PROJECT MANUAL

PENDER HIGH SCHOOL FOOD & NUTRITION LAB RENOVATION

5380 NC-53 WEST
BURGAW, NORTH CAROLINA 28425

BID DOCUMENTS

OCTOBER 06, 2026

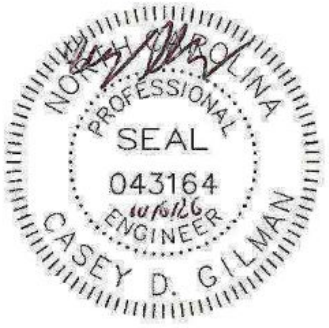
LS3P ARCHITECTURE ▪ INTERIORS ▪ PLANNING

101 N. THIRD STREET
SUITE 500
WILMINGTON, NC 28401
PHONE: 910.790.9901

LS3P COMMISSION NUMBER: 7201-261295

© 2026 LS3P

DOCUMENT 000107 – PROJECT DIRECTORY AND SEALS PAGES

ARCHITECTURE FIRM **101 N. Third Street** **Suits 500** **Wilmington, NC 28401** **910.790.9901**	LS3P Associates Ltd Corporate License #**50417**	
ARCHITECT **101 N. Third Street** **Suits 500** **Wilmington, NC 28401** **910.379.3616**	**Matt Bramstedt, AIA** License #**15497**	
STRUCTURAL ENGINEER **Woods Engineering** **254 North Front Street** **Suite 201** **Wilmington, NC 28401** **910.343.8007** **NC COA #C-1806**	**Adam L. Sisk, PE** License #**041563**	
PLUMBING ENGINEER **Cheatham & Associates, P.A.** **Consulting Engineers** **3412 Enterprise Drive** **Wilmington, NC 28405** **910.452.4210** **NC License #C-1073**	**Casey D. Gilman, PE** License #**043164**	

MECHANICAL ENGINEER **Cheatham & Associates, P.A.** **Consulting Engineers** **3412 Enterprise Drive** **Wilmington, NC 28405** **910.452.4210** **NC License #C-1073**	**Ken Lynch, PE** License #**17655**	
ELECTRICAL ENGINEER **Cheatham & Associates, P.A.** **Consulting Engineers** **3412 Enterprise Drive** **Wilmington, NC 28405** **910.452.4210** **NC License #C-1073**	**David C Beverly, PE** License #**056584**	

END OF PROJECT DIRECTORY AND SEALS PAGES

TABLE OF CONTENTS

COVER & TABLE OF CONTENTS
000101 – PROJECT TITLE PAGE
000107 – PROJECT DIRECTORY AND SEALS PAGES
000110 – TABLE OF CONTENTS

DIVISION 00 — PROCUREMENT AND CONTRACTING REQUIREMENTS
01 - FRONT END TABLE OF CONTENTS (JULY 2021)
03 - SECTION I INFORMATION FOR BIDDERS (JULY 2021)
04 - SECTION II - BID FORM BONDS HUB AFFIDAVITS PCS
05 - SECTION III OWNER - CONTRACTOR AGREEMENT (JULY 2021)
06 - SECTION IV - MINORITY PARTICIPATION
07 - SECTION V - PCS REDUCED SCOPE GENERAL CONDITIONS- $300K UP TO $2,000,000 (APRIL 2021) (R2336812X7AD04)
071 - SECTION V - APPENDIX A - CONTRACTORS SALES TAX REPORT
072 - SECTION V - APPENDIX B - SEXUAL OFFENDER REGISTRY AND CRIMINAL BACKGROUND CK
073 - SECTION V - APPENDIX C - ALLOWANCE EXPENDITURE AUTHORIZATION AEA
074 - SECTION V - APPENDIX D-1 CHANGE PROPOSAL FORM (T&M)
075 - SECTION V - APPENDIX D-2 CHANGE PROPOSAL FORM (LUMP SUM)
080 - SECTION VI - MISCELLANEOUS FORMS TITLE PAGE
081 - SECTION VI - AFFIDAVIT E - MBE CONTRACT PAYMENTS
082 - SECTION VI - E-VERIFY AFFIDAVIT
083 - SECTION VI – PENDER COUNTY SCHOOLS CALENDER-2026-2027
090 – BIDDER'S REQUEST FOR INFORMATION
090019 - ANTICIPATED PROJECT SCHEDULE

DIVISION 01 — GENERAL REQUIREMENTS
011000 - SUMMARY
012300 - ALTERNATES
012500 - SUBSTITUTION PROCEDURES
012500.1 - CONTRACTOR'S REQUEST FOR SUBSTITUTION FORM
012600 - CONTRACT MODIFICATION PROCEDURES
013000 – ADMINISTRATIVE REQUIREMENTS
013100 - PROJECT MANAGEMENT AND COORDINATION
013200 - CONSTRUCTION PROGRESS DOCUMENTATION
013300.01 - DIGITAL DATA LETTER OF AGREEMENT REV01.2023
013516 - ALTERATION PROJECT PROCEDURES
014000 - QUALITY REQUIREMENTS
014200 - REFERENCES
014339 - MOCKUPS
015000 - TEMPORARY FACILITIES AND CONTROLS
015000.01 - LS3P - SITE SIGNAGE SPECS 2024 ILM
016000 - PRODUCT REQUIREMENTS
017000 – EXECUTION AND CLOSEOUT REQUIREMENTS
017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
017823 - OPERATION AND MAINTENANCE DATA
017839 - PROJECT RECORD DOCUMENTS
017900 - DEMONSTRATION AND TRAINING

DIVISION 02 — EXISTING CONDITIONS
024100 - DEMOLITION

DIVISION 05 — METALS
055000 – METAL FABRICATIONS

DIVISION 06 — WOOD, PLASTICS, AND COMPOSITES
061053 – MISCELLANEOUS ROUGH CARPENTRY
062000 – FINISH CARPENTRY
064100 – ARCHITECTURAL WOOD CASEWORK

DIVISION 07 — THERMAL AND MOISTURE PROTECTION
078400 – FIRESTOPPING
079200 – JOINT SEALANTS

DIVISION 08 — OPENINGS
081613 – FIBERGLASS DOORS
087671 – DOOR HARDWARE SCHEDULE
087100 – DOOR HARDWARE
088000 - GLAZING

DIVISION 09 — FINISHES
090561 – SUBSTRATE PREPARATION FOR FLOORING INSTALLATION – USG
092116 – GYPSUM BOARD ASSEMBLIES
095100 – ACOUSTICAL CEILINGS
096623 – RESINOUS MATRIX TERRAZZO FLOORING
097200 – WALL COVERINGS
099123 – INTERIOR PAINTING

DIVISION 10 — SPECIALTIES
104400 – FIRE PROTECTION SPECIALTIES

DIVISION 11 — EQUIPMENT
113013 – RESIDENTIAL APPLIANCES

DIVISION 12 — FURNISHINGS
123600 - COUNTERTOPS

DIVISION 22 — PLUMBING
220100 - BASIC PLUMBING REQUIREMENTS
220513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT
220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING
220518 - ESCUTCHEONS FOR PLUMBING PIPING
220519 - METERS AND GAGES FOR PLUMBING PIPING
220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING
220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
220719 - PLUMBING PIPING INSULATION
221116 - DOMESTIC WATER PIPING
221119 - DOMESTIC WATER PIPING SPECIALTIES
221123 - DOMESTIC WATER PUMPS
221316 - SANITARY WASTE AND VENT PIPING
221319 - SANITARY WASTE PIPING SPECIALTIES
221500 - FUEL GAS PIPING
223400 - FUEL-FIRED, DOMESTIC-WATER HEATERS

224216.13 - COMMERCIAL LAVATORIES
224216.16 - COMMERCIAL SINKS

DIVISION 23 — HEATING VENTILATING AND AIR CONDITIONING
230500 - BASIC HVAC REQUIREMENTS
230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
230549 - VIBRATION CONTROLS FOR HVAC
230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC
230713 - DUCT INSULATION
230923 - DIRECT DIGITAL CONTROL SYSTEM FOR HVAC
232113 - HYDRONIC PIPING
233113 - METAL DUCTS
233300 - AIR DUCT ACCESSORIES
233346 - FLEXIBLE DUCTS
233423 - HVAC POWER VENTILATORS
233713 - AIR DIFFUSERS
233714 - REGISTERS AND GRILLES
233813 – COMMERCIAL KITCHEN HOODS
234100 - PARTICULATE AIR FILTRATION
237433 - DEDICATED OUTDOOR-AIR UNITS

DIVISION 26 — ELECTRICAL
260000 - ELECTRICAL, BASICS
260500 - BASIC ELECTRICAL MATERIALS AND METHODS
260519 - CONDUCTORS AND CABLES
260526 - GROUNDING AND BONDING
260533 - RACEWAYS AND BOXES
260553 - ELECTRICAL IDENTIFICATION
260923 - LIGHTING CONTROL DEVICES
262416 - PANELBOARDS
262726 - WIRING DEVICES
262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS
265119 - LED INTERIOR LIGHTING

DIVISION 28 — ELECTRONIC SAFETY AND SECURITY
283111 - DIGITAL, ADDRESSABLE FIRE ALARM SYSTEM

END OF TABLE OF CONTENTS

Table of Contents

Invitation to Bid

Section I – Information for Bidders

Section II – Bid Form including:

Section II Attachments:

- Affidavit A – Listing of Good Faith Efforts
- Affidavit B – Intent to Perform Contract with Own Forces
- Affidavit C – Portion of the Work to be Performed by HUB Certified/ Minority Businesses
- Affidavit D – Good Faith Efforts
- Bid Bond

Section III – Owner – Contractor Agreement, Performance and Payment Bonds

Section III Attachments:

- Bond Forms- Performance Bond
- Bond Forms- Labor and Material Payment Bond

Section IV – Minority Business Participation

Section V – General Conditions of the Contract for Construction

- Appendix A- Contractor's Sales Tax Report
- Appendix B- Sexual Offender Registry and Criminal Background Check Certification Form
- Appendix C- Allowance Expenditure Authorization Form
- Appendix D-1- Change Proposal Form (Time and Materials or Unit Price)
- Appendix D-2- Change Proposal Form (Fixed Price)

Section VI – Miscellaneous Forms

- Affidavit E – MBE Documentation for Contract Payments
- E-Verify Form
- Traditional Calendars
- Close-Out Document Checklist

Forms to be distributed at Pre-Construction meeting as required *(not included in Project Manual)*

- Application for Waiver of Tipping Fees
- Issuance of Key (s)/ Card(s) to Contractors KEY/CARD-5
- Affidavit of Capital Improvement Form E-589ci, if project is a capital improvement

SECTION I

INFORMATION FOR BIDDERS

I-1. SUBMISSION OF BIDS AND BID OPENING:

A. Bids will be received in accordance with the Invitation to Bid. Bidders, or their representative, and other interested persons may be present at the opening of the Bids.

B. The envelope containing the bid must be sealed and addressed to Pender County Schools Operations Building, 965 Penderlea Hwy, Burgaw, NC 28425. The outside of the envelope should also indicate the name of the Project, the name of the Bidder and the Bidder's North Carolina State Contractor's License Number.

C. The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids. The time with respect to the bid will be the Eastern Time for the United States as maintained by the Time Services Department of the U.S. Naval Observaory: http://www.usno.navy.mil/USNO/time/display-clocks/simpletime . Bids will not be accepted after the time(s) set forth in the Invitation to Bid.

I-2. BIDDING DOCUMENTS:

A. Bidding Documents include the Invitation to Bid, Information for Bidders, Bid Form, the Bid Security (if required), Affidavit's of Minority Participation and the Contract Documents, including any Addenda issued prior to receipt of bids. All requirements and obligations of the Bidding Documents are hereby incorporated by reference into the Contract Documents and are binding on the Successful Bidder upon award of the contract.

B. Bidders may obtain complete sets of the Bidding Documents as designated in the Invitation to Bid in the number and for the deposit, if any, stated therein.

C. Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor the Design Consultant shall assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

D. The Owner in making copies of the Bidding Documents available on the above terms does so only for the purpose of obtaining Bids on the Work and does not confer a license or grant for any other use.

I-3. DEFINITIONS:

A. THE BID:

A Bid is a complete and properly signed proposal to do the Work, or designated portion thereof, for the sums stipulated therein, submitted in accordance with the Bidding Documents and G.S. 143-128 and G.S. 143-129.

B. BASE BID:

The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which work may be added or deleted for sums stated in Alternate Bids, if any.

C. ALTERNATES:

An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

D. HE/HIS:

The term He or His is not intended to be gender specific.

I-4. QUALIFICATION OF BIDDER:

A. The Contractor must have been engaged in the performance of the type of work described in the Contract Documents for a period of no less that TWO years prior to submitting a bid.

B. Prior to Contract award or within seven days of the Owner's request to do so, the successful Bidder shall be prepared to provide sufficient references from customers with contracts of similar or greater size and scope, and other proof showing to Owner's satisfaction that Contractor is sufficiently experienced and capable of properly performing its proposed Contract with the Owner. Low Bidders that have failed to successfully perform one or more previous contracts with Owner must provide at least three (3) such references in writing from projects performed subsequent to such low bidder's most recent nonperformance of a contract with the Owner. In addition to references, Contractor must demonstrate that his present organization, direct labor force and prior work experience is of adequate size and development to maintain responsible control of the project and to schedule, coordinate and perform the work in an expeditious manner and in accordance with the Contract Documents.

C. Bidders, whether residents or nonresidents in North Carolina, will be required to show evidence of a valid North Carolina State Contractor's Licence Number before their bids will be considered.

D. The Owner will consider, in determining the qualifications of a Bidder, his record in the performance of any contracts for construction work into which he may have entered with the Owner or with similar public or private bodies or corporations. The Owner expressly reserves the right to reject the bid of any Bidder if such record discloses that such Bidder, in the opinion of the Owner, has not properly performed such contracts or has habitually and without just cause neglected the payment of bills, or has otherwise disregarded his obligations to Subcontractors, material suppliers or employees.

E. The Owner may make such investigation as they deem necessary to determine the ability of the Bidder to perform the work, and the Bidder shall furnish to the Owner all such information and

data for this purpose as they may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of such Bidder, fails to satisfy the Owner that such Bidder is a responsive and responsible Bidder in accordance with N.C. Gen. Stat. 143-128 and 143-129, and the criteria set forth herein. The Owner may require AIA Document A305 Contractor's Qualification Statement (or equivalent). Conditional bids will not be accepted.

I-5. BIDDER'S REPRESENTATIONS:

Each Bidder by submitting his Bid represents that:

A. He has read and understands the Bidding Documents and his Bid is made in accordance therewith; and Bidder agrees to be bound by the terms and requirements set forth in the Bidding and Contract Documents;

B. He has visited the site, has familiarized himself with the local conditions under which the Work is to be performed in accordance with Article I-9 herein, and has correlated his observations with the requirements of the proposed Contract Documents;

C. His Bid is based upon the materials, systems and equipment required by the Bidding Documents without exception; and

D. He has the capability, in all respects, and the moral and business integrity, reliability, technical ability, financial resources, plant, management, superintendents, equipment and materials which will assure effective and efficient good faith performance in full compliance with the Contract Documents and with any and all schedules and Milestone and Completion dates required by the Owner. The Bidder acknowledges and represents in his estimating, planning and scheduling of the Work that the Contract Time has made allowances for normal inclement weather indigenous to the Project Site. The Bidder hereby certifies that the work shall be completed, in place, in full accordance with the Contract Documents, within the time limits specified.

    i. He shall employ a competent superintendent who shall be in attendance on site during all construction activities for the execution of the work. The superintendent shall be approved by the Owner, and shall continue in that capacity on this project for the duration of the project, unless he ceases to be on the Contractor's payroll or the Owner otherwise agrees. The superintendent shall represent the Contractor and all communication given to the superintendent shall be binding as if given to the Contractor.

E. He agrees that upon receipt of the Notice of Award, he will execute the Contract, and will deliver all bonds and proof of insurance coverage as required by the Bidding Documents.

F. He agrees to execute the Contract within ten (10) buisness days from the date of Notice of Award, and in case he fails or neglects to appear within the specified time to execute the Contract, he will be considered as having abandoned the Contract, and any Bid Security accompanying this Proposal will be forfeited to the Owner by reason of such failure on the part of the Bidder.

G. He has made a "good faith effort" to meet Pender County School's verifiable ten percent (10%) goal for participation by minority businesses in the total value of the work. The Bidder shall identify on its bid the minority businesses that it will use on the project. The Bidder shall

submit along with the bid an affidavit listing the "good faith efforts" it has made pursuant to subsection (f) of G.S. 143-128.2 and the total dollar value of the bid that will be performed by the minority businesses. A bidder that performs all of the work under the contract with its own workforce may submit an affidavit to that effect in lieu of the aforementioned affidavit otherwise required under this subsection.

H. He has reviewed the General Conditions included in the Bidding Documents.

I-6. BID SECURITY:

A. Each bid must be accompanied by (1) cash; or (2) a Cashier's Check or a Certified Check of the Bidder in an amount not less than 5% of the bid, made payable to the Owner; or (3) a bidder's bond on the Bid Bond Form provided herein or on a similar form which in every respect materially complies with said Bid Bond, in the amount of 5% of his bid. For purposes of this provision, the amount of the bid shall be the Base Bid.The bidder's bond shall be issued by a surety company licensed to conduct business in North Carolina and acceptable to the Owner.

B. Said bid security is given as a guarantee that the Bidder will enter into a contract if awarded the work and, in the case of refusal or failure to so enter into said contract, the security shall be declared forfeited to the Owner. Such security shall be returned to all but the three lowest Bidders within three days after the opening of bids and the remaining security will be returned within 48 hours after the Owner and the successful Bidder have executed the Contract. If no Contract has been awarded or the bidder has not been notified of the acceptance of his bid within forty-five (45) days of the bid opening, the Bidder may withdraw his bid and request the return of his bid security. If, at the Owner's request, the Bidder agrees to extend and maintain his bid beyond the specified 45 days, his bid security will not be returned until the expiration of the period of extension.

I-7. FORFEITURE OF BID BOND**:**

The Successful Bidder, upon his failure or refusal to execute the Contract within ten (10) business days after he has received Notice of Award, shall forfeit to the Owner the security deposited with his bid in accordance with North Carolina General Statute 143-129.

I-8. MINORITY BUSINESS ENTERPRISES

It is the policy of the Owner to encourage the use of minority businesses in all school construction contracts and to have a verifiable goal of ten percent (10%) participation by minority businesses in the total value of the work. It is the intent of this policy that the Owner, as awarding authority for school construction projects, and all Contractors and Subcontractors performing the construction contracts awarded shall cooperate and in good faith do all things legal, proper, and reasonable to achieve the verifiable goal of ten percent (10%) participation. Each bidder will take specific actions to insure a good faith effort in the recrutment and selection of minority businesses including but not limited to:

SUBMITTED WITH BID:

A. For bids that will include subcontracts: The Bidders must earn at least 50 points from the good faith efforts listed below, and submit with their bid an affidavit identifying which efforts were

utilized. This affidavit is Affidavit A – Listing of Good Faith Efforts and is included as an attachment to Section I, Information to Bidders, and Section II, Bid Form.

1. **(10 pts)** Contact minority businesses that could reasonably be expected to submit a quote and that are known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notify them of the nature and scope of the work to be performed.

2. **(10 pts)** Make the construction plans, specifications and requirements available for review by prospective minority businesses, or provide these documents to them at least 10 days before the bids are due.

3. **(15 pts)** Break down or combine elements of work into economically feasible units to facilitate minority participation.

4. **(10 pts)** Work with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.

5. **(10 pts)** Attend prebid meetings scheduled by the public owner.

6. **(20 pts)** Provide assistance in getting required bonding or insurance or provide alternatives to bonding or insurance for subcontractors.

7. **(15 pts)** Negotiate in good faith with interested minority businesses and do not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.

8. **(25 pts)** Provide assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assist minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.

9. **(20 pts)** Negotiate joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.

10. **(20 pts)** Provide quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

B. For Bids that include work performed with its own workforce: A Bidder that performs all of the work under a contract with its own workforce may submit with their bid an affidavit to that effect in lieu of the affidavit mentioned in the previous subsection A. This affidavit is Affidavit B – Intent to Perform Contract with Own Forces and is included as an attachment to Section II, Bid Form.

NOTE: The Bidder must include either Affidavit A – Listing of Good Faith Efforts or Affidavit B – Intent to Perform Contract with Own Worfforce with its bid. Failure to include either of these affidavits with the bid may result in declaring the bid non-responsive.

C. Each Bidder shall identify on its bid the minority businesses that it will use on the project and the cooresponding dollar value of the bid. Section II, Bid Form, provides space for the Bidder to enter this information.

SUBMITTED BY THE LOWEST RESPONSIBLE, RESPONSIVE BIDDER WITHIN 72 HOURS AFTER NOTIFICATION OF BEING LOW BIDDER

D. An affidavit that includes a description of the portion of work to be executed by the minority businesses, expressed as a percentage of the total contract price, which is equal to or greater than the verifiable ten percent (10%) goal. This affidavit is Affidavit C – Portion of the Work to be Performed by Minority Firms and is included as an attachment to Section II, Bid Form.

E. Documentation of its good faith effort to meet the verifiable ten percent (10%) goal. The documentation must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations, and evidence of other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract. This affidavit is Affidavit D – Good Faith Efforts and is included as an attachment to Section II, Bid Form.

NOTE: The lowest responsible and responsive bidder must submit either Affidavit C – Portion of the Work to be Performed by Minority Firms or Affidavit D – Good Faith Efforts within 72 hours after notification of being low bidder. Failure to submit either of these affidavits within the time provided may result in declaring the bid non-responsive.

I-9. SITE CONDITIONS AND CONDITIONS OF THE WORK:

A. Each bidder must acquaint himself thoroughly as to the character and nature of the work to be done. Each bidder furthermore must make a careful examination of the site of the work and inform himself fully as to the difficulties to be encountered in the performance of the work, the facilities for delivering, storing and placing materials and equipment, and other conditions relating to construction and labor.

B. No plea of ignorance of conditions that exist or may hereafter exist on the site of the work, or difficulties that may be encountered in the execution of the work, as a result of failure to make necessary investigations and examinations, will be accepted as an excuse for any failure or omission on the part of the successful Bidder to fulfill in every detail all the requirements of the Contract Documents and to complete the work or the consideration set forth therein, or as a basis for any claim whatsoever.

C. Insofar as possible, the Successful Bidder, in carrying out his work, must employ such methods or means as to not cause interruption of or interference with the work of the Owner or any separate contractor.

I-10. BIDDER'S QUESTIONS, ADDENDA AND INTERPRETATIONS:

A. Bidders and Sub-bidders shall promptly notify the Design Consultant of any ambiguity, inconsistency or error which they may discover upon examination of the Bidding and Contract

Documents or of the site and local conditions. No interpretation of the meaning of the drawings, specifications or other contract documents will be made to any Bidder orally.

B. Every request for such interpretation should be in writing addressed to the Design Consultant with a copy forwarded to the Owner.

C. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the Bidding Documents which, if issued, will be transmitted to all prospective Bidders (at the respective addresses furnished for such purposes) no later than three calendar days prior to the date fixed for the opening of bids. Neither the Design Consultant nor the Owner will be responsible for any other explanations or interpretations of the proposed documents. Failure of any Bidder to receive any such addenda or interpretation shall not relieve any bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the Contract Documents.

D. Each Bidder shall ascertain prior to submitting his bid that he has received all Addenda issued, and he shall acknowledge receipt and inclusion in his proposal of all Addenda.

F. The Design Consultant and a representative from Pender County Schools will be available at a Pre-Bid Conference to answer questions concerning the project. The date and time of the Pre-Bid Conference shall be determined in the Invitation to Bid. Questions after that time shall be submitted in writing to the Design Consultant.

I-11. SECURITY FOR FAITHFUL PERFORMANCE:

A. Performance and Payment Bonds:

The Successful bidder shall furnish a Performance Bond in an amount equal to one hundred percent (100%) of the Contract Sum as security for the faithful performance of this Contract and also a Labor and Material Payment Bond in an amount not less than one hundred percent (100%) of the Contract Sum, as security for the payment of all persons performing labor and furnishing materials under this Contract. The successful Bidder shall provide a Performance Bond and a Labor and Material Payment Bond, in accordance with State law and shall be delivered to the Owner no later than the date of execution of the Contract by the successful Bidder.

