct Traverses:
   1. Duct size.
   2. Area.
   3. Design velocity.
   4. Design air flow.
   5. Test velocity.

6. Test air flow.
7. Duct static pressure.

E. Terminal Unit Data:
1. Manufacturer.
2. Type, constant, variable, single, dual duct.
3. Identification/number.
4. Model number.
5. Size.
6. Minimum design air flow.
7. Maximum design air flow.
8. Maximum actual air flow.

F. Air Distribution Tests:
1. Air terminal number.
2. Room number/location.
3. Design air flow.
4. Test (final) air flow.
5. Percent of design air flow.

END OF SECTION 230593

SECTION 230713
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

1.02 RELATED REQUIREMENTS

A. Section 230553 - Identification for HVAC Piping and Equipment.

B. Section 233100 - HVAC Ducts and Casings: Glass fiber ducts.

1.03 REFERENCE STANDARDS

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. CertainTeed Corporation
   2. Johns Manville
   3. Knauf Insulation

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.

2.03 GLASS FIBER, RIGID

A. Manufacturer:
   1. CertainTeed Corporation
   2. Johns Manville
   3. Knauf Insulation

B. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. K (Ksi) Value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.

2.04 DUCT LINER

A. Manufacturers:
   1. Armacell LLC
   2. CertainTeed Corporation
   3. Ductmate Industries, Inc, a DMI Company
   4. Johns Manville

B. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
   1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
   2. Maximum Service Temperature: 180 degrees F (82 degrees C).
   3. Connection: Waterproof vapor barrier adhesive.

C. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulated ducts conveying air below ambient temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

C. Duct Liner Application:
   1. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
   2. Seal and smooth joints. Seal and coat transverse joints.

END OF SECTION 230713

SECTION 230719
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Flexible removable and reusable blanket insulation.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 232113 - Hydronic Piping: Placement of hangers and hanger inserts.

C. Section 232300 - Refrigerant Piping: Placement of inserts.

1.03 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement 2007 (Reapproved 2019).

C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2019.

D. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation 2021a.

E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.

H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, RIGID

A. Manufacturers:
   1. CertainTeed Corporation
   2. Johns Manville Corporation
   3. Knauf Insulation
   4. Owens Corning Corporation

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
   2. Maximum Service Temperature: 850 degrees F (454 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).

D. Vapor Barrier Lap Adhesive: Compatible with insulation.

E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2.03 CELLULAR GLASS

A. Pipe and Tubing Insulation: ASTM C552, Type II, Grade 6.
   1. K (Ksi) Value: 0.35 (0.050) at 100 degrees F (38 degrees C).
   2. Service Temperature Range: From 250 degrees F (121 degrees C) to 800 degrees F (427 degrees C).

3. Water Vapor Permeability: 0.005 perm inch (0.007 ng/Pa s m) maximum per inch.
4. Water Absorption: 0.5 percent by volume, maximum.
5. Density: A minimum of 6.12 lb/cu ft (98 kg/cu m).

B. Block Insulation: ASTM C552, Type I, Grade 6.
1. K (Ksi) Value: 0.35 (0.050) at 100 degrees F (38 degrees C).
2. Service Temperature: 800 degrees F (427 degrees C), maximum.
3. Water Vapor Permeability: 0.005 perm inch (0.007 ng/Pa s m) maximum per inch.
4. Water Absorption: 0.5 percent by volume, maximum.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Glass fiber insulated pipes conveying fluids below ambient temperature:
1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

D. Inserts and Shields:
1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert location: Between support shield and piping and under the finish jacket.
4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 078400.

END OF SECTION 230719

SECTION 230800
COMMISSIONING OF HVAC

PART 1 GENERAL

1.01 SUMMARY

A. See Section 019113 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 019113.

B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.

C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.

D. The following HVAC equipment is to be commissioned, including commissioning activities for the following specific items:
   1. Major and minor equipment items.
   2. Terminal units.
   3. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS

A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.

B. DRAFT Prefunctional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled:
   1. System name.
   2. List of devices.
   3. Step-by-step procedures for testing each controller after installation, including:
      a. Process of verifying proper hardware and wiring installation.
      b. Process of downloading programs to local controllers and verifying that they are addressed correctly.
      c. Process of performing operational checks of each controlled component.
      d. Plan and process for calibrating valve and damper actuators and all sensors.
      e. Description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
   4. Copy of proposed log and field checkout sheets to be used to document the process; include space for initial and final read values during calibration of each point and space to specifically indicate when a sensor or controller has “passed” and is operating within the contract parameters.
   5. Description of the instrumentation required for testing.
   6. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the Commissioning Authority and TAB contractor for this determination.

C. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.

D. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:
   1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and

algorithms.
2. Full as-built set of control drawings.
3. Full as-built sequence of operations for each piece of equipment.
4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
   a. Floor.
   b. Room number.
   c. Room name.
   d. Air handler unit ID.
   e. Reference drawing number.
   f. Air terminal unit tag ID.
   g. Heating and/or cooling valve tag ID.
   h. Minimum air flow rate.
   i. Maximum air flow rate.
5. Full print out of all schedules and set points after testing and acceptance of the system.
6. Full as-built print out of software program.
7. Electronic copy on disk of the entire program for this facility.
8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
10. Control equipment component submittals, parts lists, etc.
11. Warranty requirements.
12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
    a. Sequences of operation.
    b. Control drawings.
    c. Points lists.
    d. Controller and/or module data.
    e. Thermostats and timers.
    f. Sensors and DP switches.
    g. Valves and valve actuators.
    h. Dampers and damper actuators.
    i. Program setups (software program printouts).

E. Project Record Documents: See Section 017800 for additional requirements.
   1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
   2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.

F. Draft Training Plan: In addition to requirements specified in Section 017900, include:
   1. Follow the recommendations of ASHRAE Guideline 1.1.
   2. Control system manufacturer's recommended training.
   3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.

G. Training Manuals: See Section 017900 for additional requirements.
   1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

PART 3 EXECUTION

3.01 PREPARATION

A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.

B. Furnish additional information requested by the Commissioning Authority.

C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.

D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.

E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.

F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.

G. Provide temperature and pressure taps in accordance with Contract Documents.

3.02 INSPECTING AND TESTING - GENERAL

A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.

B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.

C. Provide two-way radios for use during the testing.

D. Valve/Damper Stroke Setup and Check:
   1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
   2. Set pump/fan to normal operating mode.
   3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
   4. Command valve/damper open; verify position is full open and adjust output signal as required.
   5. Command valve/damper to a few intermediate positions.
   6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

E. Isolation Valve or System Valve Leak Check: For valves not by coils.
   1. With full pressure in the system, command valve closed.
   2. Use an ultra-sonic flow meter to detect flow or leakage.

F. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

3.03 TAB COORDINATION

A. TAB: Testing, adjusting, and balancing of HVAC.

B. Coordinate commissioning schedule with TAB schedule.

C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.

D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.

E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.

F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

3.04 OPERATION AND MAINTENANCE MANUALS

A. See Section 017800 for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

END OF SECTION 230800

SECTION 231123
FACILITY NATURAL-GAS PIPING

PART 2 PRODUCTS

END OF SECTION 231123

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SECTION 232113
HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hydronic system requirements.

B. Equipment drains and overflows.

C. Pipe hangers and supports.

D. Unions, flanges, mechanical couplings, and dielectric connections.

E. Valves:
   1. Ball valves.
   2. Butterfly valves.
   3. Check valves.

F. Flow controls.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting.

B. Section 230553 - Identification for HVAC Piping and Equipment.

C. Section 230719 - HVAC Piping Insulation.

D. Section 232114 - Hydronic Specialties.

1.03 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2016.

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.

D. ASME B31.9 - Building Services Piping 2020.

E. ASTM B32 - Standard Specification for Solder Metal 2020.

F. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.

G. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.

H. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers 1992, with Editorial Revision (2018).

I. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:
   1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
   2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
   3. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated:
   1. For shut-off and to isolate parts of systems or vertical risers, use gate, ball, or butterfly valves.

2.02 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53/A53M, Schedule 40 galvanized; using one of the following joint types:
   1. Threaded Joints: Galvanized cast iron, or ASME B16.3 malleable iron fittings.

B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:
   1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

2.03 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Malleable iron, adjustable swivel, split ring.
   3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

2.04 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe 2 Inches (50 mm) and Less:
   1. Ferrous Piping: 150 psig (1034 kPa) malleable iron, threaded.
   2. Copper Pipe: Bronze, soldered joints.

B. Flanges for Pipe 2 Inches (50 mm) and Greater:
   1. Ferrous Piping: 150 psig (1034 kPa) forged steel, slip-on.
   2. Copper Piping: Bronze.

2.05 BALL VALVES

A. Manufacturers:
   1. Apollo Valves
   2. Grinnell Products

B. Up To and Including 2 Inches (50 mm):
   1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder or threaded ends.

C. Over 2 Inches (50 mm):
   1. Ductile iron body, chrome plated stainless steel ball, teflon seat and stuffing box seals, lever handle, flanged ends, rated to 800 psi (5515 kPa).

2.06 BUTTERFLY VALVES

A. Manufacturers:
   1. Apollo Valves
   2. Grinnell Products

B. Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer or lug ends, extended neck.

C. Disc: Construct of aluminum bronze.

D. Stem: Stainless steel with stem offset from the centerline to provide full 360 degree circumferential setting.

E. Operator: 10 position lever handle.

2.07 SWING CHECK VALVES

A. Manufacturers:
   1. Apollo Valves
   2. Grinnell Products

B. Up To and Including 2 Inches (50 mm):
   1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, solder ends.

C. Over 2 Inches (50 mm):

1. Iron body, bronze trim, bronze swing disc, renewable disc and seat, flanged ends.

2.08 FLOW CONTROLS

A. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

B. Calibration: Control flow within 10 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, minimum pressure 2 psi (13.7 kPa).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route piping in orderly manner, parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and to avoid interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Slope piping and arrange to drain at low points.

F. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
   2. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.
   3. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   4. Use hangers with 1-1/2 inch (38 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   7. Provide copper plated hangers and supports for copper piping.
   8. Prime coat exposed steel hangers and supports. Refer to Section 09 9123. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

END OF SECTION 232113

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SECTION 232114
HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air vents.

B. Strainers.

C. Balancing valves.

D. Combination flow controls.

E. Relief valves.

1.02 RELATED REQUIREMENTS

A. Section 232113 - Hydronic Piping.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 AIR VENTS

A. Manufacturers:
   1. Armstrong International, Inc
   2. ITT Bell & Gossett

B. Manual Type: Short vertical sections of 2 inch (50 mm) diameter pipe to form air chamber, with 1/8 inch (3 mm) brass needle valve at top of chamber.