I-12. TIME OF COMPLETION AND LIQUIDATED DAMAGES FOR NON-COMPLETION:

The time for completion of this Contract and liquidated damages for non-completion within the stipulated time shall be as fixed in the Bid Documents.

I-13. LOCATION OF WORK:

The site of the proposed work is on Owner owned property, public streets, easements and/or other right-of-ways, as shown on the drawings.

I-14. LIABILITY INSURANCE AND WORKMEN'S COMPENSATION:

The Successful Bidder will be required to maintain Commercial General Liability, Workmen's Compensation and other insurance in the amounts and under the terms stipulated in the Contract.

I-15. BIDDERS REFERRED TO LAWS:

A. The attention of Bidders is called to the provisions of all Municipal, County, State and Federal laws, regulations, ordinances and resolutions, including but not limited to, (the Human Rights Ordinance; the Equal Opportunity, Small and Minority Business Enterprises and the Construction Safety Resolutions); as well as laws, regulations, ordinance resolutions and permits relating to obstructing streets, maintaining signals, storing and handling of explosives, affecting the Bidder, or his employees or his work hereunder in his relation to the Owner or any other person. The Bidder shall obey all such laws, regulations, ordinances, permits or resolutions controlling or limiting Contractors while engaged in the prosecution of work under this Contract.

B. The provisions of this Contract shall be interpreted in accordance with the laws of North Carolina and in accordance with the laws, ordinances, regulations, permits and resolutions of local Municipalities and Pender County.

I-16. TAXES

All applicable Federal, State and Local Taxes shall be included in the Bidder's proposal. The successful bidder shall provide the Owner with documentation of North Carolina sales taxes paid for all purchases on the project in a form provided by the Owner and included as an attachment to this Section II, Bid Form.

I- 17. RIGHT TO REJECT BIDS:

The Owner expressly reserves the right to reject any or all bids, to waive any informalities or irregularities in the bids received, and to accept that bid which in its judgment, best serves the interest of the Owner.

I-18. EQUAL PRODUCTS AND SUBSTITUTIONS:

A. Whenever possible, the Design Consultant shall specify in the plans the required performance and design characteristics for materials as required by N.C. Gen. Stat. § 133-3. When it is impossible or impractical to specify the required performance and design characteristics for materials, the Design Consultant may use a certain brand, make, manufacturer, article, device, product, material, fixture, form or type construction by name, make or catalog number to convey the general style, type, character and standard of quality of the article desired. Unless specifically stated to the contrary, any Bidder may, with Owner approval, use any article, device, product, material, fixture, form or type of construction which in the judgment of the Design Consultant is equal to that specified considering quality, workmanship, economy of operation, durability, suitably for the purpose intended, and acceptability for use on the project. Such requests must be submitted five (5) days prior to bid opening date. Approval by the Owner prior to bid opening will be in the form of an Addendum to the Specifications issued to all prospective Bidders indicating that the additional makes or brands appear to be equivalent to those specified. Nothing in this paragraph is intended to restrict or inhibit free and open competition on school system projects.

B. The Bidder may request approval for substitutions after award of the Contract in accordance with the provisions of Article 4.15 of the General Conditions.

I-19. PREPARATION AND SUBMITTAL OF BID:

A. Bids shall be submitted utilizing the Bid Form as bound herein as Section II, or otherwise provided with the Contract Documents, and shall be complete in every respect. The total bid amount shall be entered in words and figures in the space provided. Where applicable, the unit price or lump sum items, and their extensions, shall be entered in figures in the respective columns provided for each bid item. All entries shall be typewritten or printed in ink. The signatures of all persons shall be in longhand. Any entry of amount that appears on the face of the bid to have involved an erasure, deletion, white-out and/or substitution or other such change or alteration, shall show by them the initials of the person signing the bid and the date of the change or alteration. A failure to comply with this requirement may be cause for disqualification of the bid.

B. For Unit Price bids, in the event of any discrepancies between the unit prices and the extensions thereof or the total bid amount, the unit prices shall govern. For Lump Sum bids, in the event of a discrepancy between the bid amount in writing and that in figures, the written value shall govern.

C. Bids shall not contain any restatement or qualifications of work to be done, and alternate bids will not be considered unless called for. No oral bids or modifications will be considered.

C. Each single-prime bid shall identify the major subcontractors, including but not limited to the contractors selected to perform the site, mechanical, electrical and plumbing portions of the work, and the subcontractors' respective bid prices for the work.

I-20. MODIFICATION OR WITHDRAWAL OF BID:

A. A Bidder may withdraw his bid from consideration if such bid was based upon a mistake as provided in North Carolina General Statute 143-129.1.

B. Prior to the time and date designated for receipt of bids, any bid submitted may be modified or withdrawn by notice to the party receiving bids at the place designated for receipt of bids.

C. Withdrawn bids may be resubmitted up to the time designated for the receipt of Bids provided that they are then fully in conformance with this Information for Bidders.

D. Bid security, if any is required, shall be in an amount sufficient for the bid as modified or resubmitted.

I- 21. DETAILED BID BREAKDOWN:

If the Owner directs, the Bidder shall provide a detailed breakdown of his bid acceptable to the Owner. In addition to verifying accounting requirements, the breakdown may be used by the Owner to determine whether the Bidder has grossly misjudged the requirements of any area. Failure to provide the requested detailed breakdown may result in rejection of the Bid.

I- 22. AWARD OF CONTRACT:

The contract will be awarded to the lowest responsive and responsible Bidder taking into consideration quality, performance, and the time specified in the bids for the performance of the contract.

A. The lowest single prime bidder shall be determined by the aggregate amount of the unit prices set forth in the Bid, if work is bid on a unit price basis, or the aggregate amount of the Base Bid, plus any Alternates selected by the Owner. Bids will be received and awarded according to state law.

B. A Responsive Bidder shall mean a Bidder who has submitted a bid which conforms, in all material respects, to the Bidding Documents.

C. A Responsible Bidder shall mean a Bidder who has the capability, in all respects, to perform fully the contract requirements and the moral and business integrity and reliability which will assure good faith performance. In determining responsibility, the following criteria will be considered:

1. The ability, capacity and skill of the Bidder to perform the contract or provide the service required;

2. Whether the bidder can perform the contract or provide the service promptly, or within the time specified, without delay or interference;

3. The character, integrity, reputation, judgment, experience and efficiency of the Bidder;

4. The quality of performance of previous contracts or services. For example the following information will be considered:

    a. The administrative and consultant cost overruns incurred by Owners on previous contracts with Bidder,

    b. The Bidder's compliance record with contract general conditions on other projects,

    c. The submittal by the bidder of excessive and/or unsubstantiated extra cost proposals and claims on other projects,

    d. The Bidder's record for completion of the work within the Contract Time or within Contract Milestones and Bidders compliance with scheduling and coordination requirements on other projects,

    e. The Bidder's demonstrated cooperation with the Owner or the Design Consultant and other contractors on previous contracts,

    f. Whether the work performed and materials furnished on previous contracts was in accordance with the Contract Documents;

5. The previous and existing compliance by the Bidder with laws and ordinances relating to contracts or services;

6. The sufficiency of the financial resources and ability of the Bidder to perform the contract or provide the service;

7. The quality, availability and adaptability of the goods or services to the particular use required;

8. The ability of the Bidder to provide future maintenance and service for the warranty period of the contract;

9. Whether the Bidder is in arrears to the Owner on debt or contract or is a defaulter on surety to the Owner;

10. Whether the Bidder has demonstrated a good faith effort to use M/WBE's as subcontractors;

11. Such other information as may be secured by the Owner having a bearing on the decision to award the contract, to include, but not limited to:

    a. The ability, experience and commitment of the Bidder to properly and reasonably plan, schedule, coordinate and execute the Work,

    b. Whether the Bidder has ever been debarred from bidding or found ineligible for bidding on any other projects.

D. The purpose of the above is to enable the Owner in its opinion, to select the lowest responsible bidder. The ability of the low Bidder to provide the required bonds will not of itself demonstrate responsibility of the Bidder.

E. The Owner reserves the right to require from the Bidder: (1) submissions of references, within seven days of bid opening, to include a listing of previous and current projects and (2) financial statements indicating current financial status, prepared in accordance with generally accepted accounting principles, by a CPA licensed to do business in North Carolina, (3)AIA Document A305 Contractor's Qualification Statement and (4) any other information deemed necessary in order to establish the responsiveness and responsibility of the bidder.

F. The Owner reserves the right to defer award of this contract for a period of forty-five (45) days after the due date of bids. During this period of time, the Bidder shall guarantee the prices quoted in his bid.

I- 23. FINAL COMPLETION AND FINAL PAYMENT REQUIREMENTS:

1. When the Design Consultant and the Owner find the Work acceptable under the Contract Documents and the Contract fully performed, they will approve a final Certificate of Payment stating that to the best of their knowledge, information and belief, and on the basis of their observations and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor, and noted in said final Certificate, is due and payable, except for an amount mutually agreed upon for any work remaining incomplete or uncorrected for which the Owner is entitled a credit under the Contract Documents. If the Design Consultant and the Owner find the Work to be incomplete or unacceptable, the costs of reinspections shall be paid by the Contractor.

2. Final Payment shall not be made to the Contractor until all of the required project close-out documents, as listed on the Close-Out Document Checklist, have been submitted and approved.

END OF SECTION I - INFORMATION FOR BIDDERS

SECTION II

BID FORM

FOR: Pender High School Restroom Renovations
Design Team Project number: 7201-250372

TO: Pender County Schools
Operations Building
965 Penderlea Hwy
Burgaw, North Carolina 28425

FROM: _____
BIDDER

_____
ADDRESS

_____
CITY STATE ZIP

_____
PHONE FAX EMAIL ADDRESS

1. BASE BID PROPOSAL:

Having become completely familiar with the local conditions affecting the cost of work at the place where work is to be executed, and having carefully examined the site conditions as they currently exist, and having carefully examined the Bidding Documents prepared by LS3P Architects and titled **Pender High School Restroom Renovations** dated November 24, 2025 together with any addenda to such Bidding Documents as listed hereinafter, the undersigned hereby proposes and agrees to provide all labor, materials, plant, equipment, transportation and other facilities as necessary and/or required to execute all of the work described by the aforesaid Bidding Documents for the lump sum consideration of: (Bidder shall write in the amount of the base bid here)

_____

_____ Dollars ($ _____)

Total of Allowances _____$ 25,000

Total Base Bid_____

said amount being hereinafter referred to as the Total Base Bid or Total Base Bid Proposal.

2. ALTERNATES:

The undersigned proposes to perform alternates for stated additions to or deductions from the Base Bid. Additions and deductions shall include any modifications of work or additional work that undersigned may be required to perform by reason of the acceptance of any alternate. (Bidder shall write in the amounts for the alternates listed below)

ALTERNATE NO. 1A, 1B, 1C, 1D: Electric, Domestic Water Heaters

Adjust Base Bid by [ADDING or DELETING] _____

_____ Dollars ($ _____)

ALTERNATE NO. 2: Resinous Matrix Terrazzo Flooring

Adjust Base Bid by [ADDING or DELETING] _____

_____ Dollars ($ _____)

ALTERNATE NO. 3: North Corridor Wall Scope of Work

Adjust Base Bid by [ADDING or DELETING] _____

_____ Dollars ($ _____)

3. SUBCONTRACTOR LISTING

Bidders are requested to identify below the names of major subcontractors, including but not limited to contractors selected to perform the site, mechanical, electrical and plumbing portions of the work, and the subcontractors' respective bid prices for the work. This information is requested to be submitted at bid time.

Name of Subcontractor	Amount of Bid

4. BID BREAKDOWN: [Note: on renovation projects add this note: Section Intentionally Omitted]

For the Owner's accounting purposes only, the following Base Bid cost breakdown is provided. It is agreed upon that this information will not be used for any decisions to determine the award of this Contract. This information is required of all applicable Contractors. (Bidder shall write in the amounts for the category breakdown listed)

Category Breakdown	Amount
Site Work/Civil Costs	
New Building Construction Costs	
Renovation Building Construction Costs	
TOTAL (equal to base bid amount)	

[Note: edit items above and below for specific project. Include only those items that are applicable]

Site Work/Civil Costs (as used in the above breakdown) are defined as all Division 2 costs, and all site utility costs 5'-0" outside the building line. Renovation Costs (as used in the above breakdown) are defined as all costs associated with the Work on or within an existing building. General, electrical, mechanical, and plumbing cost shall be included in each of the above cost categories.

5B. ALLOWANCES

Total Base Bid includes all cash allowances listed below. Unused amounts will be credited to the Owner by Change Order at the end of the project.

Owner Allowance	$ 25,000

TOTAL OF ALLOWANCES: $ 25,000.00

6. SCHEDULE / WORKING HOURS

The following dates shall be adhered to unless modified by written agreement between Owner and Contractor, and executed as a Change Order to the Contract.

Notice to Proceed: Contract Activities	February 16, 2026
Notice to Proceed: Construction Activities on Site	February 16, 2026
Substantial Completion:	August 7, 2026
Final Completion:	August 14, 2026

Owner reserves the right to withhold Notice to Proceed by up to 30 days. Contractor may not begin work until a written Notice to Proceed is issued. For each day that the Notice to Proceed is withheld pursuant to this paragraph, the dates established for Substantial and Final Completion shall be adjusted. The Contractor shall not be entitled to additional compensation if the Owner withholds the issuance of the Notice to Proceed pursuant to this paragraph. If Notice to Proceed is withheld due to Contractor delays, no adjustment of completion times will be granted.

Normal working days and hours are: Monday through Friday, excluding school Holidays.

7. MINORITY BUSINESSES:

Please circle the Ownership category of Bidder's firm:
Non-Minority / Black / Hispanic / Asian-American / American Indian / White Female / Socially & Economically Disadvantaged.

If Ownership is Minority Female (circle):
NO – Firm is not minority owned.
YES – Firm is minority-female owned.

Source of Ownership category (certification/ verification) (circle one):
Not Applicable / State of NC HUB / State of NC DOT / Local Agency / Federal Agency / Out-of State Agency / Self-Identified / Unknown

Each Bidder shall identify on its bid the minority businesses that it will use on the project and the corresponding total dollar value of the bid. (Bidder shall write in the names and subcontract amount of minority businesses used in bid)

Name of Minority Business	Subcontract Amount
TOTAL:	

In addition to the information above, the Bidder must complete and provide with the bid one of the following affidavits:

Affidavit A – Listing of Good Faith Efforts
This affidavit documents the good faith efforts of the Bidder and is to be submitted with the bid if the Bidder is subcontracting portions of the work.

Affidavit B – Intent to Perform Contract with Own Forces
This affidavit documents the intent of the Bidder to perform the contract with its own workforce and is to be submitted with the bid if the Bidder is not subcontracting portions of the work.

NOTE: The Bidder must include either Affidavit A or Affidavit B with the Bid. Failure to include either of these affidavits may result in declaring the bid non-responsive.

8. ADDENDA ACKNOWLEDGEMENT:

The undersigned acknowledges receipt of the following addenda: (Bidder to write in the number and date appearing on each addendum received)

Addendum No.	Date	Addendum No.	Date

9. BID SECURITY:

Bid security in the amount of five (5) percent of the Base Bid is attached, without endorsement, in the sum of _____ Dollars ($_____) which is to become the property of the Owner in the event the Contract and Performance and Payment Bonds are is not executed within the time set forth, as liquidated damages for the delay and additional work caused to the Owner.

10. The undersigned declares that the person or persons signing this Bid is/are fully authorized to sign on behalf of the firm listed and to fully bind the firm listed to all the Bid's conditions and provisions thereof.

11. It is agreed that no person or persons or company other than the firm listed below or as otherwise indicated has any interest whatsoever in this Bid or the contract that may be entered into as a result of the Bid and that in all respects the Bid is legal and firm, submitted in good faith without collusion or fraud.

12. It is agreed that the undersigned has complied or will comply with all requirements of local, state, and national laws, and that no legal requirement has been or will be violated in making or accepting this Bid, in awarding the Contract to him and/or in the prosecution of the work required.

13. It is agreed that the undersigned shall provide any information deemed necessary by the Owner to establish the responsiveness and responsibility of the bidder.

14. The undersigned acknowledges that he has received a copy of the Owner–Contractor Agreement.

15. The following information is provided pursuant to the Contract Documents:

1. Legal Name of Firm:

   _____

   a. If Firm is a corporation, state that corporation is organized under the laws of the State of _____ Please affix corporate seal to this Bid Form.

   b. If Firm is a partnership, state names of partners: _____

   _____

   c. If Firm is an individual using a trade name, state name of individual: _____

   _____

2. North Carolina Contractor's License Number: _____

Respectfully submitted, this

_____ day of _____, 20__

(Signature) _____

(Name Typed) _____

(Title) _____

(SEAL IF BIDDER IS A CORPORATION)

END OF SECTION II – BID FORM

Enclosure

1. Either Affidavit A or B
2. Bid Bond

AFFIDAVIT A

Listing of Good Faith Efforts

County of _____

Affidavit of _____
(Name of Bidder)

I have made a good faith effort to comply under the following areas checked:

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive.

- ☐ **1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- ☐ **2 --(10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- ☐ **3** – **(15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- ☐ **4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- ☐ **5** – **(10 pts)** Attended prebid meetings scheduled by the public owner.
- ☐ **6** – **(20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- ☐ **7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- ☐ **8** – **(25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- ☐ **9** – **(20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- ☐ **10 - (20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner.

The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of North Carolina, County of_____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public_____

My commission expires _____

AFFIDAVIT B

Intent To Perform Contract With Own Forces

County of _____

Affidavit of _____
(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the _____

_____ contract.
(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of North Carolina, County of _____

Subscribed and sworn to before me this _____ day of _____ 20 ____

Notary Public _____

My commission expires _____

AFFIDAVIT C

Portion of the Work to be Performed by Minority Firms

County of _____

(Note: this form is to be submitted ONLY by the apparent lowest responsible, responsive bidder. This form is not to be included with bid.)

If the portion of the work to be executed by minority businesses as defined in GS143-128.2(g) is equal to or greater than 10% of the bidder's total contract price, then the Bidder must complete this affidavit.
Either Affidavit C or Affidavit D shall be provided by the apparent lowest responsible, responsive Bidder within **72 hours** after notification of being low Bidder.

Affidavit of _____ I do hereby certify that
(Name of Bidder)

on the _____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. Attach additional sheets if required.

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**), American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of North Carolina, County of_____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public_____

My commission expires _____

AFFIDAVIT D

Good Faith Efforts

County of _____

(Note: this form is to be submitted ONLY by the apparent lowest responsible, responsive bidder. This form is not to be included with bid.)

If the goal of 10% participation by minority business **is not** achieved, the Bidder must complete this affidavit.
Either Affidavit C or Affidavit D shall be provided by the apparent lowest responsible, responsive Bidder within **72 hours** after notification of being low Bidder.

Affidavit of: _____
(Name of Bidder)

I do certify the attached documentation as true and accurate representation of my good faith efforts. Attach additional sheets if required

Name and Phone Number	Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**), Socially and Economically Disadvantaged (**D**)

Documentation of the Bidder's good faith efforts to meet the goals set forth in these provisions. Examples of documentation include, but are not limited to, the following evidence:

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.
B. Copies of quotes or responses received from each firm responding to the solicitation.
C. A telephone log of follow-up calls to each firm sent a solicitation.
D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.
E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.
F. Copy of pre-bid roster.
G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.
H. Letter detailing reasons for rejection of minority business due to lack of qualification.
I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of North Carolina, County of_____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public_____

My commission expires _____

BID BOND

KNOW ALL MEN BY THESE PRESENTS, That we,

_____
(Bidder's Name)

_____, of _____
(Street Address) (City, State, Zip)

hereinafter called the Principal, and

_____
(Surety's Name)

a corporation organized and existing under the Laws of the State of _____, and authorized to transact business in the State of _____, as Surety, hereinafter called Surety, are held and firmly bound unto _____ as the Owner and hereinafter called Obligee, in the Penal sum of five percent (5%) of the amount bid, good and lawful money of the United States of America, for the payment of which the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The Condition of this Obligation is such, that, WHEREAS the Principal has submitted a proposal to the Obligee on a contract for the construction

of _____
(Contract Name and Number)

NOW THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the Bidding or Contract Documents with good and sufficient surety for the faithful performance of such construction for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void; otherwise to remain in full force and effect.

In witness whereof, we have hereunto set our signatures and seal this _____ day of _____, 20_____, all pursuant to due authorization.

_____ (Seal)
Principal / Owner

By _____ Surety

By _____
Attorney-in-Fact in accordance
with the attached Power of Attorney

STATE OF _____)

COUNTY OF _____)

I, _____, a Notary Public in and for the State and County aforesaid, do hereby certify that _____, and _____, whose names are signed to the foregoing bond, this day personally appeared before me in my State and County aforesaid and acknowledged the same.

Given under my hand seal this _____ day of _____, 20_____.

_____ (Seal)
Notary Public

_____
My Commission expires:

SECTION III

OWNER – CONTRACTOR AGREEMENT

PROJECT NAME: **Pender High School Food Lab Renovations**

DESIGN TEAM PROJECT NUMBER: 7201-261295

THIS AGREEMENT, in three (3) copies, made this 12th day of February, Two Thousand and Twenty-Six by and between Pender County Board of Education (herein referred to as the "Owner"), whose mailing address is 965 Penderlea HWY, Burgaw, North Carolina 28425 and _____. (herein referred to as the "Contractor"), whose mailing address is _____. Correspondence, submittals, and notices relating to or required under this Contract shall be sent in writing to the above addresses; unless either party is notified in writing by the other, of a change in address.

WITNESSETH:

WHEREAS, it is the intent of the Owner to obtain the services of the Contractor in connection with the new construction of **Pender High School Food Lab Renovations** (hereinafter referred to as the "Project" or the "Work"); and

WHEREAS, the Contractor desires to perform such construction in accordance with the terms and conditions of this Agreement,

NOW, THEREFORE, in consideration of the promises made herein and other good and valuable consideration, the following terms and conditions are hereby mutually agreed to, by and between the Owner and Contractor:

Article 1

DEFINITIONS

1.1 All terms in this Agreement which are defined in the Information for Bidders and the General Conditions shall have the meanings designated therein.

1.2 The Contract Documents are as defined in the General Conditions. Such documents form the Contract, and all are as fully a part thereof as if attached to this Agreement or repeated herein. The Contract Documents consist of the Owner-Contractor Agreement, the General Conditions of the Contract, the Drawings, the Specifications, all Addenda issued prior to bidding, and all Modifications and Change Orders issued after execution of the Contract.

Article 2

STATEMENT OF THE WORK

2.1 The Project is the Work identified in the drawings and specifications prepared by LS3P dated Month Day, 2026 for Pender County Board of Education, including the following addenda:

_____

2.2 The Parties agree that the Project shall include the following alternates:

_____

2.3 The Parties agree to the following modifications to the Project's drawings and specifications, including the noted value engineering items:

List item(s) and proposed deduct/add(s). If none, delete this language list "None"

2.4 The Parties agree that the following allowances are included in the Contract Sum in Section 5.1 below:

Allowance No. 1: [description and amount]

2.5 The Contractor shall provide and pay for all materials, tools, equipment, labor and professional and non-professional services, and shall perform all other acts and supply all other things necessary, to fully and properly perform and complete the Work, as required by the Contract Documents.

2.6 The Contractor shall further provide and pay for all related facilities described in any of the Contract Documents, including all work expressly specified therein and such additional work as may be reasonably inferred therefrom, saving and excepting only such items of work as are specifically stated in the Contract Documents not to be the obligation of the Contractor. The totality of the obligations imposed upon the contractor by this Article and by all other provisions of the Contract Documents, as well as the structures to be built and the labor to be performed, is herein referred to as the "Work".

Article 3

DESIGN CONSULTANT

3.1 The Design Consultant (as defined in the General Conditions) shall be LS3P Architects whose address is 101 N 3rd Street, Suite 500, Wilmington NC 28401, however, that the Owner may, without liability to the Contractor, unilaterally amend this Article from time to time by designating a different person or organization to act as its Design Consultant and so advising the Contractor in writing, at which time the person or organization so designated shall be the Design Consultant for purposes of this Contract.

Article 4

TIME OF COMMENCEMENT AND COMPLETION

4.1 The Contractor shall commence the Work promptly upon the date established in the Notice to Proceed. If there is no Notice to Proceed, the date of commencement of the Work shall be the date of this Agreement or such other date as may be established herein.

4.2 Time is of the essence. The Contractor shall achieve Final Completion, as defined in the General Conditions on or before the date established for Final Completion in the Owner - Contractor Agreement.

4.3 The following dates shall be adhered to and are the last acceptable dates unless modified in writing by mutual agreement between the Contractor and the Owner. All dates indicate midnight unless otherwise stipulated. The only exceptions to this schedule are defined in the General Conditions under 8.3 DELAYS AND EXTENSIONS OF TIME.

Notice of Award:	**November 3, 2026**
Notice to Proceed: Contract Activities	**November 3, 2026**
Notice to Proceed: Construction Activities on Site	**November 3, 2026**
Substantial Completion:	**January 4, 2026**
Final Completion:	**January 15, 2026**

4.4 Should the Contractor fail to complete the Work on or before the dates stipulated for Substantial Completion and/or Final Completion, or such later date as may result from an extension of time granted by the Owner, he shall pay the Owner, as liquidated damages the sums set forth below according to Article 8 of the General Conditions.

Substantial Completion Liquidated Damages:	$500.00 per day
Final Completion Liquidated Damages	$500.00 per day

Article 5

CONTRACT SUM

5.1 Provided that the Contractor shall strictly and completely perform all of its obligations under the Contract Documents, and subject only to additions and deductions by Modification or as otherwise provided in the Contract Documents, the Owner shall pay to the Contractor, in current funds and at the time and in the installments hereinafter

specified, the sum of _____ Dollars ($_____) herein referred to as the "Contract Sum". This amount includes the base bid and the Alternates in Section 2.2.

5.2 The Contract Sum includes the value engineering items and other contract modifications noted in Section 2.3 above that total $_____.

5.3 Unit Prices are established as follows for the Project:

Unit Price No. 1		$
Unit Price No. 2		$
Unit Price No. 3		$
Unit Price No. 4		$

Article 6

PROGRESS PAYMENTS

6.1 The Contractor hereby agrees that on or about the Twenty-third day of the month for every month during the performance of the Work he will deliver to the Owner's Project Manager an Application for Payment in accordance with the provisions of Article 9 of the General Conditions. This date may be changed upon mutual agreement, stated in writing, between the Owner and Contractor. Payment under this Contract shall be made as provided in the General Conditions. Payments due and unpaid under the Contract Documents shall not bear interest.

Article 7

OTHER REQUIREMENTS

7.1 The Contractor shall submit the Performance Bond, Labor and Material Payment Bond and Certification of Insurance as required by the Contract Documents.

7.2 The Owner shall furnish to the Contractor one (1) set of hard copy drawings and one (1) hard copy set of specifications, at no extra cost, for use in the Construction of the Work. Additional sets of drawings or specifications may be obtained by the Contractor by paying the Owner for the costs of reproduction, handling and mailing.

7.3 The Contractor shall make a good faith effort to utilize Historically Underutilized Businesses (HUB's) per N.C. Gen. Stat. 143-128.2, and as described in the construction documents.

7.4 The General Conditions, the drawings and specifications, including any addenda, are incorporated herein by reference.

IN WITNESS WHEREOF, Pender County Board of Education (hereinbefore called the "Owner") has caused these presents to be signed and its corporate seal to be hereunto affixed, attested by its Chairperson and Secretary, and _____ (hereinbefore called "Contractor") has caused these presents to be signed by its President and its Corporate seal to be hereunto affixed, as hereinafter attested, all as of the day and year first above written.

PENDER COUNTY BOARD OF EDUCATION

_____

Beth Burns
Chairperson

ATTEST:

[Corporate Seal]

_____

Dr. Brad Breedlove
Superintendent

[CONTRACTOR COMPANY NAME HERE]

_____

_____, President or Vice-President
(Print Name)

ATTEST:

[Corporate Seal]

_____

Corporate Secretary
(Print Name)

This instrument has been preaudited in the manner required by the School Budget and Fiscal Control Act.

_____

Lisa Nowlin, Date
Chief Financial Officer

Bond Forms

PERFORMANCE BOND

IT IS HEREBY AGREED that (Insert full name and address of Contractor) as Principal, hereinafter called Contractor, and (Insert full name and address of Surety) as Surety, hereinafter called Surety, are held and firmly bound unto the

Pender County Board of Education
965 Penderlea HWY, Burgaw NC 28425

as Obligee, hereinafter called Owner, in the amount of _____

_____ Dollars ($), for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these obligations.

WHEREAS, Contractor has by written agreement dated _____, 2021, entered into a contract with Owner for the construction of (Insert the name of the Project) in accordance with Drawings and Specifications prepared by (Insert full name and address of Architect/Engineer) which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect. The Surety hereby waives notice of any alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default, under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly:

1) Complete the Contract in accordance with its terms and conditions, or

2) Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest

responsible bidder, arrange for a contract between such bidder and Owner, and make available as Work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of any applicable statute of limitations under the Contract.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner.

Signed and sealed this _____ day of _____ 20_____.

PRINCIPAL

[Affix corporate seal]

_____

(Name)_____

(Title)_____

_____

(Witness)

SURETY

[Affix corporate seal]

_____

(Name)_____

(Title)_____

_____

(Witness)

Bond Forms

LABOR AND MATERIAL PAYMENT BOND

THIS BOND IS ISSUED SIMULTANEOUSLY WITH PERFORMANCE BOND IN FAVOR OF THE OWNER CONDITIONED ON THE FULL AND FAITHFUL PERFORMANCE OF THE CONTRACT

IT IS HEREBY AGREED that (Insert full name and address of Contractor) as Principal, hereinafter called "Principal," and (Insert full name and address of Surety) as Surety, hereinafter called "Surety," are held and firmly bound unto the

Pender County Board of Education
6410 Carolina Beach Road, Wilmington NC 28412

as Obligee, hereinafter called Owner, for the use and benefit of claimants as herein below defined, in the amount of _____ Dollars ($),

for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these obligations.

WHEREAS, Principal has by written agreement dated _____, 20_____, entered into a contract with Owner for the construction of (Insert the name of the Project) in accordance with Drawings and Specifications prepared by (Insert full name and address of Architect/Engineer) which contract is by reference made a part hereof, and is hereinafter referred to as the "Contract."

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A claimant is defined as one having a direct contract with the principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:

   a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: the Principal, the Owner, or the Surety above named, within ninety (90) days, after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail; postage prepaid, in an envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.

   b) After the expiration of one (1) year following the date on which Principal ceased Work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the Project, or any part thereof, is situated, or in the United States District Court for the district in which the Project, or any part thereof, is situated, and not elsewhere.

4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

Signed and sealed this _____ day of _____ 20_____.

PRINCIPAL

[Affix corporate seal]

_____

(Name)_____

(Title)_____

_____

(Witness)

SURETY

[Affix corporate seal]

_____

(Name)_____

_____

(Title)_____

_____

(Witness)

SECTION IV

MINORITY BUSINESS PARTICIPATION

It is the policy of the Owner to encourage the use of minority businesses in all school construction contracts and to have a verifiable goal of ten percent (10%) participation by minority businesses in the total value of the work. It is the intent of this policy that the Owner, as awarding authority for school construction projects, and all Contractors and Subcontractors performing the construction contracts awarded shall cooperate and in good faith do all things legal, proper, and reasonable to achieve the verifiable goal of ten percent (10%) participation. The Bidder shall make a good faith effort to utilize minority businesses per the requirements of Section I – Information to Bidders.

N.C. Division of Purchasing and Contract's Office for Historically Underutilized Businesses maintains a list of registered companies. Searches can be completed at https://www.ips.state.nc.us/vendor/searchvendor.aspx?t=h . Additionally, the N.C. Interactive Purchasing System is a free online Internet service for companies to do business with the state. The web address is http://www.ips.state.nc.us/ips/ . Questions for the NC office of Historically Underutilized Businesses or IPS should be directed to the help desk (984) 236-0130 or email huboffice.doa@doa.nc.gov .

SECTION V

GENERAL CONDITIONS
OF THE
CONTRACT FOR CONSTRUCTION

TABLE OF ARTICLES

1. CONTRACT DOCUMENTS
2. OWNER
3. CONTRACTOR
4. SUBCONTRACTORS
5. WORK BY OWNER OR BY SEPARATE CONTRACTORS
6. MISCELLANEOUS PROVISIONS
7. TIME
8. PAYMENTS AND COMPLETION
9. INSURANCE
10. CHANGES IN THE WORK
11. UNCOVERING AND CORRECTION
12. TERMINATION OF THE CONTRACT

APPENDIX A – Contractor's Sales Tax Report
APPENDIX B – Sexual Offender Registry and Criminal Background Check Certification
APPENDIX C – Allowance Expenditure Authorization Form
APPENDIX D-1 – Change Proposal Form (Time & Materials or Unit Price)
APPENDIX D-2 – Change Proposal Form (Fixed Price)

ARTICLE 1

CONTRACT DOCUMENTS

1.1 GENERAL

1.1.1 The Contract Documents consist of the Owner-Contractor Agreement, the Conditions of the Contract (General, Supplementary and other Conditions), the Drawings, the Specifications, and all Addenda issued prior to and all Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order issued pursuant to the provisions of Article 10, (3) a written interpretation issued by the Design Consultant, or (4) a written order for a minor change in the Work issued pursuant to this contract.

1.1.2 By executing the Contract, the Contractor represents that he has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents.

1.1.3 The Contractor will be furnished with 3 sets of drawings and specifications at no cost. Additional copies may be purchased.

END OF ARTICLE 1

ARTICLE 2

OWNER

2.1 INFORMATION, SERVICES AND RIGHTS OF THE OWNER

2.1.1 The Owner shall at all times have access to the Work whenever it is in preparation or progress. The Contractor shall provide safe facilities for such access.

2.1.2 The Owner shall not be responsible for or have control or charge of the construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, and will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.

2.1.3 The Owner will have authority to require special inspection or testing of the Work whether or not such Work is then fabricated, installed, or completed. However, neither the Owner's authority to act under Subparagraph 6.5.3, nor any decision made by the Owner in good faith either to exercise or not to exercise such authority shall give rise to any duty or responsibility of the Owner to the Contractor, any Subcontractor, any of their agents or employees, or any other person performing any of the Work.

2.1.4 The Owner shall have the authority and discretion to call, schedule, and conduct job meetings to be attended by the Contractor, representatives of his Subcontractors, and the Design Consultant, to discuss such matters as procedures, progress, problems, and scheduling.

2.1.5 The Owner and Design Consultant shall not be responsible or liable to Contractor for the acts, errors or omission of the Contractor, any separate Subcontractor, any separate contractor or any contractor's or subcontractor's agents or employees, or any other persons performing any of the Work.

2.1.6 Information or services under the Owner's control shall be furnished by the Owner with reasonable promptness to avoid unreasonable delay in the orderly progress of the Work.

2.1.7 The parties acknowledge that the Owner may perform all or part of its obligations pursuant to this Agreement through the Superintendent or his designee.

2.1.8 The foregoing rights are in addition to other rights of the Owner enumerated herein and those provided by law.

2.2 OWNER'S RIGHT TO STOP OR TO SUSPEND THE WORK

2.2.1 If the Contractor fails to correct defective Work or fails to carry out the Work or supply labor and materials in accordance with the Contract Documents, the Owner by a written order may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Owner to stop the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

2.2.2 The Owner may order the Contractor in writing to suspend, delay, or interrupt all or any part of the Work for such period of time as he may determine to be appropriate for the convenience of the Owner.

2.2.3 If the performance of all or any part of the Work (including the work of the Contractor and its subcontractors) is, for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Owner or the Design Consultant in the administration of this Contract, or by failure of any one of them to act within the time specified in this Contract (or if no time is specified, within a reasonable time), an adjustment shall be made for an increase in the actual time required for performance of the Work by the Contractor, due solely to such unreasonable suspension, delay, or interruption and the Contract modified in writing accordingly. However, no claim shall be made under this Subparagraph for any suspension, delay, or interruption pursuant to Subparagraph 2.3.1, or for which claim is provided or excluded under any other provision of this Contract. No claim under this Subparagraph shall be allowed on behalf of the Contractor or its subcontractors, unless within 10 days after the act or failure to act involved, and for continuing or ongoing acts or failures to act within 10 days of the first day of the act or failure to act the Contractor submits to the Owner a written statement setting forth, as fully as then practicable, the extent of such claim, and unless the claim is asserted in writing within 20 days after the termination of such suspension, delay, or interruption. For continuing or ongoing acts or failures to act, the Contractor shall update its written statement every 15 days until the suspension, delay or interruption is terminated. The Contractor shall waive any and all claims not filed in strict conformance with this paragraph. The Contractor shall indemnify, defend and hold the Owner harmless from any claim by a Subcontractor that is waived because it is not filed in strict conformance with this paragraph or any other provision of this Agreement regarding claims.

2.2.4 In the event of a suspension of work or delay or interruption of work, the Contractor will and will cause his subcontractors to protect carefully his, and their, materials and work against damage or injury from the weather and maintain completed and uncompleted portions of the work as required by the Contract Documents. If, in the opinion of the Owner, any work or material shall have been damaged or injured by reason of failure on the part of the Contractor or any of his subcontractors to so protect same, such work and materials shall be removed and replaced at the expense of the Contractor.

2.2.5 No claim by the Contractor shall be allowed if asserted after final payment under this Contract or if it is not asserted in strict conformance with Article 10.

2.3 OWNER'S RIGHT TO CARRY OUT THE WORK

2.3.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within ten days after the date written notice is mailed by the Owner to commence and continue remedy of such default or neglect with diligence and promptness, the Owner may, without prejudice to any other remedy he may have, make good such deficiencies and may further elect to complete all Work thereafter through such means as the Owner may select, including the use of a new contractor. In such case the Owner shall issue a Change Order deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Design Consultant's additional services made necessary by such default, neglect or failure. Such action by the Owner and the amount charged to the Contractor are both subject to the prior approval of the Design Consultant. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner. Notwithstanding the

Owner's right to carry out a portion of the work, warranty, maintenance and protection of the work remains the Contractor's responsibility. Further, the provisions of this paragraph do not affect the Owner's right to require the correction of defective or non-conforming work in accordance with this contract.

END OF ARTICLE 2

ARTICLE 3

CONTRACTOR

3.1 DEFINITION

3.1.1 This entire Contract is not one of agency by the Contractor for Owner but one in which Contractor is engaged independently in the business of providing the services and performing the Work herein described as an independent contractor.

3.2 REVIEW OF CONTRACT DOCUMENTS

3.2.1 Before placing his proposal to the Owner, and continuously after execution of the Contract, the Contractor shall carefully study and compare the Contract Documents and shall at once report to the Owner any error, inconsistency or omission he may discover, including any requirement which may be contrary to any law, ordinance, rule, regulation or order of any public authority bearing on the performance of the Work. If the Contractor has reported in writing an error, inconsistency or omission, has promptly stopped the affected work until otherwise instructed, and has otherwise followed the instructions of the Owner, the Contractor shall not be liable to the Owner or the Design Consultant for any damage resulting solely from any such errors, inconsistencies or omissions in the Contract Documents. The Contractor shall perform no portion of the Work at any time without Contract Documents and, where required, approved Shop Drawings, Product Data or Samples for such portion of the Work.

3.2.2 All designs, drawings, specifications, design calculations, notes and other works provided for this contract are the sole property of the Owner and may not be used on any other design or construction project. The use of the design, including tracings and specifications, by any person or entity, for the purpose other than the Project, shall be at the full risk of such person or entity

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1 The Contractor shall supervise and direct the Work, using his best skill and attention. He shall be solely responsible for and have control over all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract. The Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work and all statutory or legal requirements. This requirement applies continuously throughout contract performance and is not limited to regular working hours.

3.3.2 The Contractor shall be responsible to the Owner for the acts and omissions of his employees, Subcontractors and Sub- subcontractors, suppliers, their agents and employees, and other persons performing any of the Work and for their compliance with each and every requirement of the Contract Documents, in the same manner as if they were directly employed by the Contractor.

3.3.3 The Contractor shall not be relieved from his obligations to perform the Work in accordance with the Contract Documents either by the acts, failures to act or duties of the Owner or the Design Consultant in their administration of the Contract, or by inspections, tests or approvals (or the lack thereof) required or performed under Paragraph 6.5 by persons other than the Contractor.

3.3.4 The Contractor shall verify all grades, lines, levels and dimensions as indicated and shown on the Drawings and Specifications prior to beginning the work and shall immediately report in writing any errors or inconsistencies to the Design Consultant before commencing the work.

3.3.5 Contractor shall protect existing surfaces, finishes and adjacent facilities from damage during construction. Any damage shall be repaired by Contractor at his own expense prior to completion of the Project. Prior to construction start, Contractor and Owner shall perform an inspection to record existing conditions, damaged and undamaged.

3.4 LABOR AND MATERIALS

3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, supplies, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary or proper for or incidental to the execution and completion of the Work required by and in accordance with the Contract Documents and any applicable code or statute, whether specifically required by the Contract Documents or whether their provision may reasonably be inferred as necessary to produce the intended results, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. Final payment will not be made until the Work is so completed.

3.4.2 The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to him. The Owner may, by notice in writing, require the Contractor to remove from the work any employee the Owner deems incompetent, careless or otherwise objectionable. All agents and workers of the Contractor and its Subcontractors shall wear identification badges provided by the Contractor at all times they are on the Owner's property. The identification badges shall at a minimum display the company name, telephone number and employee's picture and name and must be worn in plain view at all times. Additionally, once school staff occupies the building, all contractors and their respective subcontractors shall be required to sign in and out of the visitor's log each day they are performing services. They must also wear a visitor's pass which will indicate to staff that they have met this requirement which applies to anyone performing services anywhere on the school property.

3.4.3 The Contractor shall be responsible for ensuring that the Work is completed in a skillful and workmanlike manner.

3.4.4 All equipment, apparatus and/or devices of any kind to be incorporated into the Work that are shown or indicated on the drawings or called for in the specifications or required for the completion of the work shall be entirely satisfactory to the Owner and the Design Consultant as regards operations, capacity and/or performance. No approval, either written or verbal, of any drawings, descriptive data or samples of such equipment, apparatus and/or device shall relieve the Contractor of his responsibility to turn over the same in good working order for its intended purpose at the completion of the Work in complete accordance with the Contract Documents. Any equipment, apparatus and/or device not fulfilling these requirements shall be removed and replaced by proper and acceptable equipment, etc. or put in good working order satisfactory to the Owner and Design Consultant without additional cost to the Owner.

3.4.5 All materials and Work shall meet North Carolina Building Codes. Should there be any discrepancies between design and code, the more stringent requirement shall apply. All materials shall comply with standards (or approved products) as set by the Specifications. Unless otherwise specified, NO ASBESTOS CONTAINING MATERIALS SHALL BE INSTALLED. BY DEFINITION, INSTALLATION OF ASBESTOS MATERIALS WILL BE CONSIDERED CONTRACTOR'S NEGLIGENCE AND THE CONTRACTOR SHALL PERFORM ALL NECESSARY WORK TO REMOVE THE ASBESTOS AND RESTORE THE SITE TO THE 'PRE-CONTRACT' CONDITION. Contractor shall assume all facilities built prior to 1979 have lead-based paint. Any paint removal shall be in accordance with OSHA standard pertaining to lead (29 CFR 1915.1025).

3.5 WARRANTY

3.5.1 The Contractor warrants to the Owner and the Design Consultant that all materials and equipment furnished

under this Contract will be new unless otherwise specified, and that all workmanship will be of first class quality, free from faults and defects and in conformance with the Contract Documents and all other warranties and guaranties specified therein. Where no standard is specified for such workmanship or materials, they shall be the best of their respective kinds. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Owner or the Design Consultant, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the provisions of Article 11.

3.5.2 The warranties set forth in this Paragraph 3.5 and elsewhere in the Contract Documents shall survive Final Completion of the Work.

3.5.3 If, within one year after the Date of Substantial Completion of the Work or designated portion thereof or within one year after acceptance by the Owner of designated equipment or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective, not in accordance with the Contract Documents, or not in accordance with the guarantees and warranties specified in the Contract documents, the Contractor shall correct it within five (5) working days or such other period as mutually agreed, after receipt of a written 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 with reasonable promptness after discovery of the condition. For items, which remain incomplete or uncorrected on the date of Substantial Completion, the one-year warranty shall begin on the date of Final Completion of the Work. If the Contract Documents include painting work, the one year warranty period in this section shall be extended to two years.

3.5.4 If at any time deficiencies in the Work are discovered which are found to have resulted from fraud or misrepresentation, or an intent or attempt to or conspiracy to defraud the Owner by the Contractor, any Subcontractor or Supplier, the Contractor will be liable for replacement or correction of such Work and any damages which Owner has incurred related thereto, regardless of the time limit of any guarantee or warranty.

3.5.5 The Contractor shall bear the cost of making good all work of the Owner, separate contractors or others, destroyed or damaged by such correction or removal required under this Article 3, Article 11 or elsewhere in the Contract Documents.

3.6 TAXES

3.6.1 The Contractor shall pay all sales, consumer, use and other similar taxes for the Work or portions thereof provided by the Contractor which are legally enacted at the time bids are received, whether or not yet effective. The Contractor shall indemnify and hold the Owner harmless from any claims arising out of the Contractor's failure to pay all required taxes, including claims by the county for its inability to recover taxes that were not properly paid to the State of North Carolina by the Contractor.

3.6.2 The Contractor shall provide a completed Contractor's Sales Tax Report (attached hereto as Appendix A) with each application for payment for all items provided by the Contractor or any Sub-Contractors and incorporated into this project. The Contractor shall account for at least 2% of the total contract amount in sales tax or provide justification satisfactory to the Owner that the actual sales tax paid is less than 2%. In the event the Contractor does not provide adequate justification to support the shortfall, the Contractor shall pay the Owner the difference between the amount accounted for and the 2% minimum. Such compensation shall not be deemed a penalty, but reimbursement of funds the Owner would otherwise be entitled to recover from the State.

3.6.3 Sales and Use Tax. Contractor shall be responsible for complying with any applicable sales and use tax obligations imposed by Chapter 105, Article 5 of the North Carolina General Statutes. Where Contractor has been contracted with to oversee "new construction" or "reconstruction" as defined in G.S. 105-164.4H, Contractor shall be responsible for issuing and maintaining an Affidavit of Capital Improvement.

3.7 PERMITS, FEES AND NOTICES

3.7.1 The Contractor shall secure and pay for the building permit and for all other permits and governmental fees necessary for the proper execution and completion of the Work. Costs for service and final service connections by public utilities will be reimbursed to the Contractor by the Owner. The Owner shall not be responsible for the cost of any temporary utilities.

3.7.2 The Contractor will pay for his license and reinspection fees for the work necessary for the proper execution and completion of the work.

3.7.3 The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the Work.

3.8 PROGRESS SCHEDULE

3.8.1 The Contractor shall prepare and submit to the Owner for the Owner's review and approval an estimated progress schedule for the Work. This schedule shall be in accordance with any general requirements included in the Specifications for this project.

3.9 RESPONSIBILITY FOR COMPLETION

3.9.1 The Contractor shall furnish such manpower, materials, facilities and equipment and shall work such hours, including night shifts, overtime operations and Sundays and holidays, as may be necessary to ensure the performance of the Work within the Milestone and Completion dates specified in the Owner-Contractor Agreement.

3.9.2 If the actions taken by the Contractor are not satisfactory, the Design Consultant or Owner may direct the Contractor to take any and all actions necessary to ensure completion within the required Milestone and Completion dates, without additional cost to the Owner. In such event, the Contractor shall continue to assume responsibility for his performance and for completion within the required dates.

3.10 DOCUMENTS AND SAMPLES AT THE SITE

3.10.1 The Contractor shall maintain at the site for the Owner one record copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record all changes made during construction, and approved Shop Drawings, Product Data and Samples. These shall be delivered to the Owner upon completion of the Work.

3.11 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.11.1 The Contractor shall review, approve and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the work of the Owner or any separate contractor, all Shop Drawings, Product Data, Manuals and Samples required by the Contract Documents.

3.11.2 Do not order materials until receipt of written approval. Furnish materials equal in every respect to approved samples.

3.11.3 By approving and submitting Shop Drawings, Product Data, Manuals and Samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. The Contractor shall adhere to any supplementary processing and scheduling instructions pertaining to Shop Drawings, which may be issued by the Design Consultant.

3.11.4 The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Design Consultant's review of Shop Drawings, Product Data, Samples or Manuals under unless the Contractor has specifically informed the Design Consultant in writing of such deviation at the time of

submission and the Design Consultant has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data, Samples, or Manuals by the Design Consultant's review thereof.