C. Float Type:
   1. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.

2.02 STRAINERS

A. Manufacturers:
   1. Armstrong International, Inc
   2. Grinnell Products

B. Size 2 inch (50 mm) and Under:
   1. Screwed brass or iron body for 175 psi (1200 kPa) working pressure, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.

C. Size 2-1/2 inch (65 mm) to 4 inch (100 mm):
   1. Provide flanged or grooved iron body for 175 psi (1200 kPa) working pressure, Y pattern with 3/64 inch (1.2 mm) stainless steel perforated screen.

2.03 BALANCING VALVES

A. Manufacturers:
   1. Hays Fluid Controls
   2. ITT Bell & Gossett

B. Size 2 inch (50 mm) and Smaller:
   1. Provide ball or globe style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and NPT threaded or

soldered connections.
2. Metal construction materials consist of bronze or brass.
3. Non-metal construction materials consist of Teflon or EPDM.

2.04 COMBINATION FLOW CONTROLS

A. Manufacturers:
1. Hays Fluid Controls:
2. ITT Bell & Gossett

B. Construction: Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet with blowdown/backflush drain.

C. Calibration: Control flow within 10 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, minimum pressure 2 psi (13.7 kPa).

D. Control Mechanism: Provide stainless steel or nickel plated brass piston or regulator cup, operating against stainless steel helical or wave formed spring or elastomeric diaphragm and polyphenylsulfone orifice plate.

E. Accessories: In-line strainer on inlet and ball valve on outlet.

2.05 RELIEF VALVES

A. Manufacturers:
1. Armstrong International, Inc
2. ITT Bell & Gossett

B. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions.

B. Provide manual air vents at system high points and as indicated.

C. Provide valved drain and hose connection on strainer blow down connection.

END OF SECTION 232114

SECTION 233100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ductwork.

B. Nonmetal ductwork.

C. Duct cleaning.

1.02 RELATED REQUIREMENTS

A. Section 230593 - Testing, Adjusting, and Balancing for HVAC.

B. Section 230713 - Duct Insulation: External insulation and duct liner.

C. Section 233300 - Air Duct Accessories.

D. Section 233600 - Air Terminal Units.

E. Section 233700 - Air Outlets and Inlets.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.

D. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements 2015.

E. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements 2015.

F. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements 2015.

G. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.

H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2020.

I. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors current edition, including all revisions.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

B. Ducts: Galvanized steel, unless otherwise indicated.

C. Low Pressure Supply (System with Cooling Coils): 2 inch w.g. (500 Pa) pressure class, galvanized steel.

D. Return and Relief: 1 inch w.g. (250 Pa) pressure class, galvanized steel.

E. General Exhaust: 1 inch w.g. (250 Pa) pressure class, galvanized steel.

2.02 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.

2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.

2.03 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

D. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

F. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

2.04 MANUFACTURED DUCTWORK AND FITTINGS

A. Round Ducts: Round lockseam duct with galvanized steel outer wall.
   1. Manufacture in accordance with SMACNA (DCS).

B. Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
   1. Insulation: R-4.2 with foil jacket.
   2. Pressure Rating: 10 inches WG (2.50 kPa) positive and 1.0 inches WG (250 Pa) negative.
   3. Maximum Velocity: 4000 fpm (20.3 m/sec).
   4. Temperature Range: Minus 20 degrees F to 210 degrees F (Minus 28 degrees C to 99 degrees C).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

C. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

D. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

E. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet (1.5 m) maximum length of flexible duct held in place with strap or clamp.

3.02 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning. Ductwork cleaning shall be limited to the existing and new ductwork located on the Second Floor of the Academic Wing.

END OF SECTION 233100

SECTION 233300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backdraft dampers - metal.

B. Duct access doors.

C. Flexible duct connections.

D. Volume control dampers.

1.02 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2020.

C. UL 555 - Standard for Fire Dampers Current Edition, Including All Revisions.

D. UL 555S - Standard for Smoke Dampers Current Edition, Including All Revisions.

E. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.

C. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 BACKDRAFT DAMPERS - METAL

A. Gravity Backdraft Dampers, Size 18 by 18 inches (450 by 450 mm) or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch (150 mm) width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.02 DUCT ACCESS DOORS

2.03 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.

2.04 VOLUME CONTROL DAMPERS

A. Single Blade Dampers:
   1. Fabricate for duct sizes up to 6 by 30 inch (150 by 760 mm).
   2. Blade: 24 gage, 0.0239 inch (0.61 mm), minimum.

B. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch (200 by 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
   1. Blade: 18 gage, 0.0478 inch (1.21 mm), minimum.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 233100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 by 8 inch (200 by 200 mm) size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch (100 by 100 mm) for balancing dampers only. Review locations prior to fabrication.

D. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

E. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

F. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

G. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION 233300

SECTION 233423
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof exhausters.

1.02 RELATED REQUIREMENTS

A. Section 230513 - Common Motor Requirements for HVAC Equipment.

B. Section 233300 - Air Duct Accessories: Backdraft dampers.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Indicate installation instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carnes, a division of Carnes Company Inc; [_____]

B. Greenheck Fan Corporation

C. Loren Cook Company; [_____]

2.02 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.

B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

C. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.

D. Fabrication: Comply with AMCA 99.

E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.03 ROOF EXHAUSTERS

A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch (13 mm) mesh, 0.62 inch (1.6 mm) thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

B. Roof Curb: 12 inch (300 mm) high self-flashing of galvanized steel with continuously welded seams, built-in cant strips.

C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor and wall mounted multiple speed switch.

D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

END OF SECTION 233423

SECTION 233600
AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single-duct terminal units.
   1. Single-duct, variable-volume units.

1.02 RELATED REQUIREMENTS

A. Section 230548 - Vibration and Seismic Controls for HVAC.

B. Section 230923 - Direct-Digital Control System for HVAC.

C. Section 230993 - Sequence of Operations for HVAC Controls.

D. Section 232113 - Hydronic Piping: Connections to heating coils.

E. Section 232114 - Hydronic Specialties: Connections to heating coils.

F. Section 233100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

A. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils 2001, with Addendum (2011).

B. AHRI 880 (I-P) - Performance Rating of Air Terminals 2017.

C. ASTM A492 - Standard Specification for Stainless Steel Rope Wire 1995 (Reapproved 2019).

D. ASTM A603 - Standard Specification for Metallic-Coated Steel Structural Wire Rope 2019.

E. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material) 2019.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.

G. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems 2008.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate air flow, static pressure, and NC designation. Include electrical characteristics and connection requirements.

C. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 SINGLE-DUCT, VARIABLE-VOLUME UNITS

A. Basis of Design: Titus-HVAC:
   1. Single-Duct Terminal Unit: DESV.

B. General:
   1. Factory-assembled, AHRI 880 (I-P) rated and bearing the AHRI seal, air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.
   2. Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits, coil type and coil (right or left hand) connection, where applicable.

C. Unit Casing:
   1. Minimum 22 gage, 0.0299 inch (0.76 mm) galvanized steel.
   2. Air Inlet Collar: Provide round, suitable for standard flexible duct sizes.
   3. Unit Discharge: Rectangular, with slip-and-drive connections.
   4. Acceptable Liners:
      a. 1/2 inch (13 mm) thick, coated, fibrous-glass complying with ASTM C1071.
         1) Secure with adhesive.

2) Coat edges exposed to airstream with NFPA 90A approved sealant.
3) Cover liner with non-porous foil.

b. Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.

D. Damper Assembly:
1. Heavy-gage, galvanized steel or extruded aluminum construction with solid steel, nickel-plated shaft pivoting on HDPE, self-lubricating bearings.
2. Provide integral position indicator or alternative method for indicating damper position over full range of 90 degrees.
3. Incorporate low leak damper blades for tight airflow shutoff.

E. Hot Water Heating Coil:
1. Coil Casing: Minimum 22 gage, 0.0299 inch (0.76 mm) galvanized steel, factory-installed on terminal discharge with rectangular outlet, duct connection type.
2. Coil Fins: Aluminum or aluminum plated fins, mechanically-bonded to seamless copper tubes.
3. Coil leak tested to minimum 350 psig (2413 kPa).
4. Base performance data on tests run in accordance with AHRI 410 and units to bear AHRI 410 label.

F. Controls:
1. Electric:
2. DDC (Direct-Digital Controls):
a. Bi-directional Damper Actuator: 24 volt, powered closed, spring return open.
b. Microprocessor-Based Controller: Air volume controller, pressure-independent with electronic airflow transducers, factory-calibrated maximum and minimum CFM's.
1) Occupied and unoccupied operating mode.
2) Remote reset of temperature or CFM set points.
3) Proportional, plus integral control of room temperature.
4) Monitoring and adjusting with portable terminal.
c. Room Sensor:
1) Compatible with temperature controls specified.
2) Wall-mounted, system powered, with temperature set-point adjustment including connection access for portable operator terminal.
3. Control Sequence:
a. Suitable for operation with duct pressures between 0.25 and 3.0 inch wg (60 and 750 Pa) inlet static pressure.
b. Include factory-mounted and piped, 5-micron filter; and adjustable, velocity-resetting, high-limit control with amplifying relay.
c. See Section 230993.

2.02 HOSE KITS AND VALVES

A. Manufacturers:
1. Griswold Controls
2. Hays Fluid Controls
3. IMI Flow Design

B. Automatic Balancing Valves:
1. Brass body for shutoff and hydronic balancing.

C. Ball Valves:
1. Brass body for shutoff and hydronic balancing.
2. Provide pressure/temperature ports.

D. Y Strainers:
1. Bronze body.
2. "Y" type configuration with brass cap.
3. Maximum Operating Pressure: Minimum 450 psi (3103 kPa).
4. Screen: Stainless steel.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.

C. Provide ceiling access doors or locate units above easily removable ceiling components.

D. Support units individually from structure with wire rope complying with ASTM A492 and ASTM A603 in accordance with SMACNA (SRM). See Section 23 0548.

E. Do not support from ductwork.

F. Connect to ductwork in accordance with Section 233100.

3.02 ADJUSTING

A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to zero percent full flow. Set units with heating coils for minimum 50 percent full flow.

END OF SECTION 233600

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SECTION 233700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

C. Louvers.

D. Goosenecks.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets 2006 (Reaffirmed 2021).

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2020.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carnes, a division of Carnes Company Inc

B. Krueger-HVAC

C. Price Industries

D. Titus, a brand of Air Distribution Technologies

2.02 RECTANGULAR CEILING DIFFUSERS

A. Type: Provide square, stamped, multi-core diffuser to discharge air in four way pattern with sectorizing baffles where indicated.