3.11.5 The Contractor shall make corrections required by the Design Consultant and shall resubmit the required number of corrected copies of Shop Drawings or new Product Data or Samples. The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the Design Consultant on previous submittals. Resubmittals necessitated by required corrections due to Contractor's errors or omissions shall not be cause for extension of Contract Time, and any costs associated with the processing of these resubmittals shall be paid by the Contractor.

3.11.6 No portion of the Work requiring submission of Shop Drawings, Product Data, Samples or Manuals shall be commenced until the submittal has been approved by the Design Consultant. All such portions of the Work shall be in accordance with approved submittals.

3.12 EQUAL PRODUCTS AND SUBSTITUTIONS

3.12.1 All materials, supplies and articles furnished under this Contract shall, whenever specified and otherwise practicable, be the standard products of recognized, reputable manufacturers. Unless otherwise specifically provided in the Contract Documents, the naming of a certain brand, make, manufacturer or article, device, product, material, fixture or type of construction shall convey the general style, type, character and standard of quality of the article desired and shall not be construed as limiting competition. The Contractor, in such cases, may with Design Consultant and Owner approval, use any brand, make, manufacturer, article, device, product, material, fixture, form or type of construction which in the judgment of the Design Consultant is equal to that specified. An item may be considered equal to the item so named or described if, in the opinion of the Owner and Design Consultant (1) it is at least equal in quality, durability, appearance, strength, and design; (2) it will perform at least equally the specific function imposed by the general design for the work being contracted for or the material being purchased; and (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the specifications. Approval by the Owner and Design Consultant will be granted based upon considerations of quality, workmanship, economy of operation, suitability for the purpose intended, and acceptability for use on the Project.

3.12.2 Contractor must provide evidence that proposed substitution does not require revisions to the Contract Documents, that is consistent with Contract Documents, and will produce the indicated results, and is comparable with other portions of the Work. Contractor must provide a detailed comparison of significant qualities or proposed substitution with those of the Work specified, including but not limited to the following significant qualities: performance, weight, size, durability, visual effect, sustainable design features, warranties, and any specific features and requirements indicated in Contract Documents. An annotated copy of applicable Specification section and point-by-point comparison between specified product and the proposed substitution describing each point of compliance, non-compliance, and variance between the specified and proposed product shall be provided.

3.13 USE OF SITE

3.13.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits, easements, right-of- way agreements and the Contract Documents. The Contractor shall not unreasonably encumber the site, in the opinion of the Owner, with any materials, equipment or trailers nor shall he block the entrances or otherwise prevent reasonable access to the site, other working and parking areas, completed portions of the Work and/or properties, storage areas, areas of other facilities that are adjacent to the worksite. If the Contractor fails or refuses to move said material, equipment or trailers within 24 hours of notification by the Owner, to so do, the Owner shall have the right, without further notice, to remove, at the Contractor's expense, any material, equipment and/or trailers which the Owner deems are in violation of this paragraph.

3.14 CUTTING AND PATCHING OF WORK

3.14.1 The Contractor shall not damage or endanger any portion of the Work or the work of the Owner or any separate contractors by cutting, patching or otherwise altering any work, or by excavation.

3.14.2 Existing structures and facilities including but not limited to building, utilities, topography, streets, curbs, walks, etc., that are damaged or removed due to required excavations or other construction work, shall be patched, repaired or replaced by the Contractor to satisfaction of the Design Consultant and the Owner of such structures and facilities and authorities having jurisdiction.

3.15 CLEANING UP

3.15.1 The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. If the Contractor fails to clean up during or at the completion of the Work, the Owner may do so and the cost thereof shall be charged to the Contractor.

3.16 INDEMNIFICATION

3.16.1 To the fullest extent permitted by law, the Contractor shall, at his sole cost and expense, indemnify, defend, and hold harmless the Owner and the Design Consultant and their agents, representatives, and employees from and against all claims, actions, judgments, costs, liabilities, penalties, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or caused by any negligent act, error, omission or breach of this Agreement by the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable. The above obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity, which would otherwise exist as to any party or person, described in this Paragraph 3.16. The parties agree that this indemnification clause is an “evidence of indebtedness” for purpose of N.C. Gen. Stat. § 6-21.2. The parties also specifically acknowledge that the Owner is a public body and it is the intent of the parties that the Owner not incur any expenses when the Contractor is solely responsible for the claims. Contractor’s indemnity obligations to Owner in the Contract Documents shall survive the expiration or termination of the Contract Documents.

3.16.2 In any and all claims against the Owner or the Design Consultant or any of their agents, representatives, or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Paragraph 3.16 shall not be limited in any way by Contractor’s insurance coverage required herein.

3.16.3 No provision of this Paragraph 3.16 shall give rise to any duties on the part of the Design Consultant or the Owner, or any of their agents, representatives, or employees.

3.18 CONDITIONS AFFECTING THE WORK

3.18.1 The Contractor shall be responsible for taking all steps necessary to ascertain the nature and location of the Work and the general and local conditions, which can affect the Work or the cost thereof. The Owner assumes no responsibility for any understanding or representation about conditions affecting the Work made by any of his officers, employees, representatives, or agents prior to the execution of the Contract, unless such understandings or representations are expressly stated in the Contract Documents.

3.19 MISCELLANEOUS.

3.19.1 The Contractor shall provide documentation acceptable to the Owner showing the amount of MBE participation (including a complete list of all subcontractors and their final subcontract amounts) and sales tax paid by the Contractor and its subcontractors for materials purchased for Projects completed under this contract. The Contractor agrees to comply with the all of the Owner’s policies at all times that the Contractor, its subcontractors and employees are on the Owner’s property. The Contractor acknowledges that the Owner’s policies can be accessed and viewed at http://www.pender.k12.nc.us/ The Contractor shall comply with the Owner’s site or school building access procedures when working on any existing school campus.

3.20 APPLICABLE LAWS.

3.20.1 This Contract and the relationship of the parties shall be governed by the laws of the state of North Carolina.

3.20.2 Contractor shall comply with all applicable laws and regulations in providing services under this Contract. Contractor shall not employ any individuals to provide services to the Owner who are not authorized by federal law to work in the United States. The Contractor represents that it is aware of and in compliance with the Immigration Reform and Control Act and North Carolina law (Article 2 of Chapter 64 of the North Carolina General Statutes) requiring use of the E-Verify system. The Contractor further warrants that it will use the E-Verify system to verify employment eligibility of all its employees throughout the term of this Contract, and that it will remain in compliance with all I-9 requirements throughout the term of this Contract. The Contractor shall also ensure that any subcontractors use the E-Verify system at all times while providing subcontracted services in connection with this Contract. Contractor is responsible for providing affordable health care coverage to all of its full-time employees providing services to the school system. The definitions of "affordable coverage" and "full-time employee" are governed by the Affordable Care Act and accompanying IRS and Treasury Department regulations.

3.20.3 The Contractor also acknowledges that G.S. § 14-208.18 prohibits anyone required to register as a sex offender under Article 27A of Chapter 14 of the General Statutes from knowingly being on the premises of any school. The Contractor shall conduct or arrange to have conducted, at its own expense, sexual offender registry checks on each of its employees, agents, ownership personnel, or contractors ("contractual personnel") who will engage in any service on or delivery of goods to school system property or at a school-system sponsored event, except checks shall not be required for individuals who are solely delivering or picking up equipment, materials, or supplies at: (1) the administrative office or loading dock of a school; (2) non-school sites; (3) schools closed for renovation prior to substantial completion; or (4) new school construction sites prior to substantial completion. The checks shall include at a minimum checks of the State Sex Offender and Public Protection Registration Program, the State Sexually Violent Predator Registration Program, and the National Sex Offender Registry ("the Registries"). For the Contractor's convenience only, all of the required registry checks may be completed at no cost by accessing the United States Department of Justice Sex Offender Public Website at http://www.nsopw.gov/. The Contractor shall provide certification on the Sexual Offender Registry Check Certification Form (attached as Appendix B) that the registry checks were conducted on each of its contractual personnel providing services or delivering goods under this Agreement prior to the commencement of such services or the delivery of such goods. With each pay application, the Contractor shall provide an updated list of all Project subcontractors, identifying the date the subcontractor is anticipated to first be on the site, and the status of receipt of the Completed Sexual Offender Registry Check Certification Form from each subcontractor. The Contractor shall conduct a current initial check of the registries (a check done more than 30 days prior to the date of this Agreement shall not satisfy this contractual obligation). In addition, the Contractor agrees to conduct the registry checks and provide a supplemental certification form before any additional contractual personnel are used to deliver goods or provide services pursuant to this Agreement. The Contractor further agrees to conduct annual registry checks of all contractual personnel and provide annual certifications at each anniversary date of this Agreement. The Contractor shall not assign any individual to deliver goods or provide services pursuant to this Agreement if said individual appears on any of the listed registries. The Contractor agrees that it will maintain all records and documents necessary to demonstrate that it has conducted a thorough check of the registries as to each contractual personnel, and agrees to provide such records and documents to the Owner upon request. The Contractor specifically acknowledges that the Owner retains the right to audit these records to ensure compliance with this section at any time in the Owner's sole discretion. Failure to comply with the terms of this provision shall be deemed a material breach of the Agreement. In addition, the Owner may conduct additional criminal records checks at the Owner's expense. If the Owner exercises this right to conduct additional criminal records checks, the Contractor agrees to provide within seven (7) days of request the full name, date of birth, state of residency for the past ten years, and any additional information requested by the Owner for all contractual personnel who may deliver goods or perform services under this Agreement. The Contractor further agrees that it has an ongoing obligation to provide the Owner with the name of any new contractual personnel who may deliver goods or provide services under the Agreement. The Owner reserves the right to prohibit any contractual personnel of the Contractor from delivering goods or providing services under this Agreement if the Owner determines, in its sole discretion, that such contractual personnel may pose a threat to the safety or well-being of students, school personnel or others.

3.20.4 Anti-Nepotism. Contractor warrants that, to the best of its knowledge and in the exercise of due diligence, none

of its corporate officers, directors, or trustees and none of its employees who will directly provide services under this Agreement are immediate family members of any member of the Pender County Board of Education or of any principal or central office staff administrator employed by the Board. For purposes of this provision, "immediate family" means spouse, parent, child, brother, sister, grandparent, or grandchild, and includes step, half, and in-law relationships. Should Contractor become aware of any family relationship covered by this provision or should such a family relationship arise at any time during the term of this Agreement, Contractor shall immediately disclose the family relationship in writing to the Superintendent of the Schools. Unless formally waived by the Board, the existence of a family relationship covered by this Agreement is grounds for immediate termination by Owner without further financial liability to Contractor.

3.20.5 Restricted Companies Lists. Provider represents that as of the date of this Contract, Provider is not included on the Final Divestment List created by the North Carolina State Treasurer pursuant to N.C. Gen. Stat. § 147-86.58. Provider also represents that as of the date of this Contract, Provider is not included on the list of restricted companies determined to be engaged in a boycott of Israel created by the North Carolina State Treasurer pursuant to N.C. Gen. Stat. § 147-86.81.

3.21 COMPLIANCE WITH BOARD POLICIES AND PROCEDURES

The Contractor acknowledges that Board policies are available for review at https://v3.boardpolicyonline.com/b/bl/pender and agrees to comply with the policies. The Contractor also agrees to comply with the following provisions:

3.21.1 The Contractor, its Subcontractors and employees shall not possess or carry, whether openly or concealed, any gun, rifle, pistol, or explosive on any property owned by the Owner. This includes firearms locked in containers, vehicles or firearm racks within vehicles. The Contractor, its Subcontractors and employees shall not cause, encourage or aid a minor, who is less than 18 years old to possess or carry, whether openly or concealed, any weapons on any property owned by the Owner.

3.21.2 The Contractor, its Subcontractors and employees, are prohibited from profane, lewd, obscene or offensive conduct or language, including engaging in sexual harassment.

3.21.3 The Contractor and its Subcontractors shall not manufacture, transmit, conspire to transmit, possess, use or be under the influence of any alcoholic or other intoxicating beverage, narcotic drug, hallucinogenic drug, amphetamine, barbiturate, marijuana or anabolic steroids, or possess, use, transmit or conspire to transmit drug paraphernalia on any property owned by the Owner.

3.21.4 The Contractor and its Subcontractors may not at any time use or display tobacco or nicotine-containing products, including but not limited to electronic cigarettes (e-cigarettes), on school premises, both indoor and outdoor. The prohibition of the display of tobacco or nicotine products shall not extend to a display that has a legitimate instructional or pedagogical purpose. For purposes of this Contract, "tobacco product" is defined to include cigarettes, cigars, blunts, bidis, pipes, chewing tobacco, snuff, and any other items containing or reasonably resembling tobacco, tobacco products, or any facsimile thereof. "Tobacco use" includes smoking, chewing, dipping, or any other use of tobacco products.

3.21.5 The Contractor, its Subcontractors and employees shall not solicit from or sell to students or staff within the Owner's facilities or campuses, and shall not give gifts of any value to school system employees.

3.21.6 Operators of all commercial vehicles on any property owned by the Owner shall be subject to post-accident, random, reasonable suspicion and follow-up testing for drugs and alcohol.

3.21.7 The Contractor, its Subcontractors and employees are prohibited from using access to the site pursuant to this Agreement as a means to date, court, or enter into a romantic or sexual relationship with any student enrolled in the School System. The Contractor agrees to indemnify the Owner for claims against the Owner resulting

from relationships which have occurred or may occur between a student and an employee of the Contractor or Subcontractor.

3.22 MINORITY AND HISTORICALLY UNDERUTILIZED BUSINESS

If the Contract Sum is $300,000 or greater, the Contractor shall make a good faith effort to utilize minority and Historically Underutilized Businesses (HUBs) as defined and required in N.C. Gen. Stat. 143-128.2 to -128.4. The Contractor shall identify in the list of its Subcontractors, those Subcontractors that are (HUBs) and indicate the portion of the Work that each Subcontractor will perform. If during the duration of the Project, the Contractor effects a substitution for any Subcontractor, or if additional subcontract opportunities become available, the Contractor shall make a good faith effort to utilize HUBs. The Contractor shall submit with each Application for Payment a list of those HUBs whose work is included in the application and the amount due each. Failure or refusal of the Contractor to submit the required information on HUBs shall be grounds to withhold payment.

END OF ARTICLE 3

ARTICLE 4

SUBCONTRACTORS

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

4.1.1 The Contractor, in compliance with the requirements of the Contract Documents, shall furnish in writing to the Owner the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work. The Owner will promptly reply to the Contractor in writing stating whether or not the Owner, after due investigation, has reasonable objection to any such proposed person or entity.

4.1.2. The Contractor shall identify in the list of names of the Subcontractors proposed, those Subcontractors that are Minority Business Enterprises and the date each is planned to begin work on the project. If during the duration of the project, the Contractor effects a substitution for any Subcontractor, or if additional subcontract opportunities become available, the Contractor shall make a good faith effort to utilize Minority Business Enterprises. At the completion of the project, the Contractor shall provide documentation acceptable to the Owner showing the amount of MBE participation (including a complete list of all subcontractors and their final subcontract amounts).

END OF ARTICLE 4

ARTICLE 5

WORK BY OWNER OR BY SEPARATE CONTRACTORS

5.1 OWNER'S RIGHT TO PERFORM WORK AND TO AWARD SEPARATE CONTRACTS

5.1.1 The Owner reserves the right to perform work related to the Project with his own forces, and to award separate contracts in connection with other portions of the Project or other work on the site under these or similar Conditions of the Contract.

5.2 MUTUAL RESPONSIBILITY

5.2.1 Should the Contractor cause damage to the work or property of the Owner or of any separate contractor on the Project, or to other work on the Site, or delay or interfere with the Owner's work on ongoing operations or

facilities or adjacent facilities or said separate contractor's work, the Contractor shall be liable for the same; and, in the case of another contractor, the Contractor shall attempt to settle said claim with such other contractor prior to such other contractor's institution of litigation or other proceedings against the Contractor.

5.2.2 Should a separate contractor cause damage to the Work or to the property of the Contractor or cause delay or interference with the Contractor's performance of the Work, the Contractor shall present directly to said separate contractor any claims it may have as a result of such damage, delay or interference (with an information copy to the Owner) and shall attempt to settle its claim against said separate contractor prior to the institution of litigation or other proceedings against said separate contractor.

5.2.3. In no event shall the Contractor seek to recover from the Owner or the Design Consultant, and the Contractor hereby waives any claims against the Owner and Design Consultant relating to any costs, expenses (including, but not limited to, attorney's fees) or damages or other losses incurred by the Contractor as a result of any damage to the Work or property of the Contractor or any delay or interference caused by any separate contractor.

5.3 COORDINATION OF THE WORK

5.3.1 By entering into this contract, Contractor acknowledges that there may be other contractors on the site whose work will be coordinated with that of his own. Contractor expressly warrants and guarantees that he will cooperate with other contractors and will do nothing to delay, hinder or interfere with the work of other separate contractors, the Owner or Design Consultant. Contractor also expressly agrees that, in the event his work is hindered, delayed, interfered with or otherwise affected by a separate contractor, his sole remedy will be a direct action against the separate contractor as described in this Article 5. Contractor will have no remedy, and hereby expressly waives any remedy, against the Owner and/or the Design Consultant on account of delay, hindrance, interference or other event caused by a separate contractor.

5.3.2 When certain items of equipment and other work are indicated as "NIC" (not in contract), or to be furnished and installed under other contracts, any requirements set forth in the Contract Documents for preparation of openings, provision of backing, etc., for receipt of such "NIC" work will be furnished upon written request to the Contractor who shall properly form and otherwise prepare his work in a satisfactory manner to receive such "NIC" work.

END OF ARTICLE 5

ARTICLE 6

MISCELLANEOUS PROVISIONS

6.1 GOVERNING LAW

6.1.1 This contract shall be governed by the law of the State of North Carolina. The Contractor and Owner agree that Pender County, North Carolina shall be the proper venue for any litigation arising out of this Agreement.

6.1.2 Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein. If through mistake or otherwise, any such provision is not inserted or is not correctly or fully inserted, then upon the application of either party, the Contract shall forthwith be physically amended to make such insertion.

6.2 CLAIMS AND DAMAGES

6.2.1 Should the Contractor or any of its Subcontractors suffer injury or damage to person or property because of any act or omission of the Owner or Design Consultant, or of any of their employees, agents or others for whose

acts either is legally liable, the claim on behalf of the Contractor or its subcontractors shall be made in writing to the Owner within 10 days after the first observance of such injury or damage; otherwise, the Contractor shall have waived any and all rights he may have against the Owner or the Design Consultant, or their employees, representatives and agents. The Contractor shall indemnify, defend and hold the Owner harmless from any claim by a Subcontractor that is waived because it is not filed in strict conformance with this paragraph or any other provision of this Agreement regarding claims.

6.4 RIGHTS AND REMEDIES

6.4.1 The duties and obligations of the Contractor imposed by the Contract Documents and the rights and remedies of the Owner available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.

6.4.2 Except as may be specifically agreed in writing, the failure of the Owner or the Design Consultant to insist in any one or more instances upon the strict performance of any one or more of the provisions of this Contract, or to exercise any right herein contained or provided by law, shall not be construed as a waiver or relinquishment of the performance of such provisions or right(s) or of the right to subsequently demand such strict performance or exercise such right(s), and the rights shall continue unchanged and remain in full force and effect.

6.4.3 The Contractor agrees that he can be adequately compensated by money damages for any breach of this Contract which may be committed by the Owner and hereby agrees that no default, act, or omission of the Owner or the Design Consultant, except for failure to make progress payments as required by the Contract Documents, shall constitute a material breach of the Contract entitling the Contractor to cancel or rescind the provisions of this Contract or (unless the Owner shall so consent or direct in writing) to suspend or abandon performance of all or any part of the Work. The Contractor hereby waives any and all rights and remedies to which he might otherwise be or become entitled, save only his right to money damages.

6.4.4 Contractor and Owner acknowledge that the Contract Documents shall not be construed against Owner due to the fact that they may have been drafted by Owner. For purposes of construing the Contract Documents, both Contractor and Owner shall be considered to have jointly drafted the Contract Documents.

6.4.5 In the event that Owner incurs attorney’s fees or litigation expenses in connection with enforcing or protecting its rights under the Contract Documents or defending any claim or lawsuit brought against it arising out of the Work or the Contract Documents, Contractor shall reimburse Owner for such reasonable attorney's fees and expenses.

6.5 TESTS

6.5.1 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested, or approved, the Contractor shall give the Owner timely notice of its readiness so the Design Consultant and the Owner may observe such inspection, testing or approval. The Contractor shall bear all costs of such inspections, tests or approvals conducted by public authorities. Unless otherwise provided, the Owner shall bear all costs of other inspections, tests or approvals, except the Contractor shall be responsible for the cost of any reinspection, including the rescheduling of an inspection requested by the Contractor prior to proper the completion of the work to be inspection.

6.5.2 Unless otherwise stipulated in other Contract Documents, the Contractor shall pay for all utilities required for testing of installed equipment of all of his work and work of each Subcontractor. Boiler fuel other than gas shall be provided by Subcontractor furnishing boilers. Labor and supervision required for making such tests shall be provided at no additional cost to the Owner.

6.5.3 If the Design Consultant or the Owner determines that any Work requires special inspection, testing, or approval which Subparagraph 6.5.1 does not include, the Owner will instruct the Contractor to order such special

inspection, testing or approval, and the Contractor shall give notice as provided in Subparagraph 6.5.1. If such special inspection or testing reveals a failure of the Work to comply (1) with the requirements of the Contract Documents, or (2) with respect to the performance of the Work, with laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction, the Contractor shall bear all costs thereof, including compensation for the Design Consultant's and Owner's additional construction management expenses made necessary by such failure.

6.6 UNENFORCEABILITY OF ANY PROVISION

6.6.1 If any provision of this Contract is held as a matter of law to be unenforceable or unconscionable, the remainder of the Contract shall be enforceable without such provision.

6.7 ATTORNEYS' FEES AND OTHER EXPENSES

6.7.1 The Contractor hereby agrees that he will not submit, assert, litigate or otherwise pursue any frivolous or unsubstantiated claims or claims he has specifically waived under the terms of the Contract Documents. In the event that the Contractor's or its Subcontractor's claims, or any separate item of a claim, is without substantial justification, the Contractor shall reimburse the Owner or Design Consultant for all costs and expenses associated with defending such claim or separate item, including but not limited to, attorneys' fees, audit costs, accountants' fees, expert witness' fees, additional Design Consultant expenses, additional construction management expenses, or services and any other consultant costs.

6.7.2 If the Contractor breaches any obligation under the Contract Documents, the Contractor shall reimburse the Owner and Design Consultant for all costs and expenses incurred by the Owner relating to such breach, including but not limited to attorneys' fees, audit costs, accountants' fees, expert witness' fees, additional Design Consultant expenses, additional construction management expenses, and any other consultant costs.

6.7.3 If the Owner or Design Consultant prevails in a claim brought against the Contractor, including but not limited to, claims for fraud or misrepresentation, overpayment, defective work, delay damages, and recovery of termination expenses, the Contractor shall reimburse the Owner and Design Consultant for all costs and expenses incurred by them relating to such claim, including but not limited to attorneys' fees, audit costs, accountants' fees, expert witness' fees, additional Design Consultant expenses, additional construction management expenses, and any other consultant costs.

END OF ARTICLE 6

ARTICLE 7

TIME

7.1 DEFINITIONS

7.1.1 Unless otherwise provided, the Contract Time is the period of time allotted in the Contract Documents for Substantial and Final Completion of the Work, as defined in Subparagraph 7.1.3 and 7.1.4, including any allowances and alternates. The Contractor shall complete his Work within Contract Time, unless the Contract Time is modified.

7.1.2 The date of commencement of the Work is the date established in a notice to proceed. If there is no notice to proceed, it shall be the date of the Owner-Contractor Agreement or such other date as may be established therein. The Contractor shall not commence Work or store materials or equipment on site until written Notice to Proceed is issued or until the Contractor otherwise receives the Owner's written consent.

7.2 DELAYS AND EXTENSIONS OF TIME

7.2.1 The time during which the Contractor or any of its subcontractors delayed in the performance of the Work by the acts or omissions of the Owner, Design Consultant or their employees or agents, acts of God, unusually severe and abnormal climatic conditions, fires, floods, epidemics, quarantine restrictions, strikes, riots, civil commotions or freight embargoes, or other conditions beyond the Contractor's or its subcontractors' control and which the Contractor or its subcontractors could not reasonably have foreseen and provided against, shall be added to the time for completion of the Work (i.e., the Contract Time) stated in the Owner-Contractor Agreement; provided, however, that no claim by the Contractor for an extension of time for delays will be considered unless made in strict compliance with the requirements of this Article and other provisions of the Contract Documents.

7.2.1.1 For excessive inclement weather, the Contract Time will not be extended due to reasonably anticipated inclement weather or for delays in the aftermath of inclement weather, reasonably anticipated or excessive. The time for performance of this Contract, as stated in the Contract Documents, includes an allowance for calendar days which may not be available for construction out-of-doors; for the purposes of this Contract, the Contractor agrees that the number of calendar days per month based on a five-year average shall be considered reasonably anticipated inclement weather and planned for in the construction schedule per the Contract. Unless the Contractor can substantiate to the satisfaction of the Owner that there was greater than the reasonably anticipated inclement weather considering the time from the notice-to-proceed with on-site activities until the date established for Substantial Completion using data from the national weather service station at ILM Airport or a weather station acceptable to the Owner and that such alleged greater than reasonably anticipated inclement weather actually delayed the Work or portions thereof which had an effect upon the Contract Time, the Contractor shall not be entitled to an extension of time.

Also the Contractor agrees that the calculation of the number of excessive inclement weather days shall be the number of days in excess of the five-year average for each month, in which precipitation exceeded one tenth (.10) inch, or in which the highest temperature was 32 degrees F or less as recorded at the approved weather station. Rain days from hurricanes and tropical storms not causing damage in Pender County shall be deemed inclement weather days.

If the total accumulated number of calendar days lost to excessive inclement weather, from the notice-to-proceed with on-site activities until the date established for Substantial Completion, exceeds the total accumulated number to be reasonably anticipated for the same period from the table above, time for completion will be extended by the number of calendar days needed to include the excess number of calendar days lost. No extension of time will be made for days due to excessive inclement weather occurring after the date established for Substantial Completion or for contracts that do not include work out of doors that is not on the critical path. No change in Contract Sum will be authorized because of adjustment of Contract time due to excessive inclement weather.

7.2.2 Should a time extension be granted for Substantial Completion the date for Final Completion shall be appropriately adjusted unless specifically stated otherwise.

7.2.3 Neither the Owner nor the Design Consultant shall be obligated or liable to the Contractor or its Subcontractors for, and the Contractor hereby expressly waives any claims against the Owner and the Design Consultant on account of any indirect or direct damages, costs or expenses of any nature which the Contractor, its Subcontractors, or Sub-subcontractors or any other person may incur as a result of any delays, interferences, changes in sequence or the like, which are reasonable, foreseeable, contemplated, or avoidable by Contractor, and it is understood and agreed that the Contractor's sole and exclusive remedy in any such events shall be an extension of the Contract Time in accordance with the Contract Documents, unless the delays, interferences, changes in sequence or the like arise solely from or out of any act or omission of the Owner or the Design Consultant, or their agents, employees, consultants or independent. The Contractor shall not be entitled to any damages or extensions of time pursuant to this section for concurrent delays for which the Contractor is at least partially responsible.

7.2.4 Subject to other provisions of the Contract Documents, the Contractor may be entitled to an extension of the Contract Time (but no increase in the Contract Sum) for delays arising from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, his Subcontractors or suppliers, unless caused solely by the Owner or Design Consultant

7.2.5 The Contractor and its subcontractors shall not be entitled to and hereby expressly waives any extension of time resulting from any condition or cause unless said claim for extensions of time is made in writing to the Owner within ten (10) days of the first instance of delay.

END OF ARTICLE 7

ARTICLE 8

PAYMENTS AND COMPLETION

8.1 SCHEDULE OF VALUES

8.1.1 Before the first Application for Payment, the Contractor shall submit to the Owner a schedule of values allocated to the various portions of the Work.

8.2 APPLICATIONS FOR PAYMENT

8.2.1 Prior to the date for each progress payment established in the Owner-Contractor Agreement, the Contractor, shall submit to the Owner an itemized Application for Payment including a completed Contractor's Sales Tax Report (attached hereto as Appendix A) for all items provided by the Contractor or any Subcontractors included in the application. The Contractor shall also certify that he has paid all due and payable amounts for which previous certificates for payment were issued and payments received from the Owner and that the work for which payment is requested has been completed.

8.2.2 The Owner will retain funds from each progress payment to the maximum extent allowed by N.C. General Statute 143-134.1 until the Work is finally completed and accepted, whether or not the Owner has occupied any or all of the Project before such time. If a reduction in retainage has been made or the Owner stops withholding retainage for any reason, the Owner may increase or commence the retainage as authorized by N.C. Gen. Stat. 143-134.1.

8.2.3 Owner will be under no obligation to make payment to the Contractor on account of materials or equipment not incorporated in the Work. Materials once paid for by the Owner become the property of the Owner and may not be removed from the work site without the Owner's written permission.

8.2.4 The Contractor warrants that title to all Work, materials and equipment covered by an Application for Payment will pass to the Owner either by incorporation in the construction or upon the receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in this Article 8 as "liens".

8.2.5 All invoices shall show the following:
- .1 Total amount of contract
- .2 Amount of change orders
- .3 Total value of completed work
- .4 Amount retained by Owner
- .5 Amount due Contractor

8.2.6 The following conditions shall apply to the Contractor billing for the use of allowances contained in the Contract

documents:
.1 An Allowance Expenditure Form (sample attached as Appendix C) shall be approved by the Contractor, Owner and Design Consultant prior to submitting an Application for Payment including payment for all or part of an allowance; and
.2 The Contractor shall provide documentation similar to that required to support a Change Order pursuant to Article 10 for each Allowance Expenditure Form.

8.3 CERTIFICATES FOR PAYMENT

8.3.1 By signing a Certificate for Payment, the Design Consultant shall not thereby be deemed to represent that it has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work or that it has reviewed the construction means, methods, techniques, sequences, or procedures, or that it has made any examination to ascertain how or for what purpose the Contractor has used the moneys previously paid on account of the Contract Sum.

8.4 PROGRESS PAYMENTS

8.4.1 The Contractor shall promptly pay each Subcontractor (including suppliers, laborers, and material-men) performing labor or furnishing material for the Work, upon receipt of payment from the Owner.

8.4.2 No Certificate for a progress payment, nor any progress payment, nor any partial or entire use or occupancy of the Project by the Owner, shall constitute an acceptance of any Work not in accordance with the Contract Documents.

8.4.3 The Contractor shall not submit more than one pay application during any 30-day period.

8.5 PAYMENTS WITHHELD

8.5.1 The Design Consultant may decline to certify payment and may withhold their Certificate in whole or in part, to the extent the Design Consultant deems necessary to reasonably protect the Owner from loss associated with unsatisfactory job progress, defective construction, disputed work, claims or any other similar issue. The Design Consultant may also decline to certify payment if the Contractor fails to provide Subcontractor information regarding the use of minority and HUBs and/or sexual registry checks. If the Design Consultant is unable to make representations to the Owner and to certify payment in the amount of the Application, it will notify the Contractor as provided herein. The Design Consultant may also decline to certify payment because of subsequently discovered evidence or subsequent observations that may nullify the whole or any part of any Certificate for Payment previously issued to such extent as may be necessary in its opinion to protect the Owner from loss.

8.6 FAILURE OF PAYMENT

8.6.1 Payments due and unpaid under the Contract Documents shall not bear interest.

8.7 SUBSTANTIAL COMPLETION

8.7.1 The Date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Design Consultant and Owner when the Work or a designated portion thereof is sufficiently complete, in accordance with the Contract Documents, so Owner can fully occupy and utilize the Work for the use for which it is intended, with all of the Project's parts and systems operable as required by the Contract Documents. Only incidental corrective work and any final cleaning beyond that needed for Owner's full use may remain for Final Completion. The Contractor shall be solely responsible for the cost to repair or replace any work damaged or destroyed prior to the Date of Substantial Completion.

8.7.2 When the Design Consultant and the Owner on the basis of an inspection jointly determine that the Work or

designated portion thereof is substantially complete, they will then prepare a Certificate of Substantial Completion which shall establish the Date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. 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. The Contractor shall provide operation & maintenance manuals, and operation training to the Owner as required by the Contract Documents prior to Substantial Completion. The Owner's occupancy of incomplete work shall not alter the Contractor's responsibilities pursuant to this section.

8.7.3 The acceptance of Substantial Completion payment shall constitute a waiver of all claims by the Contractor and its Subcontractors except those previously made in writing and identified by the Contractor as unsettled at the time the Contractor submits the Application for Payment for Substantial Completion, and except for the retainage sums due at final acceptance. The Contractor shall indemnify and hold the Owner harmless against any claims by its Subcontractors that are waived because they were not made in writing and identified by the Contractor as unsettled when the Contractor submitted the Application for Payment for Substantial Completion.

8.7.4 The issuance of the Certificate of Substantial Completion does not indicate final acceptance of the project by the Owner, and the Contractor is not relieved of any responsibility for the project except as specifically stated in the Certificate of Substantial Completion.

8.7.5 There will be two inspections by the Design Consultant at Substantial Completion:

.1 To generate a list of items to be completed or corrected before Owner takes possession of the Work.
.2 To check that the list of items has been completed before issuing Final Payment.

Any additional inspections by the Design Consultant requested by Contractor to complete the Punch List shall result in money being withheld from the Final Payment to cover the cost of these additional inspections.

8.7.6 The Contractor acknowledges that the Design Consultant and its consultants are only required to conduct up to two (2) comprehensive substantial completion inspections as part of its basic services. If more than two (2) substantial completion inspections are required through no fault of the Design Consultant, the cost of the additional inspections shall be paid by the Contractor.

8.8 FINAL COMPLETION AND FINAL PAYMENT

8.8.1 The date of Final Completion of the work is the date certified by the Design Consultant and the Owner when the Work is totally complete, to include punch list work, in accordance with the Contract Documents and the Owner may fully occupy and utilize the work for the use for which it is intended. The issuance of a temporary or final certificate of occupancy shall not, in itself, constitute Final Completion.

8.8.1.1 When the Design Consultant and the Owner find the Work acceptable under the Contract Documents and the Contract fully performed, they will approve a final Certificate of Payment stating that to the best of their knowledge, information and belief, and on the basis of their observations and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents. The final Certificate of Payment will constitute that the conditions precedent to the Contractor's being entitled to final payment as set forth in Section 8.8 have been fulfilled. Payment shall be made to the Contractor in the amount certified by the Design Consultant within forty five (45) calendar days after receipt by the Owner of the final Certification of Payment except for any Work for which the Owner is entitled a credit under the Contract Documents. If the Design Consultant and the Owner find the Work to be incomplete or unacceptable, the costs of reinspections shall be paid by the Contractor.

8.8.2 Final Payment shall not become due until the Contractor provides to the Design Consultant and Owner: three (3) copies of any of the following required:

.1 Final Change Order
.2 Final Application for Payment
.3 Consent of Surety to Final Payment - AIA G707(if applicable)
.4 Contractor's Affidavit of Release of Liens - AIA G706A
.5 Contractor's Affidavit of Payment of Debts and Claims - AIA G706;
.6 Certificate of Occupancy (if applicable)
.7 Contractor's Warranty, notarized
.8 Warranty Summary Sheet with Original Warranties (if not included in O & M Manuals)
.9 Certification Letter from Contractor that no Asbestos-Containing Materials were used on the project
.10 Final List of Subcontractors (name, address, phone, email, fax nos.)
.11 Record Drawings (As-Built) - 1 set
.12 Operation and Maintenance Manuals - 3 sets
.13 Other project close-out submittals, as required by the Contract Documents.

8.8.3 Neither the final payment nor the remaining retained percentage shall become due until the Work is free and clear of any and all liens and the Contractor submits to the Owner:

.1 an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or his property might in any way be responsible, have been paid or otherwise satisfied;

.2 if required by the Owner, other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of liens arising out of the Contract, to the extent and in such form as may be designated by the Owner; and

.3 As-built drawings, and other project closeout submittals, as required by the Owner.

8.8.4 The making of final payment shall constitute a waiver of all claims by the Owner against the Contractor except those arising from:

.1 unsettled liens, and claims against the Owner or the Design Consultant, or their employees, agents, or representatives,

.2 faulty, defective or non-conforming Work discovered or appearing after Substantial or Final Completion,

.3 failure of the Work to comply with the requirements of the Contract Documents,

.4 terms of any warranties contained in or required by the Contract Documents,

.5 damages incurred by the Owner resulting from lawsuits brought against the Owner, the Design Consultant, or their agents, employees or representatives because of failures or actions on the part of the Contractor, his Subcontractors, Sub-subcontractors, or any of their employees, agents or representatives, or

.6 fraud or bad faith committed by the Contractor or any subcontractor or supplier during performance of work but discovered by Owner after Final Payment.

8.8.5 The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the final Application for Payment.

8.8.6 The Contractor acknowledges that the Design Consultant and its consultants are only required to conduct up

to two (2) comprehensive final completion inspections as part of its basic services. If more than two (2) final completion inspections are required through no fault of the Design Consultant, the cost of the additional inspections shall be paid by the Contractor.

8.9 LIQUIDATED DAMAGES

8.9.1 Should the Contractor fail to substantially complete the Work on or before the date stipulated for Substantial Completion (or such later date as may result from extension of time granted by Owner), he shall pay the Owner, as Substantial Completion liquidated damages the daily amount stated in the Supplementary Conditions for each consecutive calendar day that terms of the contract remain unfulfilled beyond the date allowed by the Contract, which sum is agreed upon as a reasonable and proper measure of damages which the Owner will sustain per day by failure of the Contractor to complete work within time as stipulated; it being recognized by the Owner and the Contractor that the injury to the Owner which could result from a failure of the Contractor to complete on schedule is uncertain and cannot be computed exactly. In no way shall costs for liquidated damages be construed as a penalty on the Contractor.

8.9.2 For each consecutive calendar day that the Work remains incomplete after the date established for Final Completion, the Contractor shall pay or Owner will retain the daily amount stated in the Supplementary Conditions as Final Completion Liquidated Damages from the compensation otherwise to be paid to the Contractor. This amount is the minimum measure of damages the Owner will sustain due to the delay in the completion of all remedial work, the delay in the correction of the deficient work, the disruption to the school and the learning environment, the cost of contract management time and resources, administration time, and the inability to use the facilities fully. This amount is in addition to the liquidated damages prescribed above for Substantial Completion.

8.9.3 The amount of liquidated damages set forth in the corresponding Supplementary Conditions shall be assessed cumulatively. The items of cost included in the assessment of liquidated damages are as defined above. This provision for liquidated damages does not bar Owner's right to enforce other rights and remedies against Contractor, including but not limited to, specific performance or injunctive relief.

8.10 OWNER'S RIGHT TO OCCUPY INCOMPLETE WORK

8.10.1 Should the Project, or any portion thereof, be incomplete for Substantial or Final Completion at the scheduled date or dates, the Owner shall have the right to occupy any portion of the Project. In such an event, the Contractor shall not be entitled to any extra compensation on account of said occupancy by the Owner or by the Owner's normal full use of the Project, nor shall the Contractor interfere in any way with said normal full use of the Project. Further, in such an event, the Contractor shall not be entitled to any extra compensation on account of the Owner's occupancy and use of the Project, nor shall the Contractor be relieved of any responsibilities of the Contract including the required times of completion and property insurance coverage, unless specifically altered by the Owner in writing. Such occupancy by the Owner shall not, in itself, constitute Substantial or Final Completion.

END OF ARTICLE 8

ARTICLE 9

INSURANCE AND BONDS

9.1.1 CONTRACTOR’S INSURANCE AND BONDS

The Contractor shall purchase and maintain in companies properly licensed by the Insurance Department of the State of North Carolina and acceptable to the Owner such insurance as will protect him, the Owner, and the Owner’s agents, representatives, and employees from claims which may arise out of or result from the Contractor’s operations under the Contract, whether such operations be by himself or by any

Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable. Such insurance shall include:

9.1.1.1 Worker's Compensation including Occupational Disease and Employer's Liability Insurance

.1 Statutory - Amount and coverage as required by State of North Carolina Worker's Compensation laws

.2 Employer's Liability
$1,000,000 Each Accident
$1,000,000 Policy Limit
$1,000,000 Each Employee

9.1.1.2 Commercial General Liability (Occurrence Form) - The Contractor shall provide during the life of this Contract such Commercial General Liability (Occurrence Form) Insurance as shall protect Contractor and any Subcontractor performing work under this Contract from claims for damages for Bodily Injury including accidental death, as well as from claims for Property Damage which may arise from operations under this Contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by either of them. This insurance shall be on the Standard Insurance Services Office, Inc. (ISO) Commercial Liability Occurrence Form. The Contractor shall procure insurance coverage for direct operations, sublet work, elevators, **contractual liability** and completed operations with limits not less than those stated below:

A Combined Single Limit for Bodily Injury, Property Damage and Personal Injury of:

$2,000,000	General Aggregate (except Products - Completed Operations) Limit
$2,000,000	Products - Completed Operations Aggregate Limit
$1,000,000	Personal and Advertising Injury Limit
$1,000,000	Each Occurrence Limit

9.1.1.3 Property Damages, including Broad Form Property Damage and Explosion, Collapse, Underground property damage coverages, and blasting, where necessary.

9.1.1.4 Completed Operations Liability: Continuous coverage in force for one year after completion of Work.

9.1.1.5 Commercial Automobile Insurance, including coverage for owned, non-owned and hired vehicles - with limits not less than a Combined Single Limit for Bodily Injury and Property Damage of $1,000,000.

9.1.1.6 Umbrella Liability Insurance: Policy to 'pay on behalf of the Insured' with Limits of Liability: $1,000,000.

9.2 Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These Certificates shall contain a provision that coverages afforded under the policies will not be canceled until at least thirty (30) days prior written notice has been given to the Owner. Failure to provide such notice shall not limit the liability of the Insurer, its agents or representatives.

9.3 All insurance policies required in this Article, except Worker's Compensation and Commercial Automobile, shall name the Owner as additional named insured for the insurance.

9.4 Contractor shall not commence work under this Contract until he has obtained all the insurance and bonds required under Article 9 of this Contract and until such insurance and bonds have been approved by the Owner, nor shall Contractor allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been so obtained and approved. Approval of the insurance by Owner shall not relieve or decrease the liability of Contractor hereunder.

9.5 The Commercial General Liability and Workers Compensation Policies provided by Contractor shall have endorsements waiving subrogation against Owner.

9.6 PROPERTY INSURANCE. Contractor shall provide the following property insurance through at least Substantial Completion of the Project:

9.6.1 Unless stated otherwise in the Supplemental Conditions, Contractor shall purchase and at all times maintain such insurance as will protect Contractor, Owner, Subcontractors and Sub-subcontractors from loss or damage to Work or property in the course of construction, including all machinery, materials and supplies on the premises or in transit thereto and intended to become a part of the finished work until Final Completion. This insurance shall be in the form of 'Builder's Risk Covered Cause of Loss Form' to include, but not limited to, theft, collapse, earth movement and flood. Any deductible provision in such insurance shall not exceed $5,000.00. Notwithstanding any such deductible provision, Contractor shall remain solely liable for the full amount of any item covered by such insurance.

9.6.2 If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion thereof, such occupancy or use shall not commence prior to a time mutually agreed to by Owner and Contractor, and to which the insurance company or companies providing the property insurance have consented by endorsement to the policy or policies. This insurance shall not be canceled or lapsed on account of such partial occupancy or use. Consent of Contractor and of the insurance company or companies to such occupancy or use shall not be unreasonably withheld.

9.7 Owner shall be under no obligation to review any Certificates of Insurance provided by Contractor, or to check or verify Contractor's compliance with any and all requirements regarding insurance imposed by the Contract Documents. Contractor is fully liable for the amounts and types of insurance required herein and is not excused should any policy or certificate of insurance provided by Contractor not comply with any and all requirements regarding insurance imposed by the Contract Documents.

9.8 All insurance companies providing the above insurance shall be licensed by the Insurance Department of the State of North Carolina and maintain a rating by AM Best or a similar rating company with a minimum of an "A-" rating.

9.9 PERFORMANCE AND PAYMENT BONDS

"If required by law, or in the Supplemental Conditions or the Contract Documents, Contractor must provide performance and payment bonds each in the amount of the Contract Sum. Such bonds shall be on forms acceptable to Owner and issued by surety companies licensed to do business in North Carolina and having a rating of at least AM Best "A-" rating. Contractor may, at its option, make deposit in the form of certified check with Owner in lieu of the performance and payment bonds in an amount equal to the Contract Sum for each such bond, for a total of 200% of the Contract Sum."

9.10 Risk of Loss: Contractor shall bear the risk of loss in the event that any of the Work is stolen, lost, damaged or destroyed prior to the Final Completion of the Work, the issuance of a final Certificate of Occupancy, and acceptance of the Work by the Owner. If any of the Work is stolen, lost, damaged, or destroyed prior to Final Completion, the issuance of a final Certificate of Occupancy, and acceptance of the Work by the Owner, due to any reason except the intentional or reckless acts of Owner or Owner's authorized agents, Contractor shall bear the full cost of repairing or replacing all such Work, including all equipment and materials. Contractor should purchase his own insurance to cover this risk if required by the Contract Documents or otherwise if the Contractor so chooses.

END OF ARTICLE 9

ARTICLE 10

CHANGES IN THE WORK

10.1 CHANGE ORDERS/CONSTRUCTION CHANGE DIRECTIVE

10.1.1 The Owner may, at any time, by written order designated or indicated to be a Change Order, make any change or modification in the Work or add to the Work within the general scope of the Contract.

10.1.2 A Change Order is a document executed pursuant to this Article when the Owner and Contractor agree to Changes in the Work, the Contract Sum, the Contract Time and any other change in the Contract by written agreement signed by Owner, Contractor and Design Consultant designated or indicated to be a Change Order.

10.1.3 A Construction Change Directive is a written order prepared by the Design Consultant and signed by the Owner and Design Consultant, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. If the Contractor, subsequent to the issuance of a Construction Change Directive, agrees to its terms including any applicable adjustment to the Contract Sum and Contract Time, Contractor shall sign it and it shall become a Change Order.

10.2 OWNER DIRECTED CHANGES REQUIRING AN INCREASE IN CONTRACT SUM.

10.2.1 If the Change in the Work will result in an increase in the Contract Sum, the Owner shall have the right to require the performance thereof on a lump sum basis, a unit price basis or a time and material basis, all as hereinafter more particularly described (the right of the Owner as aforesaid shall apply with respect to each such Change in the Work).

If the Owner elects to have the Change in the Work performed on a lump sum basis, its election shall be based on a lump sum Proposal which shall be submitted by the Contractor to the Owner within seven (7) days of the Contractor's receipt of a request therefore (but the Owner's request for a lump sum Proposal shall not be deemed an election by the Owner to have the Change in the Work performed on a lump sum basis). The Contractor's Proposal shall be itemized and segregated by labor and materials for the various components of the Change in the Work (no aggregate labor or material total will be acceptable) and shall be accompanied by signed Proposals of any Subcontractors who will perform any portion of the Change in the Work and of any persons who will furnish materials or equipment for incorporation therein. The Proposal shall also include the Contractor's estimate of the time required to perform said changes. The Contractor shall provide any documentation that may be requested by the Owner or Design Consultant to support the change proposal, including but not limited to payroll records, insurance rates, material quotes, and rental quotes. The Change Proposal Forms attached as Appendix D shall be used to submit change proposals on the Project.

The portion of the Proposal relating to labor, whether by the Contractor's forces or the forces of any of its Subcontractors, may include reasonably anticipated gross wages of job site labor, including foremen, who will be directly involved in the Change in the Work (for such time as they will be so involved), plus payroll costs (including premium costs of overtime time, if overtime is anticipated, Social Security, Federal or State unemployment insurance taxes and fringe benefits required by collective bargaining agreements entered into by the Contractor or any such Subcontractor in connection with such labor) and up to fifteen percent (15%) of such anticipated gross wages, but not payroll costs or labor burden, as overhead and profit for the Contractor or any such Subcontractor actually performing the work, as applicable (said overhead and profit to include all supervision except foremen). Payroll costs and labor burden are limited to 39% of the net pay of the worker. The Proposal shall not include lodging or other travel expenses, unless approved in writing by the Owner and Design Consultant before the expense is incurred.