B. Connections: Round.

C. Frame: Provide surface mount and inverted T-bar type. In plaster ceilings, provide plaster frame and ceiling frame.

D. Color: As indicated.

2.03 DUCT-MOUNTED SUPPLY AND RETURN REGISTERS LOUVERS

A. Type: Duct-mounted, rectangular register for round-spiral duct with adjustable pivot-ended blades, end caps, built-in volume damper, and dual cover flanges to lay flush on duct surface regardless of diameter. Performance to match manufacturer's catalog data.

B. Color: Painted to match ductwork.

2.04 CEILING SUPPLY REGISTERS GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, one-way deflection.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket.

C. Color: As indicated.

D. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.05 CEILING EXHAUST AND RETURN REGISTERS GRILLES

A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with blades set at 45 degrees, vertical face.

B. Fabrication: Steel with 20 gage, 0.0359 inch (0.91 mm) minimum frames and 22 gage, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gage, 0.0359 inch

(0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.

C. Color: As indicated.

2.06 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch (13 by 13 by 13 mm) grid core.

B. Fabrication: Grid core consists of steel with baked enamel finish.

C. Color: As indicated.

D. Frame: Channel lay-in frame for suspended grid ceilings.

2.07 WALL SUPPLY REGISTERS GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing with spring or other device to set blades, vertical face, single deflection.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket.

C. Fabrication: Steel with 20 gage, 0.0359 inch (0.91 mm) minimum frames and 22 gage, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gage, 0.0359 inch (0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: As indicated.

E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.08 WALL EXHAUST AND RETURN REGISTERS GRILLES

A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with spring or other device to set blades, vertical face.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.

C. Fabrication: Steel frames and blades, with factory baked enamel finish.

D. Color: As indicated on the drawings.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.09 LINEAR WALL REGISTERS GRILLES

A. Type: Streamlined blades with 0 degree deflection, 1/8 by 3/4 inch (3.2 by 19 mm) on 1/4 inch (6 mm) centers.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum extrusions, with factory baked enamel finish.

D. Color: As indicated.

2.10 LOUVERS

A. Type: 4 inch (100 mm) deep with blades on 45 degree slope with center baffle and return bend, heavy channel frame, 1/2 inch (13 mm) square mesh screen over exhaust and 1/2 inch (13 mm) square mesh screen over intake.

B. Fabrication: 16 gage, 0.0598 inch (1.52 mm) thick galvanized steel welded assembly, with factory baked enamel finish.

C. Color: To be selected by Architect from manufacturer's standard range.

2.11 GOOSENECKS

A. Fabricate in accordance with SMACNA (DCS) of minimum 18 gage, 0.0598 inch (1.21 mm) galvanized steel.

B. Mount on minimum 12 inch (300 mm) high curb base where size exceeds 9 by 9 inch (230 by 230 mm).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 099123.

END OF SECTION 233700

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SECTION 260505
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

1.02 RELATED REQUIREMENTS

A. Section 017000 - Execution and Closeout Requirements: Additional requirements for alterations work.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements and circuiting arrangements are as indicated.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on casual field observation and existing record documents.

D. Report discrepancies to Architect before disturbing existing installation.

E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
   2. Make temporary connections to maintain service in areas adjacent to work area.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Notify Owner before partially or completely disabling system.
   2. Notify local fire service.
   3. Make notifications at least 24 hours in advance.
   4. Make temporary connections to maintain service in areas adjacent to work area.

F. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Notify Owner at least 24 hours before partially or completely disabling system.
   2. Notify telephone utility company at least 24 hours before partially or completely disabling system.
   3. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in

accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:

1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
2. PCB- and DEHP-containing lighting ballasts.
3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

F. Disconnect and remove abandoned panelboards and distribution equipment.

G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

I. Repair adjacent construction and finishes damaged during demolition and extension work.

J. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

K. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.04 CLEANING AND REPAIR

A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

B. Clean and repair existing materials and equipment that remain or that are to be reused.

C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION 260505

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Metal-clad cable.

C. Wiring connectors.

D. Electrical tape.

E. Heat shrink tubing.

F. Oxide inhibiting compound.

G. Wire pulling lubricant.

H. Cable ties.

I. Firestop sleeves.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.

C. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

F. Section 312323 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
   3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Manufactured Wiring Systems Cable Assemblies: One of each configuration, 6 feet (2000 mm) length.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
   1. Exceptions:
      a. Use manufactured wiring systems for branch circuits where concealed under raised floors.
         1) Exception: Provide single conductor building wire in raceway for circuit homerun from distribution box to panelboard.
      b. Use power and control tray cable or metal-clad cable for installation in cable tray.
      c. Use variable-frequency drive cable for connection between variable-frequency motor controllers and associated motors.

C. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
         1) Maximum Length: 6 feet (1.8 m).
      b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
         1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
   2. In addition to other applicable restrictions, may not be used:
      a. Unless approved by Owner.
      b. Where not approved for use by the authority having jurisdiction.
      c. Where exposed to view.
      d. Where exposed to damage.
      e. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
      f. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.
      g. For patient care areas of health care facilities requiring redundant grounding.
      h. [_____].

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide new conductors and cables manufactured not more than one year prior to installation.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

E. Comply with NEMA WC 70.

F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

H. Conductors for Grounding and Bonding: Also comply with Section 260526.

I. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.

J. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

K. Conductor Material:
   1. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
      a. Substitution of aluminum conductors for copper is permitted, when approved by Owner and authority having jurisdiction, only for the following:
         1) Services: Copper conductors size 1/0 AWG and larger.
         2) Feeders: Copper conductors size 1/0 AWG and larger.
      b. Where aluminum conductors are substituted for copper, comply with the following:
         1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.
         2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.
         3) Provide aluminum equipment grounding conductor sized according to NFPA 70.
         4) Equip electrical distribution equipment with compression lugs for terminating aluminum conductors.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.
   4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

L. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG.
      a. Exceptions:
         1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
         2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
         3) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.
   2. Control Circuits: 14 AWG.

M. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

N. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
      a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
   3. Color Code:

a. 480Y/277 V, 3 Phase, 4 Wire System:
   1) Phase A: Brown.
   2) Phase B: Orange.
   3) Phase C: Yellow.
   4) Neutral/Grounded: Gray.
b. 208Y/120 V, 3 Phase, 4 Wire System:
   1) Phase A: Black.
   2) Phase B: Red.
   3) Phase C: Blue.
   4) Neutral/Grounded: White.
c. Equipment Ground, All Systems: Green.
d. Isolated Ground, All Systems: Green with yellow stripe.
e. Travelers for 3-Way and 4-Way Switching: Pink.
f. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
g. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
   1. Copper Building Wire:
      a. Cerro Wire LLC: www.cerrowire.com/#sle.
      b. Encore Wire Corporation: www.encorewire.com/#sle.
      c. General Cable Technologies Corporation: www.generalcable.com/#sle.
      d. Service Wire Co: www.servicewire.com/#sle.
      e. Southwire Company: www.southwire.com/#sle.
      f. Substitutions: See Section 016000 - Product Requirements.
   2. Aluminum Building Wire (only where specifically indicated or permitted for substitution):
      a. Encore Wire Corporation: www.encorewire.com/#sle.
      b. Southwire Company: www.southwire.com/#sle.
      c. Stabiloy, a brand of General Cable Technologies Corporation: www.stabiloy.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
   1. Feeders and Branch Circuits:
      a. Size 10 AWG and Smaller: Solid.
      b. Size 8 AWG and Larger: Stranded.
   2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
      a. Size 4 AWG and Larger: Type XHHW-2.
      b. Installed Underground: Type XHHW-2.
      c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.
   2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

2.04 METAL-CLAD CABLE

A. Manufacturers:
   1. AFC Cable Systems Inc: www.afcweb.com/#sle.
   2. Encore Wire Corporation: www.encorewire.com/#sle.
   3. Service Wire Co: www.servicewire.com/#sle.

4. Southwire Company: www.southwire.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Provide oversized neutral conductors where indicated or required.

G. Provide dedicated neutral conductor for each phase conductor where indicated or required.

H. Grounding: Full-size integral equipment grounding conductor.
1. Provide additional isolated/insulated grounding conductor where indicated or required.

I. Armor: Steel, interlocked tape.

J. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.05 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 260526.

C. Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
3. Connectors for Aluminum Conductors: Use compression connectors.

D. Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
7. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
1. Manufacturers:
a. 3M: www.3m.com/#sle.
b. Ideal Industries, Inc: www.idealindustries.com/#sle.
c. NSI Industries LLC: www.nsiindustries.com/#sle.

d. Substitutions: See Section 016000 - Product Requirements.

H. Push-in Wire Connectors: Rated 600 V, 221 degrees F (105 degrees C).
1. Manufacturers:
a. Ideal Industries, Inc: www.idealindustries.com/#sle.
b. NSI Industries LLC: www.nsiindustries.com/#sle.
c. Wago Corporation: www.wago.us/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

I. Mechanical Connectors: Provide bolted type or set-screw type.
1. Manufacturers:
a. Burndy LLC: www.burndy.com/#sle.
b. Ilsco: www.ilsco.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

J. Compression Connectors: Provide circumferential type or hex type crimp configuration.
1. Manufacturers:
a. Burndy LLC: www.burndy.com/#sle.
b. Ilsco: www.ilsco.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

K. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
1. Manufacturers:
a. Burndy LLC: www.burndy.com/#sle.
b. Ilsco: www.ilsco.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

2.06 ACCESSORIES

A. Electrical Tape:
1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
a. Substitutions: See Section 016000 - Product Requirements.
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
a. Substitutions: See Section 016000 - Product Requirements.
3. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
a. Substitutions: See Section 016000 - Product Requirements.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

E. Cable Ties: Material and tensile strength rating suitable for application.

F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.
1. Products:

a. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.
b. Menzies Metal Products; Electrical Retro Box: www.menzies-metal.com/#sle.
c. Substitutions: See Section 016000 - Product Requirements.

G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
1. Products:
a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

H. Fire-Protective Coating for Electrical Conductors and Cables: Field-applied, intumescent or ablative coating designed to prevent ignition and propagation of fire along thermoplastic-insulated conductors and cables.
1. Pass flammability tests of one of the following:
a. ASTM E84, Class A; maximum flame spread index of 25.
b. FM 3971.
c. IEEE 383.
2. Products:
a. Vimasco Corporation; CharCoat CC Cable Coating: www.charcoat.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Exposed Cable Installation (only where specifically permitted):
   1. Route cables parallel or perpendicular to building structural members and surfaces.
   2. Protect cables from physical damage.

G. Direct Burial Cable Installation:
   1. Provide trenching and backfilling in accordance with Section 312316.13 - Trenching.
   2. Install cable with minimum cover of 24 inches (610 mm) unless otherwise indicated or required.
   3. Protect cables from damage in accordance with NFPA 70.
   4. Provide underground warning tape in accordance with Section 260553 along entire cable length.

H. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

I. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
   1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
   2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

J. Terminate cables using suitable fittings.
   1. Metal-Clad Cable (Type MC):
      a. Use listed fittings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
      c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.

K. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

L. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet (1.5 m) of slack.

M. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

N. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

O. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
   5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
   6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

P. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
   1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
      b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
   2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
      b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
   3. Wet Locations: Use heat shrink tubing.

Q. Insulate ends of spare conductors using vinyl insulating electrical tape.

R. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

S. Identify conductors and cables in accordance with Section 260553.

T. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

U. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION 260519

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SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
   1. Includes oxide inhibiting compound.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.

F. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

G. Separately Derived System Grounding:
   1. Separately derived systems include, but are not limited to:
      a. Transformers (except autotransformers such as buck-boost transformers).
   2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
   3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
   4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
   5. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
   6. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

H. Bonding and Equipment Grounding:
   1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
   2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
   3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
   4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
   5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
   6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
   7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
      a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
      b. Metal gas piping.
      c. Metal process piping.
   8. Provide bonding for interior metal air ducts.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
   1. Use insulated copper conductors unless otherwise indicated.

2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gauge of specified conductors.

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Oxide Inhibiting Compound: Comply with Section 260519.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Make grounding and bonding connections using specified connectors.
1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

D. Identify grounding and bonding system components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

C. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION 260526

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SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.

B. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

C. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

D. Section 262513 - Low-Voltage Busways: Additional support and attachment requirements for busway.

E. Section 265100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

1.05 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.

2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Materials for Metal Fabricated Supports: Comply with Section 055000.

C. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.
3. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
    b. Erico International Corporation: www.erico.com/#sle.
    c. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
    d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
    e. Thomas & Betts Corporation: www.tnb.com/#sle.
    f. Substitutions: See Section 016000 - Product Requirements.

D. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
1. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
    b. Erico International Corporation: www.erico.com/#sle.
    c. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
    d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
    e. Thomas & Betts Corporation: www.tnb.com/#sle.

E. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
1. Comply with MFMA-4.
2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
3. Channel Material:
    a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
5. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
6. Manufacturers:
    a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
    b. Thomas & Betts Corporation: www.tnb.com/#sle.
    c. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
    d. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.

F. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:

a. Equipment Supports: 1/2 inch (13 mm) diameter.
b. Busway Supports: 1/2 inch (13 mm) diameter.
c. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch (6 mm) diameter.
d. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch (10 mm) diameter.
e. Trapeze Support for Multiple Conduits: 3/8 inch (10 mm) diameter.
f. Outlet Boxes: 1/4 inch (6 mm) diameter.
g. Luminaires: 1/4 inch (6 mm) diameter.

G. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
3. Mounting Height: Provide minimum clearance of 6 inches (150 mm) under supported component to top of roofing.
4. Manufacturers:
a. Cooper B-Line, a division of Eaton Corporation; [_____]: www.cooperindustries.com/#sle.
b. Erico International Corporation; [_____]: www.erico.com/#sle.
c. PHP Systems/Design; [_____]: www.phpsd.com/#sle.
d. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
e. [_____].
f. Substitutions: See Section 016000 - Product Requirements.

H. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Plastic and lead anchors are not permitted.
10. Powder-actuated fasteners are permitted only as follows:
a. Where approved by Architect.
b. Use only threaded studs; do not use pins.
11. Hammer-driven anchors and fasteners are permitted only as follows:
a. Nails are permitted for attachment of nonmetallic boxes to wood frame construction (when specified).
b. Staples are permitted for attachment of nonmetallic-sheathed cable to wood frame construction (when specified).
12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
a. Comply with MFMA-4.
b. Channel Material: Use galvanized steel.
c. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm) minimum base metal thickness.
d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
14. Manufacturers - Mechanical Anchors:
a. Hilti, Inc: www.us.hilti.com/#sle.
b. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.
c. Powers Fasteners, Inc: www.powers.com/#sle.
d. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Field-Welding (where approved by Architect): Comply with Section 055000.

I. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.
   5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

J. Conduit Support and Attachment: Also comply with Section 260533.13.

K. Box Support and Attachment: Also comply with Section 260533.16.

L. Interior Luminaire Support and Attachment: Also comply with Section 265100.

M. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

N. Secure fasteners according to manufacturer's recommended torque settings.

O. Remove temporary supports.

P. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 260529

SECTION 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Flexible metal conduit (FMC).

C. Liquidtight flexible metal conduit (LFMC).

D. Electrical metallic tubing (EMT).

E. Rigid polyvinyl chloride (PVC) conduit.

F. Liquidtight flexible nonmetallic conduit (LFNC).

G. Conduit fittings.

H. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 078400 - Firestopping.

C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Metal clad cable (Type MC), armored cable (Type AC), and manufactured wiring systems, including uses permitted.

D. Section 260526 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.

E. Section 260529 - Hangers and Supports for Electrical Systems.

F. Section 260533.16 - Boxes for Electrical Systems.

G. Section 260533.23 - Surface Raceways for Electrical Systems.

H. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2013.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.

D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
   4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   2. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
   3. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
   4. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
   5. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches (100 mm) on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.

D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.

H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
   1. Locations subject to physical damage include, but are not limited to:
      a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.
      b. Where exposed below 20 feet (6.1 m) in warehouse areas.
      c. [_____].

J. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
   1. Maximum Length: 6 feet (1.8 m).

K. Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit.

2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
4. Vibrating equipment includes, but is not limited to:
    a. Transformers.
    b. Motors.

L. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.02 CONDUIT REQUIREMENTS

A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.

B. Communications Systems Conduits: Also comply with Section 271000.

C. Fittings for Grounding and Bonding: Also comply with Section 260526.

D. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

E. Provide products listed, classified, and labeled as suitable for the purpose intended.

F. Minimum Conduit Size, Unless Otherwise Indicated:
1. Branch Circuits: 3/4 inch (21 mm) trade size.
2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
3. Control Circuits: 1/2 inch (16 mm) trade size.
4. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
5. Underground, Interior: 3/4 inch (21 mm) trade size.
6. Underground, Exterior: 1 inch (27 mm) trade size.

G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com/#sle.
2. Electri-Flex Company: www.electriflex.com/#sle.
3. International Metal Hose: www.metalhose.com/#sle.

B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

C. Fittings:
1. Manufacturers:
    a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
    b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
    c. Thomas & Betts Corporation: www.tnb.com/#sle.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com/#sle.
2. Electri-Flex Company: www.electriflex.com/#sle.
3. International Metal Hose: www.metalhose.com/#sle.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:
1. Manufacturers:
    a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
    b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
    c. Thomas & Betts Corporation: www.tnb.com/#sle.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.

2.05 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
1. Allied Tube & Conduit, a division of Atkore International: www.alliedeg.com/#sle.
2. Nucor Tubular Products: www.nucortubular/#sle.
3. Western Tube, a division of Zekelman Industries: www.westerntube.com/#sle.
4. Wheatland Tube, a division of Zekelman Industries: www.wheatland.com/#sle.

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
1. Manufacturers:
    a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
    b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
    c. Thomas & Betts Corporation: www.tnb.com/#sle.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
    a. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use compression (gland) or set-screw type.
    a. Do not use indenter type connectors and couplings.
5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

2.06 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:
1. Cantex Inc: www.cantexinc.com/#sle.
2. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.
3. JM Eagle: www.jmeagle.com/#sle.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.07 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com/#sle.
2. Electri-Flex Company: www.electriflex.com/#sle.
3. International Metal Hose: www.metalhose.com/#sle.

B. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.

C. Fittings:
1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for the type of conduit to be connected.

2.08 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).

E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

F. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

G. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
   1. Products:
      a. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.
      b. Menzies Metal Products; Electrical Retro Box: www.menzies-metal.com/#sle.

H. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
   1. Manufacturers:
      a. Quickflash Weatherproofing Products, Inc: www.quickflashproducts.com/#sle.

I. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
   1. Products:
      a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

D. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.

E. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Conceal all conduits unless specifically indicated to be exposed.
   4. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
      c. Within joists in areas with no ceiling.
   5. Unless otherwise approved, do not route conduits exposed:
      a. Across floors.
      b. Across roofs.
      c. Across top of parapet walls.
      d. Across building exterior surfaces.
   6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where

practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.
14. Group parallel conduits in the same area together on a common rack.

F. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide required vibration isolation and/or seismic controls in accordance with Section 260548.
3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
4. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
5. Use conduit strap to support single surface-mounted conduit.
    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
6. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
7. Use conduit clamp to support single conduit from beam clamp or threaded rod.
8. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
9. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
10. Use of spring steel conduit clips for support of conduits is permitted only as follows:
    a. Support of electrical metallic tubing (EMT) up to 1 inch (27 mm) trade size concealed above accessible ceilings and within hollow stud walls.
11. Use of wire for support of conduits is not permitted.
12. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.

G. Connections and Terminations:
1. Use suitable adapters where required to transition from one type of conduit to another.
2. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
3. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
4. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
5. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

H. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.

3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
9. Provide metal escutcheon plates for conduit penetrations exposed to public view.
10. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

I. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
   1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
   2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
   3. Where conduits are subject to earth movement by settlement or frost.

J. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
   1. Where conduits pass from outdoors into conditioned interior spaces.
   2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
   3. Where conduits penetrate coolers or freezers.

K. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

L. Provide grounding and bonding in accordance with Section 260526.

M. Identify conduits in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION 260533.13

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SECTION 260533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

C. Boxes and enclosures for integrated power, data, and audio/video.

D. Floor boxes.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

E. Section 260533.23 - Surface Raceways for Electrical Systems:
   1. Accessory boxes designed specifically for surface raceway systems.
   2. Lay-in wireways and wiring troughs with removable covers.

F. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 262726 - Wiring Devices:
   1. Wall plates.
   2. Floor box service fittings.
   3. Poke-through assemblies.
   4. Access floor boxes.
   5. Additional requirements for locating boxes for wiring devices.

H. Section 262813 - Fuses: Spare fuse cabinets.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
   4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
   5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
   6. Coordinate the work with other trades to preserve insulation integrity.
   7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.

8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
   5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
   1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
   2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
   3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
   4. Use cast aluminum boxes where aluminum rigid metal conduit is used.
   5. Use nonmetallic boxes where exposed rigid PVC conduit is used.
   6. Use suitable concrete type boxes where flush-mounted in concrete.
   7. Use suitable masonry type boxes where flush-mounted in masonry walls.
   8. Use raised covers suitable for the type of wall construction and device configuration where required.
   9. Use shallow boxes where required by the type of wall construction.
   10. Do not use "through-wall" boxes designed for access from both sides of wall.
   11. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
   12. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.

13. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
14. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
15. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
16. Minimum Box Size, Unless Otherwise Indicated:
    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    b. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
17. Wall Plates: Comply with Section 262726.
18. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com/#sle.
    b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com/#sle.
    c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com/#sle.
    d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
    e. Thomas & Betts Corporation: www.tnb.com/#sle.
    f. Substitutions: See Section 016000 - Product Requirements.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    a. Indoor Clean, Dry Locations: Type 1, painted steel.
    b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
    b. Boxes 6 square feet (0.56 sq m) and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
    b. Back Panels: Painted steel, removable.
    c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
6. Manufacturers:
    a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
    b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.
    c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.

D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
1. Manufacturers:
    a. Hubbell Incorporated: www.hubbell.com/#sle.

E. Floor Boxes:
1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 262726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
2. Use cast iron floor boxes within slab on grade.
3. Use sheet-steel or cast iron floor boxes within slab above grade.
4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
5. Manufacturer: Same as manufacturer of floor box service fittings.

2.02 ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.
   1. Manufacturers:
      a. Quickflash Weatherproofing Products, Inc: www.quickflashproducts.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:
   1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
   2. Unless dimensioned, box locations indicated are approximate.
   3. Locate boxes as required for devices installed under other sections or by others.
      a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
      b. Communications Systems Outlets: Comply with Section 271000.
   4. Locate boxes so that wall plates do not span different building finishes.
   5. Locate boxes so that wall plates do not cross masonry joints.
   6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
   7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
   8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.
   9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
      a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
      b. Do not install flush-mounted boxes with area larger than 16 square inches (0.0103 sq m) or such that the total aggregate area of openings exceeds 100 square inches (0.0645 sq m) for any 100 square feet (9.29 sq m) of wall area.
   10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
   11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
      a. Concealed above accessible suspended ceilings.

b. Within joists in areas with no ceiling.
c. Electrical rooms.
d. Mechanical equipment rooms.

I. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.

L. Install boxes as required to preserve insulation integrity.

M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

N. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.

O. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

Q. Close unused box openings.

R. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

S. Provide grounding and bonding in accordance with Section 260526.

T. Identify boxes in accordance with Section 260553.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION 260533.16

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SECTION 260533.23
SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.
   1. Includes metal channel (strut) used as raceway.

C. Section 260533.13 - Conduit for Electrical Systems.

D. Section 260533.16 - Boxes for Electrical Systems.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 262726 - Wiring Devices: Receptacles.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of raceways with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate rough-in locations of outlet boxes provided under Section 260533.16 and conduit provided under Section 260533.13 as required for installation of raceways provided under this section.
   3. Verify minimum sizes of raceways with the actual conductors and components to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install raceways until final surface finishes and painting are complete.
   2. Do not begin installation of conductors and cables until installation of raceways is complete between outlet, junction and splicing points.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.
   1. Surface Raceway Systems: Include information on fill capacities for conductors and cables.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 RACEWAY REQUIREMENTS

A. Provide all components, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

2.02 SURFACE RACEWAY SYSTEMS

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell.com/#sle.
   2. MonoSystems, Inc: www.monosystems.com/#sle.
   3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Surface Metal Raceways: Listed and labeled as complying with UL 5.

C. Surface Nonmetallic Raceways: Listed and labeled as complying with UL 5A.

D. Multioutlet Assemblies: Listed and labeled as complying with UL 111.

E. Metal Channel (Strut) Used as Raceway: Comply with Section 260529.

2.03 WIREWAYS

A. Manufacturers:
   1. Cooper B-Line, a division of Cooper Industries: www.cooperindustries.com/#sle.
   2. Enduro Composites: www.endurocomposites.com/#sle.
   3. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.
   4. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

B. Description: Lay-in wireways and wiring troughs with removable covers; listed and labeled as complying with UL 870.

C. Wireway Type, Unless Otherwise Indicated:
   1. Indoor Clean, Dry Locations: NEMA 250, Type 1, painted steel with screw-cover.
   2. Outdoor Locations: NEMA 250, Type 3R, painted steel with screw-cover; include provision for padlocking.

D. Finish for Painted Steel Wireways: Manufacturer's standard grey unless otherwise indicated.

E. Minimum Wireway Size: 4 by 4 inches (100 by 100 mm) unless otherwise indicated.

F. Where wireway size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.04 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Factory test each production unit for pre-wired surface raceway systems to verify proper wiring.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes and conduit terminations are installed in proper locations and are properly sized in accordance with NFPA 70 to accommodate raceways.

C. Verify that mounting surfaces are ready to receive raceways and that final surface finishes are complete, including painting.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Surface Nonmetallic Raceways: Install in accordance with NEMA PRP 5.

D. Install raceways plumb and level.

E. Arrange wireways and associated raceway connections to comply with NFPA 70, including but not limited to requirements for deflected conductors and wireways used as pullboxes. Increase size of wireway where necessary.

F. Secure and support raceways in accordance with Section 260529 at intervals complying with NFPA 70 and manufacturer's requirements.

G. Close unused raceway openings.

H. Provide grounding and bonding in accordance with Section 260526.

I. Identify raceways in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect raceways for damage and defects.

C. Surface Raceway Systems with Integrated Devices: Test each wiring device to verify operation and proper polarity.

D. Correct wiring deficiencies and replace damaged or defective raceways.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 PROTECTION

A. Protect installed raceways from subsequent construction operations.

END OF SECTION 260533.23

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SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Voltage markers.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting.

B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

C. Section 262726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:
   1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
   2. Do not install identification products until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.

B. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Panelboards:
         1) Identify ampere rating.
         2) Identify voltage and phase.
         3) Identify power source and circuit number. Include location when not within sight of equipment.
         4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door,

use identification nameplate.
5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

b. Transformers:
1) Identify kVA rating.
2) Identify voltage and phase for primary and secondary.
3) Identify power source and circuit number. Include location when not within sight of equipment.
4) Identify load(s) served. Include location when not within sight of equipment.

c. Centralized Emergency Lighting Inverters:
1) Identify input and output voltage and phase.
2) Identify power source and circuit number for normal power source. Include location when not within sight of equipment.
3) Identify load(s) served. Include location.

2. Emergency System Equipment:
a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
c. Use identification nameplate to identify emergency operating instructions for emergency system equipment.

3. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
4. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
5. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
6. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
7. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
8. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.

C. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
2. Identification for Communications Conductors and Cables: Comply with Section 271000.
3. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

D. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
2. Use voltage markers or color coded boxes to identify systems other than normal power system.
3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
a. For exposed boxes in public areas, use only identification labels.

E. Identification for Devices:
1. Wiring Device and Wallplate Finishes: Comply with Section 262726.
2. Use identification label to identify fire alarm system devices.
a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.

3. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
4. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

F. Identification for Luminaires:
1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Manufacturers:
a. Brimar Industries, Inc: www.brimar.com/#sle.
b. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
c. Seton Identification Products: www.seton.com/#sle.
2. Materials:
a. Indoor Clean, Dry Locations: Use plastic nameplates.
3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
a. Exception: Provide minimum thickness of 1/8 inch (3 mm) when any dimension is greater than 4 inches (100 mm).
4. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Manufacturers:
a. Brady Corporation: www.bradyid.com/#sle.
b. Brother International Corporation: www.brother-usa.com/#sle.
c. Panduit Corp: www.panduit.com/#sle.
2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
a. Use only for indoor locations.
3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend:
a. Equipment designation or other approved description.
b. Other information as indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
a. System Designation: 1 inch (25 mm).
b. Equipment Designation: 1/2 inch (13 mm).
c. Other Information: 1/4 inch (6 mm).
d. Exception: Provide minimum text height of 1 inch (25 mm) for equipment located more than 10 feet (3.0 m) above floor or working platform.
5. Color:
a. Normal Power System: White text on black background.
1) 480Y/277 V, 3 Phase Equipment: White text on [_____] background.
2) 208Y/120 V, 3 Phase Equipment: White text on [_____] background.
b. Fire Alarm System: White text on red background.

2.03 VOLTAGE MARKERS

A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
2. Brimar Industries, Inc: www.brimar.com/#sle.
3. Seton Identification Products: www.seton.com/#sle.

B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

D. Minimum Size:
   1. Markers for Equipment: 1 1/8 by 4 1/2 inches (29 by 110 mm).
   2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
   3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
   4. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).

E. Legend:
   1. Markers for Voltage Identification: Highest voltage present.
   2. Markers for System Identification:
      a. Emergency Power System: Text "EMERGENCY".
      b. Other Systems: Type of service.

F. Color: Black text on orange background unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
   6. Interior Components: Legible from the point of access.
   7. Boxes: Outside face of cover.
   8. Conductors and Cables: Legible from the point of access.
   9. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
   1. Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Secure rigid signs using stainless steel screws.

G. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 260553

SECTION 260583
WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260533.13 - Conduit for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 262726 - Wiring Devices.

E. Section 262816.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
   2. Determine connection locations and requirements.

B. Sequencing:
   1. Install rough-in of electrical connections before installation of equipment is required.
   2. Make electrical connections before required start-up of equipment.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring device manufacturer’s catalog information showing dimensions, configurations, and construction.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Disconnect Switches: As specified in Section 262816.16 and in individual equipment sections.

B. Wiring Devices: As specified in Section 262726.

C. Flexible Conduit: As specified in Section 260533.13.

D. Wire and Cable: As specified in Section 260519.

E. Boxes: As specified in Section 260533.16.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION 260583

SECTION 260923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

B. In-wall time switches.

C. Lighting contactors.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 260918 - Remote Control Switching Devices: Remotely controlled devices for lighting control, including networked lighting controls, programmable relay panels, and remote control switching relays.

F. Section 262726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
   1. Includes finish requirements for wall controls specified in this section.
   2. Includes accessory receptacles, switches, dimmers and wall plates, to match lighting controls specified in this section.

G. Section 262813 - Fuses.

H. Section 265100 - Interior Lighting.

I. Section 265561 - Theatrical Lighting: Controls for stage lighting units.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
   3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
   4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
   5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install lighting control devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:
   1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

D. Field Quality Control Reports.

E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data: Include detailed information on device programming and setup.

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 Locking Receptacle-Mounted Outdoor Photo Controls: Five percent of total quantity installed for each type, but not less than two of each type.
   3. Electronic Trip Circuit Breakers: Provide one portable test set.
   4. Indicating Lights: Two of each different type.

H. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all occupancy sensors.

C. Provide five year manufacturer warranty for utility grade locking receptacle-mounted outdoor photo controls.

D. Provide two year manufacturer warranty for all daylighting controls.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell.com/#sle.

2. Lutron Electronics Company, Inc: www.lutron.com/#sle.
3. Sensor Switch Inc: www.sensorswitch.com/#sle.
4. WattStopper: www.wattstopper.com/#sle.
5. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. All Occupancy Sensors:
1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
   a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
   b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
   c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
   d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
8. Sensitivity: Field adjustable.
9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.
11. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
12. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.
13. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.
14. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.