The portion of the Proposal relating to materials may include the reasonably anticipated direct costs to the Contractor or to any of its Subcontractors of materials to be purchased for incorporation in the Change in the Work, plus transportation and applicable sales and use taxes and up to fifteen percent (15%) of said direct material costs as overhead and profit for the Contractor or any such Subcontractor actually performing the work (said overhead and profit to include all small tools), and may further include the Contractor's and any of its Subcontractor's reasonably anticipated rental costs in connection with the Change in the Work (either actual or discounted local published rates), plus up to eight percent (8%) thereof as overhead and profit for the Contractor

or any such Subcontractors, as applicable.. The Contractor shall provide an itemized breakdown of all transportation and shipping costs, including receipts documenting the expenses. Notwithstanding the above, overhead and profit shall not be applied to any sales tax paid for any purpose or to any transportation or shipping costs incurred by the Contractor or any subcontractor actually performing the work. If any of the items included in the lump sum Proposal are covered by unit prices contained in the Contract Documents, the Owner may, if it requires the Change in the Work to be performed on a lump sum basis, elect to use these unit prices in lieu of the similar items included in the lump sum Proposal, in which event an appropriate deduction will be made in the lump sum amount prior to the application of any allowed overhead and profit percentages. No overhead and profit shall be applied to any unit prices.

The lump sum Proposal may include up to eight percent (8%) of the amount which the Contractor or Subcontractor will pay to any Subcontractor for Changes in the Work as overhead and profit for the Contractor and/or Subcontractor that is not performing the work. The Contractor shall not be reimbursed for the costs of the Subcontractors' Payment and Performance Bonds, as such bonding is not required by the Owner.

10.2.2 In the event that (1) the parties are unable to agree as to the reasonable cost and time to perform the Change in the Work based upon the Contractor's Proposal and the Owner does not elect to have the Change in the Work performed on a time and material basis, (2) the Contractor fails to submit his Proposal within the designated period, or (3) the Work needs to begin immediately, the Owner may choose to make a determination of the reasonable cost and time to perform the Change in the Work, based upon its own estimates, the Contractor's submission or a combination thereof. A Construction Change Directive shall be issued in this case for the amounts of cost and time determined by the Owner and shall become final and binding upon the Contractor, subject to Contractor's right to dispute such action in accordance with Paragraph 10.9. Owner has the right to direct by Construction Change Directive a Change in the Work, which is the subject of such Change Order. Failure of the parties to reach agreement regarding the cost and time of the performing the Construction Change Directive, shall not relieve the Contractor from performing the Change in the Work promptly and expeditiously.

10.2.2.1 The Owner reserves the right to reject the Contractor's Proposal for a Change in the Work and to elect to perform said Work using a Separate Contractor. Under such circumstances, all provisions of Article 6 shall be in force.

10.2.3 If the Owner elects to have the Change in the Work performed on a time and material basis or on a time and material basis with a not to exceed amount, the same shall be performed, whether by the Contractor's forces or the forces of any of its Subcontractors or Sub-subcontractors, at actual cost to the entity performing the Change in the Work (without any charge for administration, clerical expense, supervision or superintendence of any nature whatsoever, including foremen, or the cost, use or rental of tools or plant), plus fifteen percent (15%) thereof as the total overhead and profit (except that said fifteen percent (15%) shall not be applied against any payroll costs, sales and use taxes, or any transportation or shipping costs incurred by the Contractor or any subcontractor actually performing the work as set forth in Paragraph 10.2.1.). Compensation for a Change in the Work shall not include lodging or other travel expenses, unless approved in writing by the Owner and Design Consultant before the expense is incurred. If the Owner and Contractor agree upon a not to exceed amount, it shall be clearly identified in the Change Order or change proposal form and shall be the maximum amount paid by the Owner for the identified work. The Contractor shall submit to the Owner daily time and material tickets, on a daily basis to include the identification number assigned to the Change in the Work, the location and description of the Change in the Work, the classification of labor employed (including employee names and positions), the materials used, the equipment rented (not tools) and such other evidence of cost as the Owner may require. The Owner may require authentication of all time and material tickets and invoices by persons designated by the Owner for such purpose. The failure of the Contractor to secure any required authentication shall, if the Owner elects to treat it as such, constitute a waiver by the Contractor of any Claim for the cost of that portion of the Change in the Work covered by a non-authenticated ticket or invoice; provided, however, that the authentication of any such ticket or invoice by the Owner shall not constitute an acknowledgment by the Owner that the items thereon were reasonably required for the Change in the Work.

10.2.3.1 The Contractor may only bill for all or a portion of work performed on a time and material basis if the work has been completed, accepted and properly documented to the Owner and Design Consultant's satisfaction.

10.2.4 No overhead and profit will be paid by the Owner on account of a Change in the Work except as specifically provided in Section 10.2. Overhead and profit, as allowed under Section 10.2, shall be deemed to include all costs and expenses which the Contractor or any of its Subcontractors may incur in the performance of a Change in the Work and which are not otherwise specifically recoverable by them pursuant to Section 10.2.

10.3 CONTRACTOR NOTICE OF CHANGE

10.3.1 If the Contractor or any of its Subcontractors asserts that any event or occurrence has caused a change in or addition to the Work which change causes an increase or decrease in the Contractor's or its Subcontractors' cost or the time required for the performance of any part of the Work under the Contract, including Work not affected directly by the change, the Contractor shall, within ten (10) days of such event, give the Owner written notice as herein required. Said notice shall include the instructions or circumstances that are the basis of the claim and the Contractor's best estimate of the cost and time involved.

10.3.2 If the Contractor intends to assert a claim under this Article, he must, within ten (10) days after receipt of a written Change Directive under Subparagraph 10.2.1 above or the furnishing of a written notice under Subparagraph 10.3.1, submit to the Owner a written statement setting forth the specific nature and cost of such claim, unless this period is extended by the Owner. The statement of claim hereunder may be included in the notice under Subparagraph 10.3.1 above. The statement of claim shall include all direct, indirect and impact costs associated with the change, as well as the Contractor's estimate of the schedule impact of the change, if any. The Contractor and its subcontractors shall not be entitled to reimbursement for any claims that are not filed in strict conformance with this Article. The Contractor shall indemnify and hold the Owner harmless against any claims by Subcontractors that are waived because they are not filed in strict conformance with this Article.

10.3.3 If the parties are unable to agree to the reasonable cost and time to perform the Change, or are unable to agree as to whether a change occurred, the Owner shall make a unilateral determination as described in Article 10.2.2. The Contractor shall proceed pursuant to the provisions of that Article.

10.4 GENERAL PROVISIONS RELATED TO CHANGES

10.4.1 The Contractor shall not be entitled to any amount for indirect costs, damages or expenses of any nature, including, but not limited to, so-called "impact" costs, labor inefficiency, wage, material or other escalations beyond the prices upon which the proposal is based and to which the parties have agreed pursuant to the provisions of Article 10, and which the Contractor, its Subcontractors or Sub-subcontractors or any other person may incur as a result of delays, interferences, suspensions, changes in sequence or the like, for whatever cause, whether reasonable or unreasonable, foreseeable or unforeseeable, or avoidable or unavoidable, arising from the performance of any and all changes in the Work performed pursuant to this Article 10, unless the delay is caused solely by the Owner or its agent. It is understood and agreed that the Contractor's sole and exclusive remedy in such event shall be recovery of his direct costs as compensable hereunder and an extension of the Contract Time, but only in accordance with the provisions of the Contract Documents. The phrase "Owner or its agent" as used in this Agreement, does not include the Prime Contractors or their Subcontractors.

10.4.2 No claim by the Contractor hereunder shall be allowed if asserted after final payment under this Contract. No claim relating to or flowing from a particular change shall be allowed after execution of the Change Order relating to that change or commencement of the change by the Contractor.

10.5 CHANGES REQUIRING A DECREASE IN CONTRACT SUM.

10.5.1 If the Change in the Work will result in a decrease in the Contract Sum, the Owner may request a quotation by the Contractor of the amount of such decrease for use in preparing a Change Order. The Contractor's quotation shall be forwarded to the Owner within ten (10) days of the Owner's request and, if acceptable to the Owner,

shall be incorporated in the Change Order. If not acceptable, the parties shall make every reasonable effort to agree as to the amount of such decrease, which may be based on a lump sum properly itemized, on unit prices stated in the Contract Documents and/or on such other basis as the parties may mutually determine. If the parties are unable to so agree, the amount of such decrease shall be the total of the estimated reduction in actual cost of the Work, as determined by the Owner in its reasonable judgment, plus fifteen percent (15%) thereof as overhead and profit.

10.6 DISPUTES REGARDING CHANGES.

10.6.1 If any dispute should arise between the parties with respect to an increase or decrease in the Contract Sum or an expansion or contraction in the Contract Time as a result of a Change in the Work, the Contractor shall not suspend performance of a Change in the Work or the Work itself unless otherwise so ordered by the Owner in writing. The Owner shall, however, pay to the Contractor up to the Owner's reasonable estimated value of the Change in the Work, regardless of the dispute, if said Change in the Work results in an increase in the Contract Sum; and the Owner shall have the right to decrease the Contract Sum up to the Owner's reasonable estimated value of the Change in the Work, regardless of the dispute, if said Change in the Work results in a decrease in the Contract Sum.

10.7 MINOR CHANGES IN THE WORK

10.7.1 The Owner shall have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or an 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 the Contractor. The Contractor shall carry out such written orders promptly.

10.7.2 The Contractor shall not perform any changes in the Work unless authorized in writing by the Design Consultant or Owner.

10.8 DIFFERING SITE CONDITIONS

10.8.1 Should the Contractor encounter subsurface and/or latent conditions at the site materially differing from those shown on the drawings or indicated in the specifications or differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this contract, he shall immediately give notice to the Owner of such conditions before they are disturbed. The Owner and the Design Consultant shall thereupon promptly investigate the conditions and if they find that they materially differ from those shown on the drawings or indicated in the specifications, they shall at once make such changes in the drawings and/or specifications as they may find necessary. Any increase or decrease of cost resulting from such changes shall be adjusted in the manner provided herein for adjustments as to extra and/or additional work and changes. However, neither the Owner nor the Design Consultant shall be liable or responsible for additional work, costs or changes to the work due to material differences between actual conditions and any geotechnical, soils and other reports, surveys and analyses made available for the Contractor's review.

10.9 CLAIMS AND DISPUTE RESOLUTION

10.9.1 Definition. A Claim is a demand or assertion by the Contractor seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term “Claim” also includes other disputes and matters in question from the Contractor arising out of or relating to the Contract. Claims must be initiated by written notice. The responsibility to substantiate Claims shall rest with the Contractor.

10.9.2 Time Limits on Claims. Claims by Contractor must be initiated within 10 days occurrence of the event giving rise to such Claim or within 10 days after the Contractor first recognizes the condition giving rise to the Claim, whichever is later, but in no event subsequent to the Contractor’s final payment application. Claims must be initiated by written notice to the Design Consultant (if there is one) and the other party.

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

10.9.4 Claims for Additional Cost. If the Contractor wishes to make Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property when the giving of such notice would increase the risk of injury or damage to persons or property.

10.9.5 Claims for Additional Time. If the Contractor wishes to make Claim for an extension of the dates set for Substantial or Final Completion, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary. Contractor bears the burden of proving it is entitled to an extension of time. Unless Contractor meets this burden, Liquidated Damages shall be assessed automatically.

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

10.9.7 Resolution of Claims and Disputes. Claims, including those alleging an error or omission by the Design Consultant, shall be referred initially to the Design Consultant for decision, if there is a Design Consultant with Contract Administration duties which include Claims resolution; otherwise, such Claims by Contractor shall initially be referred to the Owner. An initial decision by such Design Consultant (or Owner as applicable) shall be required as a condition precedent to mediation or litigation of all Claims by the Contractor arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Design Consultant (or Owner as applicable) with no decision having been rendered. The Design Consultant (or Owner as applicable) will not decide disputes between the Contractor and persons or entitles other than the Owner.

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

10.9.9 Upon receipt of the response or supporting data, if any, the Design Consultant (or Owner as applicable) will either reject or approve the Claim in whole or in part.

10.9.10 The Design Consultant (or Owner as applicable) will approve or reject Claims by written decision, which shall state the reasons therefor and which shall notify the parties or any change in the Contract Sum or Contract Time, or both. The approval or rejection of a Claim by the Design Consultant (or Owner as applicable) shall be final and binding on the parties but subject to mediation and litigation.

10.9.11 When a written decision of the Design Consultant (or Owner as applicable) states that (1) the decision is final but subject to mediation and litigation and (2) a demand for mediation of a Claim (if required by Owner's Dispute Resolution Procedures) or the commencement of a lawsuit (if mediation is not required as a pre-condition to litigation in Owner's Dispute Resolution Procedures) covered by such decision must be made or done within 30 days after the date on which the party making the demand (or filing the lawsuit) receives the final written decision, then failure to demand mediation in writing (if required) or file the lawsuit within said 30 days' period shall result in the Design Consultant's (or Owner's as applicable) decision becoming final and binding upon the Owner and Contractor. If the Design Consultant (or Owner as applicable) renders a decision after litigation proceedings have been initiated, such decision may be entered as evidence, but shall not supersede litigation proceedings unless the decision is acceptable to all parties concerned.

10.9.12 In the event of a dispute, the Owner, Contractor, and other parties involved in the Project shall utilize the Dispute Resolution Procedures adopted by Owner pursuant to N.C.G.S. §143-128(g), if applicable. Owner's Dispute Resolution Procedures are as follows:

These Procedures are applicable to the resolution of disputes with amounts in controversy in excess of $15,000.00 arising between or among any parties involved in Owner's construction and repair Projects, including the Design Consultant and the Contractors, and the first and lower tier subcontractors, on Claims arising out of the contract or construction process. In no event shall the Owner be subject to arbitration proceedings pursuant to these Procedures. Unless otherwise specified in these Procedures, if there is any conflict between these Procedures and the other provisions of the Contract Documents, the terms of these Procedures control.

Any Claim as defined in the Contract Documents or any dispute between parties to a construction contract involving the Project, other than the Owner's claims, except those Claims which are waived shall be subject to nonbinding mediation as a condition precedent to the institution of legal proceedings by any party, except that any party may institute legal proceedings in order to meet any applicable statute of limitations or similar deadlines prior to engaging in nonbinding mediation.

The parties shall endeavor to resolve their claims by nonbinding mediation, which, unless the parties mutually agree otherwise, shall be in accordance with rules established by Owner if Owner is a party to the mediation. If Owner is not a party to the mediation, the mediation shall be conducted in accordance with rules established by the parties to the mediation. The parties to the mediation shall share the cost of mediation equally. The mediation shall be held in the place where the project is located unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

10.9.13 All suits in law or equity between the Owner and the Contractor arising out of the Contract shall be heard in the appropriate court of justice in Pender County, North Carolina.

END OF ARTICLE 10

ARTICLE 11

CORRECTION OF WORK

11.1 CORRECTION OF WORK

11.1.1 The Contractor shall promptly reconstruct, replace or correct all Work rejected by the Design Consultant as defective or as failing to conform to the Contract Documents or as not in accordance with the guarantees and warranties specified in the Contract Documents whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work, including compensation for the Design Consultant's and the Owner's additional construction management services made necessary thereby.

11.1.2 The Contractor, unless removal is waived by the Owner, shall remove from the site all portions of the Work which are defective or non-conforming, or if permitted or required, he shall correct such work in place at his own expense promptly after receipt of notice, and such rejected Work shall not thereafter be tendered for acceptance unless the former rejection or requirement for correction is disclosed.

11.1.3 If the Contractor does not proceed with the correction of such defective or non-conforming Work within a reasonable time fixed by written notice from the Owner, the Owner may either (1) by separate contract or otherwise replace or correct such Work and charge the Contractor the cost occasioned the Owner thereby and remove and store the materials or equipment at the expense of the Contractor, or (2) terminate this Contract for default as provided in Paragraph 12.3. If the Contractor does not pay the cost of such replacement or correction and the removal and storage within ten (10) days thereafter, the Owner may upon ten (10) additional

days' written notice sell such Work at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for additional services of the Design Consultant and the Owner made necessary thereby. If such proceeds of sale do not cover all costs, which the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

11.1.4 The Contractor shall bear the cost of making good all work of the Owner or separate contractors destroyed or damaged by such correction or removal.

11.1.5 Nothing contained in this Paragraph 11.1 shall be construed to establish a period of limitation with respect to any other obligation, which the Contractor might have under the Contract Documents, including Paragraph 3.5 hereof. The establishment of the time period of one year after the Date of Substantial Completion or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which his obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to his obligations other than specifically to correct the Work.

END OF ARTICLE 11

ARTICLE 12

TERMINATION OF THE CONTRACT

12.1 TERMINATION BY THE CONTRACTOR

12.1.1 If the Work is stopped for a period of sixty (60) days under an order of any court or other public authority having jurisdiction, or as a result of an act of government, such as a declaration of a national emergency making materials unavailable, through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the Work under a contract with the Contractor, then the Contractor may, upon seven (7) additional days' written notice to the Owner and the Design Consultant, terminate the Contract and recover from the Owner payment on a quantum merit basis, for all Work executed. The Contractor shall not be entitled to collect and hereby expressly waives, any profit on work not performed or any damages related to that portion of the Contract, which has been terminated.

12.2 TERMINATION FOR CONVENIENCE OF THE OWNER

12.2.1 The Owner may, at any time upon ten (10) days' written notice to the Contractor which notice shall specify that portion of the Work to be terminated and the date said termination is to take effect, terminate (without prejudice to any right or remedy of the Owner) the whole or any portion of the work for the convenience of the Owner. The Contractor's sole remedy, in the event of such termination, will be the allowable termination costs permitted by Article 12.4. Contractor shall include termination clauses identical to Article 12 in each of his Subcontracts.

12.3 DEFAULT TERMINATION

12.3.1 Subject to the provisions of Paragraph 2.3.1, ten (10) days after written notice is mailed to the Contractor, the Owner may terminate (without prejudice to any right or remedy of the Owner or any subsequent buyer of any portion of the Work) the employment of the Contractor and his right to proceed either as to the whole or any portion of the Work required by the Contract Documents and may take possession of the Work and complete the Work by contract or otherwise in any one of the following circumstances:

.1 if the Contractor refuses or fails to prosecute the work or any separable part thereof with such diligence as will ensure the Substantial or Final Completion of the Work within the Contract Time or fails to complete the Work or remedy a default within said period;

.2 if the Contractor is in material default in carrying out any provisions of the Contract for a cause within his control;

.3 if the Contractor fails to supply a sufficient number of properly skilled workmen or proper equipment or materials;

.4 if the Contractor fails to make prompt payment to Subcontractors or for materials or labor, unless he otherwise provides the Owner satisfactory evidence that payment is not legally due;

.5 if the Contractor disregards laws, permits, ordinances, rules, regulations or orders of any public authority having jurisdiction, or fails to follow the instructions of the Owner;

.6 if the Contractor substantially violates any provisions of the Contract Documents; or

.7 if the Contractor refuses or fails to properly schedule, plan, coordinate and execute the Work, as specified herein, so as to perform the Work within the specified Milestone and Completion dates, or to provide scheduling or related information, revisions and updates as required by the Contract Documents.

12.3.2 If, after the Contractor has been terminated for default pursuant to Paragraph 12.3, it is determined that none of the circumstances set forth in Subparagraph 12.3.1 exist, then such termination shall be considered a termination for convenience pursuant to Paragraph 12.2 In such case, the Contractor's sole remedy will be the costs permitted by Article 12.4.

12.3.3 If the Owner so terminates the employment of the Contractor, the Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the compensation is to be paid to the Contractor hereunder shall exceed the expense of so completing the Work (including compensation for additional managerial, administrative, consultant and inspection services and any damages for delay) such excess shall be paid to the Contractor.

12.3.4 If such expenses shall exceed the unpaid balance, the Contractor shall be liable to the Owner for such excess. If the right of the Contractor to proceed with the Work is partially or fully terminated, the Owner may take possession of and utilize in completing the Work such materials, appliances, supplies, plant and equipment as may be on the site of the terminated portion of the Work and necessary for the completion of the Work. If the Owner does not fully terminate the right of the Contractor to proceed, the Contractor shall continue to perform the part of the work that is not terminated.

12.4 ALLOWABLE TERMINATION COSTS

12.4.1 If the Owner terminates the whole or any portion of the Work pursuant to Paragraph 12.2, then the Owner shall only be liable to the Contractor for those costs reimbursable to the Contractor in accordance with Subparagraph 12.4.2, plus a markup of ten percent for profit and overhead on the actual fully accounted costs recovered under 12.4.2; provided however, that if there is evidence that the Contractor would have sustained a loss on the entire Contract had it been completed, no profit shall be included or allowed hereunder and an appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss.

12.4.1.1 After receipt of a Notice of Termination, the Contractor shall submit to the Owner his termination claim, in the form and with certification prescribed by the Owner. Such claim shall be submitted promptly but in no event later than three (3) months from the effective date of termination, unless one or more extensions in writing are granted by the Owner upon request of the Contractor made in writing within such three (3) month period or authorized extension thereof. However, if the Owner determines that the facts justify such action, he may receive and evaluate any such termination claim at any time after such three (3) month period or any extension

thereof. Upon failure of the Contractor to submit his termination claim within the time allowed, the Owner may determine, on the basis of information available to him, the amount, if any, due to the Contractor by reason of the termination.

12.4.2 If the Owner terminates the whole or any portion of the Work pursuant to Paragraph 12.2, the Owner shall pay the Contractor the amounts determined by the Owner as follows:

.1 an amount for supplies, services, or property accepted by the Owner pursuant to Clause 12.5.1.6 or sold or acquired pursuant to Clause 12.5.1.7 and not heretofore paid for, and to the extent provided in the Contract such amount shall be equivalent to the aggregate price for such supplies or services computed in accordance with the price or prices specified in the Contract, appropriately adjusted for any saving of freight or other charges; and

.2 the total of:

(1) the cost incurred in the performance of the Work terminated, including initial costs and preparatory expense allocable thereto, but exclusive of any costs attributable to supplies or services paid or to be paid for under Clauses 12.4.2.1 or 12.4.2.2.(2);

(2) the cost of settling and paying claims arising out of the termination of Work under Subcontracts or orders, pursuant to Clause 12.5.1.5, which are properly chargeable to the terminated portion of the Work (exclusive of amounts paid or payable on account of completed items of equipment delivered or services furnished by Subcontractors or vendors prior to the effective date of the notice of termination), which amounts shall be included in the costs payable under (1) above; and

(3) the reasonable costs of settlement, including accounting, legal, clerical and other expenses reasonably necessary for the preparation of settlement claims and supporting data with respect to the terminated portion of the Work and for the termination and settlement of Subcontracts thereunder, together with reasonable storage, transportation and other costs incurred in connection with the protection or disposition of property allocable to the Contract.

.3 Provided, however, that neither the Owner nor the Design Consultant will be liable for payments to Subcontractors pursuant to Article 12.4.2.2 unless each subcontract contains termination provisions identical to those set forth in Article 12. The Owner and the Design Consultant will not be liable to the Contractor for any costs associated with termination if the subcontract of the party involved does not include the proper termination clauses.

12.4.3 In arriving at any amount due the Contractor pursuant to Paragraph 12.4, there shall be deducted the following:

.1 all unliquidated advance or other payments on account theretofore made to the Contractor applicable to the terminated portion of the Contract;

.2 any claim which the Owner may have against the Contractor;

.3 such amount as the Owner determines to be necessary to protect the Owner against loss because of outstanding or potential liens or claims; and

.4 the agreed price for, or the proceeds of sale of, any materials, supplies or other things acquired by the Contractor or sold, pursuant to the provisions of Clause 12.5.1.7, and not otherwise recovered by or credited to the Owner.

12.4.4 The total sum to be paid to the Contractor under Paragraph 12.4 shall not exceed the Contract Sum as reduced by the amount of payments otherwise made or to be made for Work not terminated and as otherwise permitted by the Contract. Except for normal spoilage, and except to the extent that the Owner shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amounts payable to the Contractor, as

provided in Subparagraph 12.4.2, the fair value, as determined by the Owner, of property which is destroyed, lost, stolen or damaged so as to become undeliverable to the Owner, or to a buyer pursuant to Clause 12.5.1.7.

12.4.5 If the Owner terminates the whole or any part of the Work pursuant to Paragraph 12.3, the Owner may procure, upon such terms and in such manner as the Owner may deem appropriate, supplies or services similar to those so terminated, and the Contractor shall be liable to the Owner for any excess costs for such similar supplies or services. The Contractor shall continue the performance of the Contract to the extent not terminated hereunder.

12.5 GENERAL TERMINATION PROVISIONS

12.5.1 After receipt of a notice of termination from the Owner, pursuant to Paragraph 12.2 or 12.3, and except as otherwise directed by the Owner, the Contractor shall:

.1 stop Work under the Contract on the date and to the extent specified in the notice of termination;

.2 place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portion of the work under the Contract as is not terminated;

.3 terminate all orders and subcontracts to the extent that they relate to the performance of Work terminated by the notice of termination;

.4 at the option of the Owner, assign to the Owner in the manner, at the times and to the extent directed by the Owner, all of the rights in the contracts so terminated, in which case the Owner shall have the right, at his discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;

.5 settle all outstanding liabilities and all claims arising out of such termination or orders and subcontracts, with the approval or ratification of the Owner, to the extent he may require, which approval or ratification shall be final for all the purposes of this Article;

.6 transfer title and deliver to the entity or entities designated by the Owner, in the manner, at the times and to the extent directed by the Owner to the extent specifically produced or specifically acquired by the Contractor for the performance of such portion of the Work as had been terminated, the following:

(1) the fabricated or unfabricated parts, Work in process, partially completed supplies and equipment, materials, parts, tools, dies, jigs and other fixtures, completed Work, supplies and other material produced as part of, or acquired in connection with the performance of, the Work terminated by the notice of termination; and

(2) the completed or partially completed plans, drawings, information, releases, manuals and other property related to the Work and which, if the Contract had been completed, would have been required to be furnished to the Owner;

.7 use his best efforts to sell, in the manner, at the times, to the extent and at the price or prices directed or authorized by the Owner, any property of the types referred to in Clause 12.5.1.6; provided, however, that the Contractor:

(1) shall not be required to extend credit to any buyer, and

(2) may acquire any such property under the conditions prescribed by and at a price or prices approved by the Owner; and provided further that the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the Owner to the Contractor under the Contract or shall otherwise be credited to the Contract Sum covered by the Contract or paid in such other manner as the Owner may direct;

.8 complete performance of such part of the Work as shall not have been terminated by the notice of

termination; and

.9 take such action as may be necessary, or as the Owner may direct, for the protection and preservation of the property related to the Contract, which is in the possession of the Contractor, and in which the Owner has or may acquire an interest.

12.5.2 The Contractor shall, from the effective date of termination until the expiration of three (3) years after final settlement under the Contract, preserve and make available to the Owner, at all reasonable times at the office of the Contractor, but without direct charge to the Owner, all his books, records, documents and other evidence bearing on the costs and expenses of the Contractor under the Contract and relating to the Work terminated hereunder, or, to the extent approved by the Owner, photographs, micro-photographs or other authentic reproductions thereof.

12.5.3 If the termination, pursuant to Paragraph 12.2, be partial, the Contractor may file with the Owner a claim for an equitable adjustment of the price or prices specified in the Contract relating to the continued portion of the Contract (the portion not terminated by the notice of termination), and such equitable adjustment as may be agreed upon shall be made in such price or prices. Any claim by the Contractor for an equitable adjustment under this Subparagraph must be asserted within six (6) months from the effective date of the notice of termination.

12.5.4 The Contractor shall refund to the Owner any amounts paid by the Owner to the Contractor in excess of costs reimbursable under Paragraph 12.4.

12.5.5 The Contractor shall be entitled to only those damages and that relief from termination by the Owner as specifically provided in Article 12.

END OF ARTICLE 12

END OF GENERAL CONDITIONS

[INSERT APPENDIX A – Contractor Sales Tax Form]
Don't print this page- it's just a reminder

[INSERT APPENDIX B – Sexual Offender Registry]
Don't print this page- it's just a reminder

[INSERT APPENDIX C – Allowance Expenditure Authorization Form]
Don't print this page- it's just a reminder

[INSERT APPENDIX D-1 – Change Proposal Form- Time and Material Estimate]
Don't print this page- it's just a reminder

[INSERT APPENDIX D-2 – Change Proposal Form- Lump Sum]
Don't print this page- it's just a reminder

Appendix A

CONTRACTOR'S SALES TAX REPORT

OWNER: _____ **PROJECT:** _____

CONTRACTOR: _____ **FOR PERIOD:** _____

ADDRESS: _____ **TO:** _____

VENDOR NAME	ADDRESS	MATERIAL PURCHASED	INVOICE NUMBER	INVOICE DATE	INVOICE AMOUNT	N.C. TAX	COUNTY TAX	NAME OF COUNTY
				Totals				

N.C. STATE & LOCAL SALES TAXES PAID

I hereby certify that, during the period stated above, North Carolina sales and use taxes were paid as listed above, with respect to building materials, supplies, fixtures, and equipment which have become a part of, or annexed to, a building or structure erected, altered or repaired for the New Hanover County Schools, and the vendors from whom the property was purchased, the dates, numbers and amounts of the invoices covering the purchases, and the North Carolina sales and use taxes paid thereon. Also include the cost of property withdrawn from warehouse stock and North Carolina sales or use taxes paid thereon.

By:_____ **Title:** _____

Sworn to and Subscribed before me, this _____ day of _____, 20___.

_____, Notary. My Commission Expires: _____

Form revised 8/1/18

Appendix B

Sexual Offender Registry and Criminal Background Check Certification Form

Check the appropriate box to indicate the type of check:
□ Initial
□ Supplemental
□ Annual

I, _____ (insert name), _____ (insert title) of _____ (insert company name) hereby certify that I have performed all of the required sexual offender registry and criminal background checks required under this Agreement for all contractual personnel (employees, agents, ownership personnel, or contractors) who may be used to deliver goods or provide services under this Agreement, including the North Carolina Sex Offender and Public Protection Registration Program, the North Carolina Sexually Violent Predator Registration Program, and the National Sex Offender Registry. I further certify that none of the individuals listed below appears on any of the above-named registries or has any criminal conviction listed in the Agreement, and that I will not assign any individual to deliver goods or perform services under this Agreement if said individual appears on any of the sex offender registries or has any criminal conviction listed in the Agreement, without the prior written permission of Owner. I agree to maintain all records and documents associated with these registry and criminal background checks, and that I will provide such records and documents to the Owner upon request. I specifically acknowledge that the Owner retains the right to audit these records to ensure compliance with this section at any time in the Owner's sole discretion. I acknowledge that I am required to perform these checks and provide this certification form before any work is performed under the Agreement (initial check), any time additional contractual personnel may perform work under the Agreement (supplemental check), and at each anniversary date of the Agreement (annual check).

Contractual Personnel Names	**Job Title**
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____

(attach additional page(s) if needed)

I attest that the forgoing information is true and accurate to the best of my knowledge.

_____ (print name) _____ (signature)
_____ (title) _____ (date)

Appendix C

PENDER COUNTY SCHOOLS
ALLOWANCE EXPENDITURE AUTHORIZATION (AEA)

OWNER
ARCHITECT
CONTRACTOR

PO #:

PROJECT:
(Name & Address)

AEA NO.: _____

DATE: _____

PCS PROJECT NO: _____

CONTRACTOR:
(Name & Address)

CONTRACT DATED: _____

CONTRACT FOR: _____

Original Contract Allowance Amount(s):

_____
_____

Current Contract Allowance Amount(s):

_____
_____

(Attach Work Change Proposal Request(s) and associated documentation)
CPR 1- xxxxx
CPR 2- xxxxx

A. Description of Contract Allowance utilized for this Authorization:	**Unforeseen Work**
B. Original Contract Allowance amount:	$ -
C. Contract Allowance Expenditures previously authorized:	$ -
D. Contract Allowance will be [increased][decreased] by this Authorization:	$ -
E. Contract Allowance balance including this Authorization	$ -

Approval Recommended:	Owner Approval:	Contractor Acceptance:
ARCHITECT:	**OWNER:** Pender County Schools	**CONTRACTOR:**
ADDRESS:	**ADDRESS:** 965 Penderlea Hwy Burgaw, NC 28425	**ADDRESS:**
BY: (Signature)	**BY:** Bill Nelson (Signature)	**BY:** (Signature)
DATE:	**DATE:**	**DATE:**

Note: The Allowance Expenditure Authorization is not a Change Order and does not modify Contract Sum or contract time. Upon signature by all parties, this document becomes immediately effective.

APPENDIX D-1
CHANGE PROPOSAL FORM
Time and Material / Unit Price Estimate

Project: Pender High School Food & Nutrition Lab Renovation
Proposal #:
Contract:
Project #: 7201-261595
Contractor:
Contractor #:

Description of change:

	SUBTOTALS
Materials & Labor Estimated cost of labor & materials including shipping, overtime, payroll taxes and insurance, and overhead and profit. Maintain accurate records for billing purposes.	**$0.00**
Unit Price Work Estimated quantity of units required less allowance units not used, times the established unit cost. Maintain accurate records for billing purposes. Third party records may be required.	**$0.00**
Equipment Rental Estimated cost of equipment rental including shipping, taxes and overhead and profit. Maintain accurate records for billing purposes.	**$0.00**
Subcontractors Estimated cost of subcontracts including all subcontractor expenses. Maintain accurate records for billing purposes.	**$0.00**
Subtotal of Proposal	**$0.00**
	$0.00
Bonds (% of subtotal of proposal) **2.0%**	**$0.00**
(Bonds only for adjustment in CCAP)	
*** TOTAL NOT TO EXCEED CHANGE PROPOSAL ESTIMATE**	**$0.00**

Time Extension Requests: ___day(s) Schedule Activity # Affected: _____

The Contractor agrees to perform the work outlined in this change proposal for an amount that shall not exceed the amount stated above and in accordance with the Contract documents if the work is authorized by the Owner. If the price to perform the work is expected to exceed the above stated amount, a new change proposal form for the additional work is required.

* Actual amount paid will be based on actual documented expenses.

Contractor's Signature: _____ **Date:** _____

Approval Recommended by Design Consultant: _____ **Date:** _____

Owner's Representative Approval: _____ **Date:** _____

APPENDIX D-2
CHANGE PROPOSAL FORM
Lump Sum Change Proposal Form

Project: Pender High School Food & Nutrition Lab Renovation **Proposal #:**

Contract: **Project #:** 7201-261295

Contractor: **Contractor #:**

Description of change:

				SUBTOTALS
Materials	(Attach list with Qty, Item, Unit $, Unit mh, Total mh, OT mh, Total $)			
1	Total Direct Cost of Materials		**$0.00**	
2	Overhead & Profit on Item 1.		**$0.00**	
	(15% maximum, includes small tools & consumables)			
3	Sales Tax (on item 1 only)		**$0.00**	
4	Shipping & Transportation		**$0.00**	**$0.00**
Labor				
5	Total Manhours:	**0** MH @ **$0.00** /hr.	**$0.00**	
6	Overhead & Profit on Item 5.		**$0.00**	
	(15% maximum on straight labor cost, not premium portion)			
	(O & P includes supervisor's time)			
7	Payroll Taxes & Insurance	**39.0%**	**$0.00**	**$0.00**
	(on item 5 only)			
Equipment Rental	(Include quotes)			
8	Equipment Rental		**$0.00**	
9	Overhead & Profit on Item 8.		**$0.00**	**$0.00**
	(8% maximum)			
Subcontractors	(Include quotes with material & equipment backup)			
10	Subcontractors		**$0.00**	
11	Overhead & Profit on Item 10.		**$0.00**	**$0.00**
	(8% maximum)			
			Subtotal of Proposal	**$0.00**
				$0.00
12	Bonds (% of subtotal of proposal)	**2.0%**		**$0.00**
	(Bonds only for adjustment in CCAP)		**TOTAL OF CHANGE PROPOSAL**	**$0.00**

Time Extension Requests: ____ day(s) Schedule Activity # Affected: _____

The Contractor agrees to perform the work outlined in this change proposal for the amount specified above and in accordance with the Contract documents if the work is authorized by the Owner.

Contractor's Signature: _____ **Date:** _____

Approval Recommended by Design Consultant: _____ **Date:** _____

Owner's Representative Approval: _____ **Date:** _____

SECTION VI

MISCELLANEOUS FORMS

AFFIDAVIT E

MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: _____

Address & Phone: _____

Project Name: _____

SCO Project ID: _____

Pay Application #: _____ Period: _____

The following is a list of payments made to Minority Business Enterprises on this project for the above-mentioned period.

MBE FIRM NAME	* TYPE OF MBE	AMOUNT PAID THIS MONTH (With This Pay App)	TOTAL PAYMENTS TO DATE	TOTAL AMOUNT COMMITTED

*Minority categories: Black (B), Hispanic (H), Asian American (AA), American Indian (AI), White Female (WF), Socially and Economically Disadvantaged (SED)

Approved/Certified By:

_____ _____

Name Title

_____ _____

Date Signature

SUBMIT WITH EACH PAY REQUEST - FINAL PAYMENT - FINAL REPORT

E-VERIFY AFFIDAVIT

STATE OF _____
COUNTY OF _____
I, _____ (the individual attesting below), being duly authorized by

and on behalf of _____ (hereinafter "Employer") after first

being duly sworn hereby swears or affirms as follows:

1. Employer understands that E-Verify is the federal E-Verify program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law in accordance with NCGS §64-25(5).
2. Employer understands that Employers Must Use E-Verify. Each employer, after hiring an employee to work in the United States, shall verify the work authorization of the employee through E-Verify in accordance with NCGS §64-26(a).
3. Employer is a person, business entity, or other organization that transacts business in this State and that employs 25 or more employees in this State. (Mark "Yes" or "No")
   a. YES _____
   b. NO _____
4. Employer's subcontractors will comply with E-Verify, and Employer will ensure compliance with E-Verify by any and all subcontractors subsequently hired by Employer.

This _____ day of _____, 20_____.

_____
Signature of Affiant

Print or Type Name: _____

State of _____
County of _____
Signed and sworn to (or affirmed) before me, this
the _____ day of _____, 20_____.
My Commission Expires: _____

_____
Notary Public

Seal

Pender County Schools Calendar 2026-2027

Scan to visit North CarolinaSchools.us

AUGUST 2026

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

SEPTEMBER 2026

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

OCTOBER 2026

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

NOVEMBER 2026

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

DECEMBER 2026

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

JANUARY 2027

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

FEBRUARY 2027

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28						

MARCH 2027

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

APRIL 2027

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

MAY 2027

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

JUNE 2027

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

JULY 2027

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

- Holiday
- Recess / Non-Studying
- Start of Grading Period
- End of Grading Period
- Testing Start
- Testing End
- Early Release
- Other

Verified School District Data • Powered by North CarolinaSchools.us

Copyright © 2026 North CarolinaSchools.us

Original data verified for Pender County Schools on 7/2/2026

Pender County Schools Calendar 2026-2027

Scan to visit North CarolinaSchools.us

AUGUST 2026

Aug 13 – 14 Optional Teacher Workday

Aug 17 – 21 Mandatory Teacher Workday

Aug 24 First Day of School / 1st Grading Period Begins
First Day of School for Students

SEPTEMBER 2026

Sep 7 Labor Day

OCTOBER 2026

Oct 20 End of Quarter 1
End of 1st Grading Period

Oct 20 Early Release / Staff PD
Early Release and Staff Professional Development

NOVEMBER 2026

Nov 3 Optional Teacher Workday

Nov 11 Veterans Day

Nov 25 – 27 Thanksgiving Break

DECEMBER 2026

Dec 18 End of Quarter 2 / Semester 1 Ends
End of 2nd Grading Period

Dec 18 Early Release / Staff PD
Early Release and Staff Professional Development

Dec 21 – 22 Optional Teacher Workday

Dec 23 – 31 Winter Break

JANUARY 2027

Jan 1 New Year's Day

Jan 4 – 5 Mandatory Teacher Workday

Jan 6 Second Semester Begins
Students Return for Second Semester

Jan 18 Dr. Martin Luther King Jr. Day

FEBRUARY 2027

Feb 10 Optional Teacher Workday

MARCH 2027

Mar 1 – 5 Spring Break

Mar 19 End of Quarter 3
End of 3rd Grading Period

Mar 26 Good Friday

Mar 29 Optional Teacher Workday

APRIL 2027

Apr 21 Optional Teacher Workday

MAY 2027

May 19 – 28 End of the Year Testing

May 31 Memorial Day

JUNE 2027

Jun 2 Last Day of School / End of Quarter 4
Last Day for Students and End of 4th Grading Period

Jun 2 Early Release

Jun 3 – 8 Mandatory Teacher Workday

Jun 9 Optional Teacher Workday

Verified School District Data • Powered by North CarolinaSchools.us

Copyright © 2026 North CarolinaSchools.us

Original data verified for Pender County Schools on 7/2/2026

BIDDER'S REQUEST FOR INFORMATION FORM

Project: Pender High School Food & Nutrition Lab Renovation LS3P Project #7201-261295

To: LS3P Associates Ltd.
101 N. Third Street, Suite 500
Wilmington, NC 28401

E-Mail: mattbramstedt@ls3p.com
Attn: Matt Bramstedt, AIA

Requested By: _____
Firm: _____
Phone No.: _____
Date: _____
Related Section and Paragraph No.: _____
Related Drawings/Details: _____

Bidder's Inquiry:

Signed:

Response:

Architect's response will be issued by formal Addendum.

Signed: Date:

ANTICIPATED PROJECT SCHEDULE

Pre-Bid Meeting	October 12, 2026
Questions / RFI Due	October 14, 2026, at 5:00 pm
Final Addendum Issued	October 15, 2026
CM Bid Opening	**October 20, 2026, at 2:00 pm**
BOE Meeting for Award of Bids	November 3, 2026
GC Contract Completed	November 3, 2026
BOE Meeting for Contract Approval	November 3, 2026
Notice to Proceed Issued	November 4, 2026
On-Site Construction Activity	November 6, 2026
Substantial Completion	January 4, 2027
Final Completion	**January 15, 2027**

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project Information.
2. Work covered by Contract Documents.
3. Owner-furnished / Contractor-installed (OF / CI) products.
4. Owner-furnished / Owner-installed (OF / OI) products.
5. Contractor's use of site and premises.
6. Coordination with occupants.
7. Work restrictions.
8. Specification and Drawing conventions.
9. Miscellaneous provisions.

1.2 PROJECT INFORMATION

A. Project Identification: Pender High School Food & Nutrition Lab Renovation; LS3P Associates Project Number: 7201-261295.

1. Project Location: 5380 NC-53, Burgaw, North Carolina 28425.

B. Owner: Pender County Schools, 925 Penderlea Hwy, Burgaw, NC 28425.

1. Owner's Representative: William Nelson | Telephone: 910.540.3507 | Email: William_nelson@pender.k12.nc.us.

C. Architect: LS3P Associates Ltd., 101 Third Street, Suite 500, Wilmington, North Carolina 28401; Telephone: 910.790.9901.

1. Architect's Representative: Matt Bramstedt, AIA | Telephone: 910. Email: mattbramstedt@ls3p.com.

D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:

1. Structural Engineering: Woods Engineering

a. Structural Engineering Representative: Adam L. Sisk, PE | Telephone: 910.343.8007 | Email: adam@woodseng.com.

2. Plumbing, Mechanical, Electrical Engineering: Cheatham & Associates, P.A.

a. Plumbing Engineering Representative: Casey D. Gilman, PE | Telephone: 910.451.4210 | Email: cgilman@cheathampa.com.

b. Mechanical Engineering Representative: Kenneth Lynch, PE | Telephone: 910.451.4210 | Email: klynch@cheathampa.com.
c. Electrical Engineering Representative: Mark A. Ciarrocca, PE | Telephone: 910.451.4210 | Email: mciarrocca@cheathampa.com.

E. Construction Manager at Risk: Daniels & Daniels Construction Co., Inc.

1. Construction Manager Representative: Erik Barrow, Vice President of Preconstruction | Telephone: 919.778.4525 | Email: estimating@danddcc.com.
2. Construction Manager for this Project is Project's constructor. The terms "Construction Manager" and "Contractor" are synonymous.

F. Cloud-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.

1. See Section 013100 "Project Management and Coordination" for requirements for using web-based Project software.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project: The project consists of the renovation of approximately 1,586 square feet of existing instructional space at Pender High School, including selective demolition, interior construction, metal stud framing and gypsum board assemblies, doors, hardware, and storefront systems, architectural finishes, casework and countertops, plumbing, mechanical, electrical, and technology modifications, kitchen equipment and utility connections, kitchen exhaust systems; and all associated work necessary to provide a fully operational food and nutrition lab as indicated in the contract documents. Work will be performed within an occupied school facility and shall be coordinated with Pender County Schools to maintain campus operations throughout construction.

B. Type of Contract: Single prime contract.

C. Owner's Purchase Contracts: Owner has negotiated purchase contracts.

1. Dedicated Outdoor-Air Units (DOAS Unit): See Section 237433 " Dedicated Outdoor-Air Units."

a. Construction Manager at Risk contractor will install unit and connect to building systems.

D. Use of Site: Limited to work in areas indicated.

1. Contractor limited use of site as indicated on Drawings.
2. Owner occupancy and use by public will occur during Work of this Contract.

E. Owner's Occupancy Requirements: The primary area of construction is on a partially occupied floor.

1.4 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:

1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
2. Provide for delivery of Owner-furnished products to Project site.
3. Upon delivery, inspect, with Contractor present, delivered items.

    a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.

4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

C. Owner-Furnished/Contractor-Installed (OFCI) Products:

1. Built-In Dishwasher (DW1).
2. ADA Compliant Dishwasher (DW2).
3. Two-Section Reach-In Freezer: (FZ1).
4. ADA Compliant Ice Maker (ICE1).
5. ADA-Compliant Gas Range (RE1).
6. Gas Range (RE2).
7. Two-Section Reach-In Refrigerator (REF1).

1.5 OWNER-FURNISHED/OWNER-INSTALLED (OFOI) PRODUCTS

A. The Owner will furnish and install products indicated.

B. Owner-Furnished/Owner-Installed (OFOI) Products:

1. Paper Towel Dispenser.
2. Soap Dispenser.

1.6 CONTRACTOR'S USE OF SITE AND PREMISES

A. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.

    a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.7 COORDINATION WITH OCCUPANTS

A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.8 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to between 7 a.m. to 7 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.

C. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Owner's property is not permitted.

D. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

E. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

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

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

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

B. Execute accepted alternates under the same conditions as other Work of the Contract.

C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. <**Insert number**>: <**Insert title of alternate**>.

1. Base Bid: <**Insert brief description of base-bid requirement**> as indicated on Drawing <**Insert title of Drawing**> and as specified in Section <**Insert Section number**> "<**Insert Section title**>."
2. Alternate: <**Insert brief description of alternate requirement**> as indicated on Drawing <**Insert title of Drawing**> and as specified in Section <**Insert Section number**> "<**Insert Section title**>."

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 012100 "Allowances" for products selected under an allowance.
2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience (Not Allowed): Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form provided in Project Manual.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance:

1) During Bid Phase: Addenda.
2) During Construction: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

DOCUMENT 012500.1 – CONTRACTOR'S REQUEST FOR SUBSTITUTION FORM

Project:	Pender High School Food & Nutrition Lab Renovation	Project No.:	7201-261295
To:	LS3P Associates Ltd.	Specification Section #:	
	101 N. Third Street, Suite 500 Wilmington, NC 28401	Contractor:	
Attn.:	Matt Bramstedt, AIA	Requested by:	
Phone:	910.790.9901	Phone:	
Fax:		Fax:	
Email:	mattbramstedt@ls3p.com	Email:	

Reason for not providing specified item:

Savings to Owner for accepting substitution:

Specified Product/Fabrication Method
(List name/description; model no.; manufacturer):

Required Information for ***Specified*** Product:	Attached:
Point by Point Comparative Product Data	☐
Tests	☐
Reports	☐
Fabrication Drawings	☐
Samples (Where Applicable)	☐

Proposed Product/Fabrication Method
(List trade name/description; model no.; manufacturer) :

Required Information for ***Proposed*** Product:	Attached:
Point by Point Comparative Product Data	☐ (Required)
Tests	☐
Reports	☐
Fabrication Drawings	☐
Samples (Where Applicable)	☐

List of Related Changes/Modifications:

Differences between proposed substitution and specified product:

Proposed product/fabrication method affects other parts of the Work ☐ No ☐ Yes: Explain

Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product as utilized for this project, except as noted herein.
- Qualifications of manufacturer, installer, and other specified parties meet the specified qualifications.
- Same special warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source for replacement parts, as applicable, is available as that specified.
- Proposed substitution does not affect dimensions and functional clearances, except as noted herein.
- Proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
- Failure of proposed substitution to produce indicated results will not be considered grounds for additional payment or time.