C. Wall Switch Occupancy Sensors:
1. All Wall Switch Occupancy Sensors:
   a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
   b. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.
   c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.

d. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
f. Finish: Match finishes specified for wiring devices in Section 262726, unless otherwise indicated.

2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).
3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 400 square feet (37.2 sq m).
4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).

D. Wall Dimmer Occupancy Sensors:
1. General Requirements:
a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
e. Provide field adjustable dimming preset for occupied state.
f. Provide fade-to-off operation to notify occupant of impending load turn-off.
g. Finish: Match finishes specified for wiring devices in Section 262726, unless otherwise indicated.
2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).

E. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
a. Description: Low profile occupancy sensors designed for ceiling installation.
b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
c. Provide field selectable setting for disabling LED motion detector visual indicator.
d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
e. Finish: White unless otherwise indicated.
2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 square meters) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
3. Ultrasonic Ceiling Mounted Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet (46.5 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
b. Medium Range Sensors: Capable of detecting motion within an area of 1,000 square feet (92.9 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

c. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet (185.8 sq m) at a mounting height of 9 feet (2.7 m).

4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
   b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
   b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq m) at a mounting height of 9 feet (2.7 m).

F. Directional Occupancy Sensors:
1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
   a. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
   b. Provide field selectable setting for disabling LED motion detector visual indicator.
   c. Finish: White unless otherwise indicated.
2. Passive Infrared (PIR) Directional Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within a distance of 40 feet (12 m) at a mounting height of 10 feet (3.1 m).
   b. Long Range Sensors: Capable of detecting motion within a distance of 80 feet (24 m) at a mounting height of 10 feet (3.1 m).

G. Power Packs for Low Voltage Occupancy Sensors:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
3. Input Supply Voltage: Dual rated for 120/277 V ac.
4. Load Rating: As required to control the load indicated on drawings.

2.03 TIME SWITCHES

A. Manufacturers:
1. Intermatic, Inc: www.intermatic.com/#sle.
2. Tork, a division of NSI Industries LLC: www.tork.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.
4. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. Digital Electronic Time Switches:
1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
2. Program Capability:
   a. 24-Hour Time Switches: Single channel, with same schedule for each day of the week and skip-a-day feature to omit selected days.
   b. 7-Day Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days.
   c. Astronomic Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
3. Schedule Capacity: Not less than 16 programmable on/off operations.

4. Provide automatic daylight savings time and leap year compensation.
5. Provide power outage backup to retain programming and maintain clock.
6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
7. Provide remote photocell input with light level adjustment.
8. Input Supply Voltage: As indicated on the drawings.
9. Output Switch Configuration: As required to control the load indicated on drawings.
10. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:
    a. Indoor clean, dry locations: Type 1.
    b. Outdoor locations: Type 3R.
11. Provide flush-mounted unit where indicated, where mounted in public areas, or where mounted adjacent to flush-mounted equipment.

2.04 IN-WALL TIME SWITCHES

A. Manufacturers:
1. Intermatic, Inc: www.intermatic.com/#sle.
2. Tork, a division of NSI Industries LLC: www.tork.com/#sle.
3. Substitutions: See Section 016000 - Product Requirements.
4. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. Digital Electronic In-Wall Time Switches:
1. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.
2. Program Capability:
    a. 7-Day Time Switches: Capable of different schedule for each day of the week.
    b. Astronomic Time Switches: Capable of different schedule for each day of the week and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
3. Schedule Capacity: Not less than 40 programmable on/off operations.
4. Provide automatic daylight savings time compensation.
5. Provide power outage backup to retain programming and maintain clock.
6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
7. Switch Configuration: Suitable for use in either SPST or 3-way application.
8. Contact Ratings: As required to control the load indicated on drawings.

C. Electromechanical In-Wall Time Switches:
1. Description: Factory-assembled controller with motor-operated timing dial mechanism and adjustable trippers for setting on/off operations, suitable for mounting in standard wall box, and listed and labeled as complying with UL 917.
2. Program Capability: 24-hour time switch with same schedule for each day of the week.
3. Schedule Capacity: Accommodating not less than 24 selected on/off operations per day.
4. Manual override: Capable of permanently overriding current schedule.
5. Switch Configuration: SPST.
6. Contact Ratings: As required to control the load indicated on drawings.

2.05 ACCESSORIES

A. Auxiliary Contacts:
1. Comply with NEMA ICS 5.
2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.

B. Control and Timing Relays:
1. Comply with NEMA ICS 5.

2. Provide number and type of relays indicated or required to perform necessary functions.
3. Timing Relays: Electronic or pneumatic as indicated.
   a. Adjustable Timing Range: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Install lighting control relays furnished under Section 253626

C. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of lighting control devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switch Occupancy Sensors: 48 inches (1.2 m) above finished floor.
      b. In-Wall Time Switches: 48 inches (1.2 m) above finished floor.
      c. In-Wall Interval Timers: 48 inches (1.2 m) above finished floor.
   2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
   3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

D. Install lighting control devices in accordance with manufacturer's instructions.

E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

F. Install lighting control devices plumb and level, and held securely in place.

G. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 262726.

H. Provide required supports in accordance with Section 260529.

I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

J. Identify lighting control devices in accordance with Section 260553.

K. Occupancy Sensor Locations:
   1. Location Adjustments: Do not make adjustments to locations without obtaining approval from the Architect.

2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

M. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

N. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

O. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

P. Where indicated or required, provide cabinet or enclosure in accordance with Section 260533.16 for mounting of lighting control device system components.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test time switches to verify proper operation.

E. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect. Record settings in written report to be included with submittals.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Location: At project site.

END OF SECTION 260923

SECTION 262200
LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General purpose transformers.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260533.13 - Conduit for Electrical Systems: Flexible conduit connections.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 262416 - Panelboards.

1.03 REFERENCE STANDARDS

A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers Current Edition.

B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers 2015.

C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers 2013.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers 2015.

F. NEMA ST 20 - Dry-Type Transformers for General Applications 2014.

G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

I. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 506 - Standard for Specialty Transformers Current Edition, Including All Revisions.

K. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
   4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.

C. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.
   1. Greater than 10 kVA: 104 degrees F (40 degrees C) maximum.
   2. Less than 10 kVA: 77 degrees F (25 degrees C) maximum.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation: www.eaton.com/#sle.

B. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

C. Siemens Industry, Inc: www.usa.siemens.com/#sle.

D. Source Limitations: Furnish transformers produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 TRANSFORMERS - GENERAL REQUIREMENTS

A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.

B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
   1. Altitude: Less than 3,300 feet (1,000 m).
   2. Ambient Temperature:
      a. Greater than 10 kVA: Not exceeding 104 degrees F (40 degrees C).
      b. Less than 10 kVA: Not exceeding 77 degrees F (25 degrees C).

C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.

E. Basic Impulse Level: 10 kV.

F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

G. Isolate core and coil from enclosure using vibration-absorbing mounts.

H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.03 GENERAL PURPOSE TRANSFORMERS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

B. Primary Voltage: 480 volts delta, 3 phase.

C. Insulation System and Allowable Average Winding Temperature Rise:
   1. Less than 15 kVA: Class 180 degrees C insulation system with 115 degrees C average winding temperature rise.
   2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.

D. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.

E. Winding Taps:
   1. Less than 3 kVA: None.
   2. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
   3. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
   4. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.

F. Energy Efficiency: Comply with 10 CFR 431, Subpart K.

G. Sound Levels: Standard sound levels complying with NEMA ST 20

H. Mounting Provisions:
   1. Less than 15 kVA: Suitable for wall mounting.
   2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
   3. Larger than 75 kVA: Suitable for floor mounting.

I. Transformer Enclosure: Comply with NEMA ST 20.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   2. Construction: Steel.
      a. Less than 15 kVA: Totally enclosed, non-ventilated.
      b. 15 kVA and Larger: Ventilated.
   3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
   4. Provide lifting eyes or brackets.

J. Accessories:
   1. Mounting Brackets: Provide manufacturer's standard brackets.
   2. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

2.04 SOURCE QUALITY CONTROL

A. Factory test transformers according to NEMA ST 20.

B. Sound Level Tests: Perform factory test designated in NEMA ST 20 as "design" test on each production unit.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.

C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install transformers in accordance with NECA 409 and IEEE C57.94.

D. Use flexible conduit, under the provisions of Section 260533.13, 2 feet (600 mm) minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.

F. Install transformers plumb and level.

G. Transformer Support:
   1. Provide required support and attachment in accordance with Section 260529, where not furnished by transformer manufacturer.
   2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
   3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.
   4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

H. Provide grounding and bonding in accordance with Section 260526.

I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.

J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

K. Identify transformers in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

3.04 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.

B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from transformer components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262200

SECTION 262416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Lighting and appliance panelboards.

B. Load centers.

C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 262200 - Low-Voltage Transformers: Small power centers with integral primary breaker, transformer, and panelboard.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e (Amended 2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

E. NEMA PB 1 - Panelboards 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less 2013.

G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

K. UL 67 - Panelboards Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

M. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.

N. UL 1053 - Ground-Fault Sensing and Relaying Equipment Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
   4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.

D. Manufacturer's equipment seismic qualification certification.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
   1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation: www.eaton.com/#sle.

B. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

C. Siemens Industry, Inc: www.usa.siemens.com/#sle.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.

2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
a. Indoor Clean, Dry Locations: Type 1.
2. Boxes: Galvanized steel unless otherwise indicated.
a. Provide wiring gutters sized to accommodate the conductors to be installed.
3. Fronts:
a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Aluminum.
3. Ground Bus Material: Aluminum.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 LOAD CENTERS

A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.

B. Bussing:
1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Bus Material: Aluminum or copper.

C. Circuit Breakers: Thermal magnetic plug-in type.

D. Enclosures:
1. Provide flush-mounted enclosures unless otherwise indicated.
2. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   3. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
   6. Provide the following circuit breaker types where indicated:
      a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
   7. Do not use tandem circuit breakers.
   8. Do not use handle ties in lieu of multi-pole circuit breakers.

2.06 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 260529.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.

I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

J. Provide grounding and bonding in accordance with Section 260526.

K. Install all field-installed branch devices, components, and accessories.

L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

M. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

N. Provide filler plates to cover unused spaces in panelboards.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than [_____] amperes. Tests listed as optional are not required.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E. Test GFCI circuit breakers to verify proper operation.

F. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 262416

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SECTION 262726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates.

E. Floor box service fittings.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 260533.23 - Surface Raceways for Electrical Systems: Surface raceway systems, including multioutlet assemblies.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 260583 - Wiring Connections: Cords and plugs for equipment.

G. Section 260923 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
   3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
   4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
   5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
   6. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install wiring devices 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 catalog information showing dimensions, colors, and configurations.
   1. Wall Dimmers: Include derating information for ganged multiple devices.
   2. Surge Protection Receptacles: Include surge current rating, voltage protection rating (VPR) for each protection mode, and diagnostics information.

C. Operation and Maintenance Data:
   1. Wall Dimmers: Include information on operation and setting of presets.

2. GFCI Receptacles: Include information on status indicators.

D. Project Record Documents: Record actual installed locations of wiring devices.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Keys for Locking Switches: Two of each type.
3. Extra Wall Plates: One of each style, size, and finish.
4. Extra Flush Floor Service Fittings: Two of each type.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide tamper resistant receptacles for receptacles installed in dwelling units.

E. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.

F. Provide GFCI protection for receptacles installed in kitchens.

G. Provide GFCI protection for receptacles serving electric drinking fountains.

H. Unless noted otherwise, do not use combination switch/receptacle devices.

I. For flush floor service fittings, use tile rings for installations in tile floors.

J. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.02 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: White with oversized stainless steel wall plate.

C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

D. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.

E. Isolated Ground Convenience Receptacles: Orange.

F. Surge Protection Receptacles: Blue.

G. Wiring Devices Connected to Emergency Power: Red with red nylon wall plate.

H. Clock Hanger Receptacles: Brown with stainless steel wall plate.

I. Above-Floor Service Fittings: Gray wiring devices with satin aluminum housing.

J. Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.

K. Flush Poke-Through Service Fittings: Gray wiring devices with aluminum cover and aluminum flange.

L. Access Floor Boxes: Gray wiring devices with gray steel cover with insert to match floor covering.

2.03 WALL SWITCHES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com/#sle.
2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
4. .
5. Substitutions: See Section 016000 - Product Requirements.

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

D. Lighted Wall Switches: Industrial specification grade, 20 A, 120/277 V with illuminated standard toggle type switch actuator and maintained contacts; illuminated with load off; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

E. Pilot Light Wall Switches: Industrial specification grade, 20 A, 120/277 V with red illuminated standard toggle type switch actuator and maintained contacts; illuminated with load on; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

F. Locking Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed switch actuator and maintained contacts; switches keyed alike; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

G. Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with toggle type three position switch actuator and momentary contacts; single pole double throw, off with switch actuator in center position.

H. Locking Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed three position switch actuator and momentary contacts; switches keyed alike; single pole double throw, off with switch actuator in center position.

2.04 WALL DIMMERS

A. Manufacturers:
   1. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
   2. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com/#sle.
   3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

C. Control: Slide control type with separate on/off switch.

D. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:
   1. Incandescent: 600 W.
   2. Magnetic Low-Voltage: 600 VA.
   3. Electronic Low-Voltage: 400 VA.
   4. Fluorescent: 600 VA.

E. Provide locator light, illuminated with load off.

F. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

2.05 RECEPTACLES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com/#sle.
2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.
4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
5. Substitutions: See Section 016000 - Product Requirements.
6. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.
   3. Hospital Grade Receptacles: Listed as complying with UL 498 Supplement SD, with green dot hospital grade mark on device face.

C. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Automatically Controlled Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; controlled receptacle marking on device face per NFPA 70; single or duplex as indicated on the drawings.
   3. Isolated Ground Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, with ground contacts isolated from mounting strap; isolated ground triangle mark on device face; single or duplex as indicated on the drawings.
   4. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
   5. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

D. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
      a. Provide test and reset buttons of same color as device.
   2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
   3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
   4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
   5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

E. USB Charging Devices:
   1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
      a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
      b. Charging Capacity - Four-Port Devices: 4.2 A, minimum.
   2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

F. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.
   1. Standard Locking Convenience Receptacles: Single, 20A, 125V, NEMA L5-20R.

2.06 WALL PLATES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell-wiring.com/#sle.
   2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
   3. Lutron Electronics Company, Inc: www.lutron.com/#sle.
   4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.
   6. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

B. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Oversized.
   3. Screws: Metal with slotted heads finished to match wall plate finish.
   4. Provide screwless wallplates with concealed mounting hardware where indicated.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

E. Brass Wall Plates: Brushed satin finish, factory-coated to inhibit oxidation.

F. Aluminum Wall Plates: Smooth satin finish, clear anodized, factory-coated to inhibit oxidation.

G. Chrome Wall Plates: Smooth finish, chrome plated steel.

H. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

I. Premarked Wall Plates: Factory labeled as indicated; hot stamped for nylon wall plates and engraved for metal wall plates.

J. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

K. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.07 FLOOR BOX SERVICE FITTINGS

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell.com/#sle.
   2. Thomas & Betts Corporation: www.tnb.com/#sle.
   3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

B. Description: Service fittings compatible with floor boxes provided under Section 260533.16 with components, adapters, and trims required for complete installation.

C. Above-Floor Service Fittings:
   1. Single Service Pedestal Convenience Receptacles:
      a. Configuration: One standard convenience duplex receptacle.
   2. Single Service Pedestal Communications Outlets:
      a. Configuration: One 1 inch bushed opening.
      b. Voice and Data Jacks: Provided by others.
   3. Single Service Pedestal Furniture Feed:
      a. Configuration: One 3/4 inch knockout.
   4. Dual Service Pedestal Combination Outlets:
      a. Configuration:

1) Power: One standard convenience duplex receptacle.
2) Communications: One 1 inch bushed opening.
3) Voice and Data Jacks: Provided by others.

b. Provide barrier to separate line and low voltage compartments.

D. Flush Floor Service Fittings:
1. Single Service Flush Convenience Receptacles:
a. Cover: Rectangular.
b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
2. Single Service Flush Communications Outlets:
a. Cover: Rectangular.
b. Configuration: [_____].
c. Voice and Data Jacks: Provided by others.
3. Single Service Flush Furniture Feed:
a. Cover: Rectangular.
b. Configuration: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
4. Dual Service Flush Combination Outlets:
a. Cover: Rectangular.
b. Configuration:
1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).
2) Voice and Data Jacks: Provided by others.
5. Dual Service Flush Furniture Feed:
a. Cover: Rectangular.
b. Configuration:
1) Power: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
2) Communications: One 2-1/8 inch by 1 inch combination threaded opening(s).
6. Accessories:
a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.
b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that core drilled holes for poke-through assemblies are in proper locations.

H. Verify that openings in access floor are in proper locations.

I. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switches: 48 inches (1200 mm) above finished floor.
      b. Wall Dimmers: 48 inches (1200 mm) above finished floor.
      c. Fan Speed Controllers: 48 inches (1200 mm) above finished floor.
      d. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
   4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
   5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.

I. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

J. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.

K. Install wiring devices plumb and level with mounting yoke held rigidly in place.

L. Install wall switches with OFF position down.

M. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

N. Do not share neutral conductor on branch circuits utilizing wall dimmers.

O. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

P. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

Q. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

R. Identify wiring devices in accordance with Section 260553.

S. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Inspect each surge protection receptacle to verify surge protection is active.

G. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 262726

SECTION 26 41 00 - LIGHTNING PROTECTION SYSTEM FOR ROOFING

PART 1 GENERAL

1.1 WORK INCLUDES, BUT NOT LIMITED TO:

A. Install / modify existing lightning protection system as applicable to the installation of new rooftop mounted equipment as well as the removal of existing rooftop mounted equipment.

1.2 APPLICABLE REFERENCES

A. The following references form a part of this specification.
   1. NFPA – 780 Standard.
   2. UL- 96A Standard

1.3 QUALITY ASSURANCE

A. Installer should be a Lightning Protection Institute [LPI] certified master installer or a certified NFPA installer. Perform work in accordance with Local Building Code.

PART 2 PRODUCTS

2.1 SYSTEM DESIGN

General: System consists of air terminals, interconnecting conductors, down conductors, grounding and surge protection.

A. Design shall be per current NFPA 780 requirements, with class I materials. Materials that form electrolytic in the present of moisture shall not be used.

B. Grounding system and down conductors determined to meet the overall design requirement shall remain in place and shall be interconnected to the new or reinstalled system.

C. New designed air terminal minimum 10 inches projection above the object protected, maximum 20 feet spacing on the roof or perimeter edges and maximum 24 inches from roof edges and outside corners. Mid-roof areas are to be provided with air terminals of sufficient amount/height to insure the entire roof area is cover by a zone of protection as afforded by a 150-radius sphere.

PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect existing lightning protection materials to be reused and store in an area where materials do not interfere with the roof installation and are safe. Only materials that are in good shape shall be reused.

3.2 INSTALLATION

General: Component design shall be in accordance with UL 96 standard.

A. All fasteners necessary to maintain position and hold conductors in place. Do not screw into coping/siding/shingles to anchor clips or to install conductors, use adhesive for all applications, as applicable.

3.3 INSPECTION / MASTER LABEL

A. Upon completion the project must receive a new certificate for the building that the reinstalled/upgraded system is capable to function property.

END OF SECTION

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SECTION 265100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 260533.16 - Boxes for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 260923 - Lighting Control Devices.
   1. Includes lighting contactors.

E. Section 262726 - Wiring Devices: Manual wall switches and wall dimmers.

F. Section 265561 - Theatrical Lighting: Stage lighting units and associated controls.

1.03 REFERENCE STANDARDS

A. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information 2002 (Reaffirmed 2008).

B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products 2019.

C. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules 2019.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
   2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
   3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
   4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories,

and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:
    a. Include estimated useful life, calculated based on IES LM-80 test data.
    b. Include IES LM-79 test report upon request.

D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.

F. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide three year manufacturer warranty for LED luminaires, including drivers.

C. Provide two year manufacturer warranty for linear fluorescent ballasts.

D. Provide five year pro-rata warranty for batteries for emergency lighting units.

E. Provide ten year pro-rata warranty for batteries for self-powered exit signs.

F. Provide three year full warranty for fluorescent emergency power supply units.

G. Provide three year manufacturer warranty for LED retrofit luminaire conversion kits.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.
2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

H. LED Luminaires:
1. Components: UL 8750 recognized or listed as applicable.
2. Tested in accordance with IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

I. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
1. LED Tape - General Requirements:
a. Listed.
b. Designed for field cutting in accordance with listing.
c. Wet Location Applications: IEC 60529, IP 68 (waterproof) rated.
2. White LED Tape:
a. Color Rendering Index (CRI): Not less than 90.

J. Track Lighting Systems: Provide track compatible with specified track heads, with all connectors, power feed fittings, dead ends, hangers and canopies as necessary to complete installation.

K. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.03 EMERGENCY LIGHTING UNITS

A. Manufacturers:
1. Acuity Brands, Inc: www.acuitybrands.com/#sle.
2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.
3. Hubbell Lighting, Inc: www.hubbelllighting.com/#sle.

B. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

C. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

D. Battery:
1. Sealed maintenance-free lead calcium unless otherwise indicated.
2. Size battery to supply all connected lamps, including emergency remote heads where indicated.

E. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

F. Provide low-voltage disconnect to prevent battery damage from deep discharge.

G. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

H. Where indicated, provide units with integral time delay to maintain emergency illumination for 15 minutes after restoration of normal power source.

I. Accessories:
1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
2. Provide compatible accessory high impact polycarbonate vandal shields where indicated.
3. Provide compatible accessory wire guards where indicated.
4. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.04 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single- or double-face as indicated or as required for installed location.
   2. Directional Arrows: As indicated or as required for installed location.

B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
   1. Self-Powered Exit Signs:
      a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
      b. Battery: Sealed, maintenance-free, nickel cadmium unless otherwise indicated.
      c. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
      d. Provide low-voltage disconnect to prevent battery damage from deep discharge.
      e. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

C. Self-Luminous Exit Signs: Internally illuminated by tritium gas sealed inside phosphor-lined gas tubes, requiring no electrical power or batteries to operate, and with a service life of 20 years unless otherwise indicated.

D. Accessories:
   1. Provide compatible accessory high-impact polycarbonate vandal shields where indicated.
   2. Provide compatible accessory wire guards where indicated.

2.05 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
   3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

B. Fluorescent Ballasts:
   1. All Fluorescent Ballasts: Unless otherwise indicated, provide high frequency electronic ballasts complying with ANSI C82.11 and listed and labeled as complying with UL 935.
      a. Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 10 percent.
      b. Total Harmonic Distortion: Not greater than 20 percent.
      c. Power Factor: Not less than 0.95.
      d. Ballast Factor: Normal ballast factor between 0.85 and 1.15, unless otherwise indicated.
      e. Thermal Protection: Listed and labeled as UL Class P, with automatic reset for integral thermal protectors.
      f. Sound Rating: Class A, suitable for average ambient noise level of 20 to 24 decibels.
      g. Lamp Compatibility: Specifically designed for use with the specified lamp, with no visible flicker.
      h. Lamp Operating Frequency: Greater than 20 kHz, except as specified below.
         1) Do not operate lamp(s) within the frequencies from 30 kHz through 40 kHz in order to avoid interference with infrared devices.
         2) Do not operate lamp(s) within the frequencies from [_____] in order to avoid interference with [_____].
      i. Lamp Current Crest Factor: Not greater than 1.7.

j. Lamp Wiring Method:
   1) Instant Start Ballasts: Parallel wired.
   2) Rapid Start Ballasts: Series wired.
   3) Programmed Start Ballasts: Provide parallel or series/parallel wired where available; otherwise series wired is acceptable.
k. Provide automatic restart capability to restart replaced lamp(s) without requiring resetting of power.
l. Provide end of lamp life automatic shut down circuitry for T5 and smaller diameter lamp ballasts.
m. Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category A.
n. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class A, non-consumer application.
o. Provide high efficiency T8 lamp ballasts certified as NEMA premium where indicated.
p. Provide lamp striation reduction circuitry where indicated.
q. Ballast Marking: Include wiring diagrams with lamp connections.

C. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
   2. Control Compatibility: Fully compatible with the dimming controls to be installed.
      a. Wall Dimmers: See Section 262726.

2.06 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

D. Fire-Rated Luminaire Enclosures:
   1. Manufacturers:
      a. Fire Rated Product Specialties Corp: www.frpsonline.com/#sle.
      b. Specialty Products & Insulation (SPI); SafeLite: www.spi-co.com/#sle.
   2. Provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install products in accordance with manufacturer's instructions.

D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

E. Provide required support and attachment in accordance with Section 260529.

F. Provide required seismic controls in accordance with Section 260548.

G. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

H. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
   3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
   4. Secure pendant-mounted luminaires to building structure.
   5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
   6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.
   7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

I. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
   2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
   3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

J. Suspended Luminaires:
   1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
   2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
   3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet (1.2 m) between supports.
   4. Install canopies tight to mounting surface.
   5. Unless otherwise indicated, support pendants from swivel hangers.

K. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

L. Install accessories furnished with each luminaire.

M. Bond products and metal accessories to branch circuit equipment grounding conductor.

N. Emergency Lighting Units:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
   2. Install lock-on device on branch circuit breaker serving units.

O. Exit Signs:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
   2. Install lock-on device on branch circuit breaker serving units.

P. Identify luminaires connected to emergency power system in accordance with Section 260553.

Q. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

D. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 265100

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SECTION 265561
THEATRICAL LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stage lighting units and lamps.

B. Dimmers and control units.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate layout of rack-mounted equipment and details and diagrams of interconnecting wiring.

C. Product Data: Provide for each item of equipment, showing sizes and ratings.

D. Manufacturer's Installation Instructions.

E. Project Record Documents: Record actual locations of dimmer outlets and circuiting arrangements.

F. Operation Data:
   1. Instructions for operating lighting control system.
   2. Instructions for operating system under unusual conditions when emergency life safety conditions exist.
   3. Identify limits beyond which operation would result in hazardous or unsafe conditions or in equipment damage.
   4. Document ratings of system and of each major component.

G. Maintenance Data:
   1. Routine preventive maintenance schedule.
   2. Lists of special tools, maintenance materials, and replacement parts.
   3. Repair instructions for procedures to check, repair, and test equipment during typical malfunctions.
   4. Recommended cleaning methods, frequency, and materials.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL COMPONENTS

A. Lighting Dimming and Control System: For stage area and house lighting.

2.02 STAGE LIGHTING UNITS AND ACCESSORIES

A. Furnish products as indicated in Schedule included on the Drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install components in accordance with manufacturer's instructions.

B. Provide the services of a manufacturer representative to prepare and start systems.

C. Aim and adjust luminaires as indicated on Drawings.

D. Clean electrical parts to remove conductive and harmful materials.

E. Remove dirt and debris from enclosure.

F. Clean photometric control surfaces as recommended by manufacturer.

G. Clean finishes and touch up damage.

3.02 CLOSEOUT ACTIVITIES

END OF SECTION 265561

SECTION 270533.13
CONDUIT FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Aluminum rigid metal conduit (RMC).

C. Galvanized steel intermediate metal conduit (IMC).

D. Flexible metal conduit (FMC).

E. Galvanized steel electrical metallic tubing (EMT).

F. Aluminum electrical metallic tubing (EMT).

G. Rigid polyvinyl chloride (PVC) conduit.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2020.

C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A) 2020.

D. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit 2018.

E. BICSI ITSIMM - Information Technology Systems Installation Methods Manual, 7th Edition 2017.

F. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition 2019.

G. BICSI TDMM - Telecommunications Distribution Methods Manual, 13th Edition 2014.

H. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

I. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2013.

J. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit 2004.

K. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.

L. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, TIA-569, BICSI ITSIMM, BICSI TDMM, manufacturers' instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), stainless steel

electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).

D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or inside-plant flexible nonmetallic communications raceway/innerduct.

G. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), stainless steel electrical metallic tubing (EMT), or schedule 80 rigid PVC conduit.
   1. Locations subject to physical damage include, but are not limited to:
      a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.

H. Exposed, Interior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or stainless steel intermediate metal conduit (IMC).

I. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70 and TIA-569.

B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.

C. Provide conduit, fittings, supports, and accessories required for complete communications pathway.

D. Provide products listed, classified, and labeled as suitable for purpose intended.

E. Maximum Number of Communications Outlet Boxes per Continuous Conduit Homerun: 4.

F. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Communications Outlet Box: 1-inch (27 mm) trade size.
   2. Continuous Conduit Homerun Serving One Communications Outlet Box: 1-inch (27 mm) trade size.
   3. Continuous Conduit Homerun Serving Two Communications Outlet Boxes: 1-inch (27 mm) trade size.

G. Where conduit size is not indicated, size to comply with NFPA 70, TIA-569, and BICSI TDMM, but not less than applicable minimum size requirements specified. Where specified standards differ, comply with most stringent.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
   2. Material: Use steel or malleable iron.

3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.04 ALUMINUM RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.

B. Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6A
2. Material: Use aluminum.
3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.05 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.06 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. PVC-Coated Boxes and Fittings:
1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Nonhazardous Locations: Use boxes and fittings listed and labeled as complying with UL 514A, UL 514B, or UL 6.
3. Material: Use steel or malleable iron.
4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil, 0.040 inch (1.02 mm).
5. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

C. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil, 0.015 inch (0.38 mm).

2.07 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

2.08 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use compression/gland or set-screw type.
      a. Do not use indenter type connectors and couplings.
   4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.09 ALUMINUM ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT aluminum electrical metallic tubing listed and labeled as complying with UL 797A.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; listed for use with aluminum EMT.
   2. Material: Use aluminum.
   3. Connectors and Couplings: Use compression/gland or set-screw type.
      a. Do not use indenter type connectors and couplings.
   4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.10 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.
   3. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.

E. Install galvanized steel intermediate metal conduit (IMC) in accordance with NECA 101.

F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by manufacturer.

G. Install galvanized steel electrical metallic tubing (EMT) in accordance with NECA 101.

H. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

I. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
    a. Electrical rooms.
    b. Communications rooms.
    c. Mechanical equipment rooms.
    d. Within joists in areas with no ceiling.
5. Unless otherwise approved, do not route exposed conduits:
    a. Across floors.
    b. Across roofs.
    c. Across top of parapet walls.
    d. Across building exterior surfaces.
6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than equivalent of two 90-degree bend(s) between pull points.
    a. The equivalent of three 90-degree bends between pull points is permitted only under conditions described in BICSI TDMM.
9. Arrange conduit to provide no more than 100 feet (33 m) between pull points.
10. Arrange conduit to provide minimum bend radii in accordance with BICSI TDMM.
11. Route conduits above water and drain piping where possible.
12. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
13. Maintain recommended separation from sources of EMI greater than 5 kVA in accordance with BICSI ITSIMM and BICSI TDMM.
14. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
15. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.
16. Group parallel conduits in same area on common rack.

J. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use metal channel/strut with accessory conduit clamps to support multiple, parallel, surface-mounted conduits.
5. Use conduit clamp to support single conduit from beam clamp or threaded rod.
6. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple, parallel, suspended conduits.
7. Use of spring steel conduit clips for support of conduits is not permitted.
8. Use of wire for support of conduits is not permitted.

K. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.

3. Use suitable adapters where required to transition from one type of conduit to another.
4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
5. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect cables.
6. Secure joints and connections to provide mechanical strength and electrical continuity.

L. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves and/or slots for penetrations as indicated or as required to facilitate installation.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering building from underground at first accessible point to prevent entry of moisture and gases.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
8. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.

M. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed cables or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

N. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at accessible point near penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

O. Provide pull string in each empty conduit and innerduct/cell, and in each conduit where cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

P. Provide grounding and bonding.

Q. Identify conduits.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of cables.

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DRAWINGS [ATTACHED]

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