For the Contractor:

Submitted by: _____

Signed: _____

Firm: _____

Telephone: _____

Fax: _____

Email: _____

For the Manufacturer:

Submitted by: _____

Signed: _____

Firm: _____

Telephone: _____

Fax: _____

Email: _____

END OF CONTRACTOR'S REQUEST FOR SUBSTITUTION FORM

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
2. Section 013100 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue through Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.4 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PRODUCTS (Not Used)

PART 2 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Project Information Management System.
5. Project meetings.

B. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, in web-based Project software directory, and in prominent location in each built facility. Keep list current at all times.

1.4 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to assure proper performance of components, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling, raised access floor, and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:

    a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.

c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection System: Show the following:

a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Architect will review coordination drawings to verify that components requiring coordination have been included, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures" and post to Project Information Management System.

C. Coordination Drawing Process: Prepare coordination drawings in the following manner:

1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.
6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
7. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.

D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2. File Preparation Format: DWG, DXF, or Revit model, Version 2022 or newer, operating in Microsoft Windows operating system.
3. File Submittal Format: Submit or post coordination drawing files using PDF format.
4. BIM File Incorporation: Develop and incorporate coordination drawing files into BIM established for Project.

a. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.

5. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
b. Digital Data Software Program: Drawings are available in AutoCad or Revit.
c. Contractor shall execute a data licensing agreement in the form of Agreement included in this Project Manual.

1.6 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI via the Project Information Management System.

1. Architect will not respond to those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Owner name.
3. Owner's Project number.
4. Name of Architect.
5. Architect's Project number.
6. Date.
7. Name of Contractor.
8. RFI number, numbered sequentially.
9. RFI subject.
10. Specification Section number and title and related paragraphs, as appropriate.
11. Drawing number and detail references, as appropriate.
12. Field dimensions and conditions, as appropriate.
13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
14. Contractor's signature.
15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form within Project Information Management System

1. Attachments shall be electronic files in PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow ten days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will not be reviewed:

a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for approval of Contractor's means and methods.
d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 5 days of receipt of the RFI response.

E. RFI Log: The Project Information Management System will create and maintain the RFI log.

F. On receipt of Architect's and Construction Manager's action, immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven days if Contractor disagrees with response.

1.7 WEB-BASED PROJECT INFORMATION MANAGEMENT SYSTEM

A. The Architect has established a web-based Project Information Management System to facilitate communication and record-keeping during the project. Architect will provide access to Contractor's key personnel. Refer to www.NewForma.com.

1. Use Architect's web-based Project Information Management System for purposes of managing project communication and documentation until Final Completion.
2. Due to the size restrictions on email communication, all electronic files must be submitted through the Project Information Management System. Architect assumes no responsibility for information not received or retrieved by Contractor's failure to use the Project Information Management System and such loss or delay of information will not be considered as a delay claim.

B. The Project Information Management System shall include the following:

1. Project directory.
2. Project correspondence.
3. Meeting minutes.
4. Contract modifications forms and logs.
5. RFI forms and logs.
6. Submittal forms and logs.
7. Architect's Supplementary Instruction forms and logs
8. Proposal request forms and logs.
9. Change order forms and logs.
10. Reminder and tracking functions.
11. Task and issue management.
12. Photo documentation.
13. Schedule and calendar management.
14. Payment application forms.
15. Drawing and specification document hosting, viewing, and updating.
16. Online document collaborations.
17. Archiving function.

C. Contractor, subcontractors, and other parties granted access by Contractor to Project Information Management System shall execute a data licensing agreement in the Form of Agreement included in this Project Manual.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record discussions and agreements achieved. Distribute the meeting minutes to attendees, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Responsibilities and personnel assignments.
    b. Tentative construction schedule.
    c. Phasing.
    d. Critical work sequencing and long lead items.
    e. Designation of key personnel and their duties.

f. Lines of communications.
g. Use of web-based Project software.
h. Procedures for processing field decisions and Change Orders.
i. Procedures for RFIs.
j. Procedures for testing and inspecting.
k. Procedures for processing Applications for Payment.
l. Distribution of the Contract Documents.
m. Submittal procedures.
n. Sustainable design requirements.
o. Preparation of Record Documents.
p. Use of the premises and existing building.
q. Work restrictions.
r. Working hours.
s. Owner's occupancy requirements.
t. Responsibility for temporary facilities and controls.
u. Procedures for moisture and mold control.
v. Procedures for disruptions and shutdowns.
w. Construction waste management and recycling.
x. Parking availability.
y. Office, work, and storage areas.
z. Equipment deliveries and priorities.
aa. First aid.
bb. Security.
cc. Progress cleaning.
dd. Bonds and insurance.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Sustainable Design Requirements Coordination Conference: Owner will schedule and conduct a sustainable design coordination conference before starting construction, at a time convenient to Owner Architect, and Contractor.

1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent and sustainable design coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect meeting sustainable design requirements, including the following:

a. Sustainable design Project checklist.
b. General requirements for sustainable design-related procurement and documentation.
c. Project closeout requirements and sustainable design certification procedures.
d. Role of sustainable design coordinator.
e. Construction waste management.
f. Construction operations and sustainable design requirements and restrictions.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

D. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect , and Owner's Commissioning Authority of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Sustainable design requirements.
    i. Review of mockups.
    j. Possible conflicts.
    k. Compatibility requirements.
    l. Time schedules.
    m. Weather limitations.
    n. Manufacturer's written instructions.
    o. Warranty requirements.
    p. Compatibility of materials.
    q. Acceptability of substrates.
    r. Temporary facilities and controls.
    s. Space and access limitations.
    t. Regulations of authorities having jurisdiction.
    u. Testing and inspecting requirements.
    v. Installation procedures.
    w. Coordination with other work.
    x. Required performance results.
    y. Protection of adjacent work.
    z. Protection of construction and personnel.

3. Record conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

E. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 60 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of Record Documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Procedures for completing and archiving web-based Project software site data files.
    d. Submittal of written warranties.
    e. Requirements for completing sustainable design documentation.
    f. Requirements for preparing operations and maintenance data.
    g. Requirements for delivery of material samples, attic stock, and spare parts.
    h. Requirements for demonstration and training.
    i. Preparation of Contractor's punch list.
    j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    k. Submittal procedures.
    l. Coordination of separate contracts.
    m. Owner's partial occupancy requirements.
    n. Installation of Owner's furniture, fixtures, and equipment.
    o. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

F. Progress Meetings: Conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Status of sustainable design documentation.
6) Deliveries.
7) Off-site fabrication.
8) Access.
9) Site use.
10) Temporary facilities and controls.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Status of RFIs.
16) Status of Proposal Requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

G. Coordination Meetings: Conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site use.
9) Temporary facilities and controls.
10) Work hours.
11) Hazards and risks.
12) Progress cleaning.
13) Quality and work standards.
14) Status of RFIs.
15) Proposal Requests.
16) Change Orders.
17) Pending changes.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's Construction Schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Unusual event reports.

B. Related Requirements:

1. Section 014000 "Quality Requirements" for schedule of tests and inspections.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of labor and equipment necessary for completing an activity as scheduled.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file.
2. PDF file, or
3. Two paper copies, of sufficient size to display entire period or schedule, as required.

B. Startup construction schedule.

1. Submittal of cost-loaded startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports to contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
3. Total Float Report: List of activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

F. Construction Schedule Updating Reports: Submit with Applications for Payment.

G. Daily Construction Reports: Submit at weekly intervals.

H. Material Location Reports: Submit at weekly intervals.

I. Site Condition Reports: Submit at time of discovery of differing conditions.

J. Unusual Event Reports: Submit at time of unusual event.

K. Qualification Data: For scheduling consultant.

1.4 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.5 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Computer Scheduling Software: Prepare schedules using current version of a program that is capable of managing construction schedules.

1. Use Microsoft Project for current Windows operating system.

B. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting, using CPM scheduling.

1. In-House Option: Owner may waive requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant to attend all meetings related to Project progress, alleged delays, and time impact.

C. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.

1. Contract completion date to not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

D. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Temporary Facilities: Indicate start and completion dates for the following as applicable:

a. Securing of approvals and permits required for performance of the Work.
b. Temporary facilities.
c. Construction of mock-ups, prototypes and samples.
d. Owner interfaces and furnishing of items.
e. Interfaces with Separate Contracts.
f. Regulatory agency approvals.
g. Punch list.

3. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
4. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
6. Commissioning Time: Include no fewer than 15 days for commissioning.
7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
8. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.

E. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use-of-premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
    l. Building flush-out.
    m. Startup and placement into final use and operation.
    n. Commissioning.

8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Structural completion.
    b. Temporary enclosure and space conditioning.
    c. Permanent space enclosure.
    d. Completion of mechanical installation.
    e. Completion of electrical installation.

f. Substantial Completion.

9. Other Constraints.

F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion , and the following interim milestones:

1. Temporary enclosure and space conditioning.

G. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

H. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

I. Contractor's Construction Schedule Updating: At intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Final Completion percentage for each activity.

J. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

K. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.7 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.8 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for commencement of the Work.

1. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.9 CPM SCHEDULE REQUIREMENTS

A. Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 14 days of date established for commencement of the Work. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule, so it can be accepted for use no later than 60 days after date established for commencement of the Work.

a. Failure to include any work item required for performance of this Contract must not excuse Contractor from completing all work within applicable completion dates.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.
    i. Testing and inspection.
    j. Commissioning.
    k. Punch list and Final Completion.
    l. Activities occurring following Final Completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates to be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.

    a. Each activity cost to reflect an appropriate value subject to approval by Architect.
    b. Total cost assigned to activities to equal the total Contract Sum.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

    a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    b. Submit value summary printouts one week before each regularly scheduled progress meeting.

1.10 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.

4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Construction Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List to be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

DIGITAL DATA LETTER OF AGREEMENT

An Agreement between LS3P ASSOCIATES LTD. (the "Architect") and ___ (the "Licensee," either Original or Third Party, as the case may be) for Licensing of Digital Data

Architect: LS3P ASSOCIATES LTD.
101 N. Third Street, Suite 500
Wilmington, NC 28401

Contact: Matt Bramstedt, AIA
Email: mattbramstedt@ls3p.com

Licensee:
Original __
3rd Party __

Project No.: **7201-261295**
Project Name: **Pender High School Food & Nutritution Lab Renovation**
Location: **Burgaw, North Carolina 28425**
Date: _____

The Architect will provide the following Digital Data, dated as of the particular transmission, to the Licensee **for information purposes only:**

Sheet XXX (.dwg format)
Sheet XXX (.dwg format)
Sheet XXX (.dwg format)
Sheet XXX (.dwg format)

Revit MODEL (Revit 20XX)

Digital Data was prepared using the following:

Software: Revit (.rvt) **Version:**

Digital Data to be delivered via the following media: Newforma Website posting

Licensee shall pay the Architect a service fee of $0.00 and other good and valuable consideration.

TERMS AND CONDITIONS

1. The Architect and its consultants make no representation as to the compatibility of the Digital Data with any hardware or software. The Licensee shall notify the Architect within five (5) business days of any problems associated with accessing and/or using the Digital Data.

2. The Licensee acknowledges and agrees that the Digital Data may change or degrade during the transmission process. The Licensee acknowledges and agrees that the Architect and its consultants may remove all indications of ownership from the Digital Data prior to transmission.

3. All Digital Data shall be considered the property of the Architect and/or its consultants and shall not be used for other Projects, for additions to this Project without the prior written permission of the Architect and/or its consultants. Digital Data shall not be re-transmitted by the Original Licensee to a Third-Party Licensee without prior execution of an agreement identical to this Agreement between the Architect, the Original Licensee, and

the Third-Party Licensee. Under no circumstances shall the transmission of the Digital Data be considered a sale of goods or a sale of copyrights.

4. **THE ARCHITECT AND THE ARCHITECT'S CONSULTANTS HEREBY EXPRESSLY DISCLAIM ANY AND ALL WARRANTIES, BOTH EXPRESS AND IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AS WELL AS ANY WARRANTY OF ACCURACY, COMPLETENESS, AND/OR PERMANENCE. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.** Addenda information and/or revisions made to the most current Digital Data after any date of transmission have not been incorporated into the transmitted Digital Data. In the event of a conflict between the Architect's printed instruments of service (2D Documents) whether sealed or unsealed) and the Digital Data (3D Model), the printed instruments of service shall govern. The Licensee acknowledges and agrees that the duty to determine the existence of any and all conflicts between the Digital Data and any other information upon which the Licensee relies rests solely upon the Licensee. The Digital Data shall not be considered Contract Documents or Construction Documents as defined by any General Conditions of Contract for Construction. The Digital Data is being provided for information only and on a strictly "AS IS" basis.

5. Licensee agree the extent of its reliance on any Digital Data shall be limited to the uses identified in this Agreement.

6. Licensee may use and rely upon the Digital Data only for programming, site analysis, design review, 3D coordination of structural, mechanical, plumbing, and electrical systems, and preconstruction activities.

7. The Level of Development (LOD) describes the minimum dimensional, spatial, quantitative, qualitative, and other data included in the Digital Data to support the uses and reliance included in this Agreement. The LOD of the Digital Data transmitted is LOD 200. LOD 200 is defined as model and model elements that are generically and graphically represented within the Digital Data with approximate quantity of major components, size, shape, location, and orientation.

8. If Licensee discovers or becomes aware of any discrepancies, inconsistencies, errors, or omissions in any Digital Data transmitted, they shall promptly report the discrepancy, inconsistency, error, or omission in writing to the Architect. Licensee shall not use any discrepancy, inconsistency, error, or omission in the Digital Data as the basis of a claim.

9. Any reliance on the Digital Data not in accordance with this Agreement shall be at the sole risk of the Licensee.

10. The use and/or provision of the Digital Data prepared by the Architect and/or its consultants shall not in any way reduce or obviate the Licensee's duty to check and coordinate dimensions, details, and quantities of materials as required to facilitate construction of the Project in a complete and quality manner consistent with the applicable standards of care. Confirmation of existing conditions is the sole responsibility of the Licensee.

11. The Licensee agrees to the extent permitted by applicable law, to indemnify, hold harmless, and release the Architect and/or its consultants, their officers, shareholders, employees, and sub-consultants from any and all injuries, claims, demands, expenses, suits, liabilities, losses, damages, costs, disputes, other matters in question, third party claims, pass-through claims, subrogated claims, and/or claim expenses related to the Digital Data, including but not limited to, attorneys' fees, expert witness fees, and court costs arising out of or in any way related to or connected with any negligent act and/or omission in the generation, provision, and/or use of the Digital Data by the Licensee and/or any of its subcontractors, suppliers, and/or consultants and waive any and all rights to such claims and causes of action.

12. The Licensee waives damages against the Architect for any and all injuries, claims, losses, expenses, damages, disputes, other matters in question, and/or claim expenses arising out of or relating to this Agreement and/or generation, provision, and/or use of the Digital Data, including, but not limited to, consequential damages and reasonable attorneys' fees and defense costs.

13. The Architect's and/or the Architect's consultants' liability to the Licensee and/or any of its subcontractors, suppliers, and/or consultants for any and all injuries, claims, losses, expenses, damages, disputes, other matters in question, third party claims, pass-through claims, subrogated claims, and/or claim expenses arising out of or relating to this Agreement and/or the Digital Data, including, but not limited to, reasonable attorneys' fees and defense costs, regardless of the nature of the claim or damage, shall not exceed, either individually or in the aggregate, the total amount of $1,000.00. Such causes include, but are not limited to, the Architect's and/or the Architect's consultants' negligence, errors, omissions, strict liability, breach of contract, and/or breach of warranty.

14. To the best of the Architect's knowledge, information and belief, there are no licensing or copyright fees due to others based on the transmission of the Digital Data, but to the extent that such unknown fees do exist, the Licensee agrees to pay the required fees and hold the Architect and/or its consultants harmless from any associated costs or penalties.

15. Upon execution of this Agreement, the Architect grants to the Licensee a non-exclusive, non-transferable (except as set forth herein), limited license to use the Digital Data solely and exclusively for informational purposes on the identified Project only, provided that the Licensee substantially performs its obligations under this Agreement.

16. Any purchase order number provided by the Licensee is for the Licensee's accounting purposes only. The Licensee acknowledges and agrees that purchase order terms and conditions are null, void, and inapplicable to this Agreement.

17. This Agreement constitutes the entire agreement between the parties relative to the Digital Data and shall be governed by the laws of the State of **North Carolina** without regard to principles of conflicts of law.

AUTHORIZED ACCEPTANCE

by Architect:
LS3P ASSOCIATES LTD.

_____
Signature

_____
Print Name and Title

_____
Date

by Original Licensee:

_____
Signature

_____
Print Name and Title

_____
Date

by Third Party Licensee:

_____

_____
Signature

_____
Print Name and Title

_____
Date

WE SO CONSENT:

by Owner:
_____

_____
Signature

_____
Print Name and Title

_____
Date

SECTION 013516 - ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes special procedures for alteration work.

1.2 DEFINITIONS

A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.

B. Consolidate: To strengthen loose or deteriorated materials in place.

C. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.

D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.

F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.

G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.

H. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.

I. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.

J. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.

K. Retain: To keep an element or detail secure and intact.

L. Strip: To remove existing finish down to base material unless otherwise indicated.

1.3 COORDINATION

A. Alteration Work Subschedule: A construction schedule coordinating the sequencing and scheduling of alteration work for entire Project, including each activity to be performed, and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration work.

1. Schedule construction operations in sequence required to obtain best Work results.
2. Coordinate sequence of alteration work activities to accommodate the following:

a. Owner's continuing occupancy of portions of existing building.
b. Owner's partial occupancy of completed Work.
c. Other known work in progress.
d. Tests and inspections.

3. Detail sequence of alteration work, with start and end dates.
4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
5. Use of elevator and stairs.
6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use in existing structure. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.

B. Pedestrian and Vehicular Circulation: Coordinate alteration work with circulation patterns within Project building and site. Some work is near circulation patterns. Circulation patterns cannot be closed off entirely and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.4 PROJECT MEETINGS FOR ALTERATION WORK

A. Preliminary Conference for Alteration Work: Before starting alteration work, conduct conference at Project site.

1. Attendees: In addition to representatives of Owner, Architect, and Contractor, testing service representative, specialists, and chemical-cleaner manufacturer(s) shall be represented at the meeting.
2. Agenda: Discuss items of significance that could affect progress of alteration work, including review of the following:

a. Alteration Work Subschedule: Discuss and finalize; verify availability of materials, specialists' personnel, equipment, and facilities needed to make progress and avoid delays.
b. Fire-prevention plan.
c. Governing regulations.
d. Areas where existing construction is to remain and the required protection.
e. Hauling routes.
f. Sequence of alteration work operations.
g. Storage, protection, and accounting for salvaged and specially fabricated items.

h. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
i. Qualifications of personnel assigned to alteration work and assigned duties.
j. Requirements for extent and quality of work, tolerances, and required clearances.
k. Embedded work such as flashings and lintels, special details, collection of waste, protection of occupants and the public, and condition of other construction that affects the Work or will affect the work.

3. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.

B. Coordination Meetings: Conduct coordination meetings specifically for alteration work at biweekly intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, Architect, and Contractor, each specialist, supplier, installer, and other entity concerned with progress or involved in planning, coordination, or performance of alteration work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to alteration work.
2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project.

a. Alteration Work Subschedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within the Contract Time.
b. Schedule Updating: Revise Contractor's Alteration Work Subschedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
c. Review present and future needs of each entity present, including review items listed in the "Preliminary Conference for Alteration Work" Paragraph in this article and the following:

1) Interface requirements of alteration work with other Project Work.
2) Status of submittals for alteration work.
3) Access to alteration work locations.
4) Effectiveness of fire-prevention plan.
5) Quality and work standards of alteration work.
6) Change Orders for alteration work.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.5 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.

1. Carefully dismantle and salvage each item or object in a manner to prevent damage and protect it from damage, then promptly deliver it to Owner where directed at Project site.

1.6 INFORMATIONAL SUBMITTALS

A. Alteration Work Subschedule:

1. Submit alteration work subschedule within seven days of date established for commencement of alteration work.

B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements that are to remain, including finish surfaces, that might be misconstrued as damage caused by Contractor's alteration work operations.

C. Alteration Work Program: Submit 14 days before work begins.

D. Fire-Prevention Plan: Submit 14 days before work begins.

1.7 QUALITY ASSURANCE

A. Specialist Qualifications: An experienced firm regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work as specified in each Section and that has completed a minimum of three recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.

1. Field Supervisor Qualifications: Full-time supervisors experienced in specialty work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on-site when specialty work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.

a. Construct new mockups of required work whenever a supervisor is replaced.

B. Title X Requirement: Each firm conducting activities that disturb painted surfaces shall be a "Lead-Safe Certified Firm" according to 40 CFR 745, Subpart E, and use only workers that are trained in lead-safe work practices.

C. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.

1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.

D. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.

E. Safety and Health Standard: Comply with ANSI/ASSP A10.6.

1.8 STORAGE AND HANDLING OF SALVAGED MATERIALS

A. Salvaged Materials:

1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site.
5. Protect items from damage during transport and storage.

B. Salvaged Materials for Reinstallation:

1. Repair and clean items for reuse as indicated.
2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.

C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.

D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.

1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
2. Secure stored materials to protect from theft.
3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F or more above the dew point.

E. Storage Space:

1. Owner will arrange for limited on-site location(s) for free storage of salvaged material.
2. Arrange for off-site locations for storage and protection of salvaged material that cannot be stored and protected on-site.

1.9 FIELD CONDITIONS

A. Survey of Existing Conditions: Record existing conditions that affect the Work by use of preconstruction photographs.

1. Comply with requirements specified in Section 013233 "Photographic Documentation."

B. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.

C. Owner's Removals: Before beginning alteration work, verify in correspondence with Owner that all items to be removed and stored have been removed and stored away from the project site.

D. Size Limitations in Existing Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within existing spaces, areas, rooms, and openings, including temporary protection, by 12 inches Insert dimension or more.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.

1. Use only proven protection methods, appropriate to each area and surface being protected.
2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
3. Erect temporary barriers to form and maintain fire-egress routes.
4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
8. Provide supplemental sound-control treatment to isolate demolition work from other areas of the building.

B. Temporary Protection of Materials to Remain:

1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.

C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

D. Utility and Communications Services:

1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.

1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

3.2 PROTECTION FROM FIRE

A. General: Follow fire-prevention plan and the following:

1. Comply with NFPA 241 requirements unless otherwise indicated. Perform duties titled "Owner's Responsibility for Fire Protection."
2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.

    a. If combustible material cannot be removed, provide fire blankets to cover such materials.

B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:

1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:

    a. Train each fire watch in the proper operation of fire-control equipment and alarms.
    b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
    c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
    d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
    e. Maintain fire-watch personnel at each area of Project site until 60 minutes after conclusion of daily work.

C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.

D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.

1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.

B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents

or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.

C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.

D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.

E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 GENERAL ALTERATION WORK

A. Have specialty work performed only by qualified specialists.

B. Ensure that supervisory personnel are present when work begins and during its progress.

C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs or video recordings. Comply with requirements in Section 013233 "Photographic Documentation."

D. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.

E. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.

1. Do not proceed with the work in question until directed by Architect.

END OF SECTION 013516

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, Commissioning Authority, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Requirements:

1. Section 012100 "Allowances" for testing and inspection allowances.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of three previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.

1. Mockups are used for one or more of the following:

a. Verify selections made under Sample submittals.
b. Demonstrate aesthetic effects.
c. Demonstrate the qualities of products and workmanship.
d. Demonstrate successful installation of interfaces between components and systems.
e. Perform preconstruction testing to determine system performance.

2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.

E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) in accordance with 29 CFR 1910.7, by a testing agency accredited in accordance with NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.3 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in

compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.4 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Mockup Shop Drawings:

1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

F. Reports: Prepare and submit certified written reports and documents as specified.

G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by Commissioning Authority.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and

inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.9 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.

1. Requirements of authorities having jurisdiction supersede requirements for specialists.

G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor's Responsibilities:

    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    d. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
    e. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.

    a. Allow seven days for initial review and each re-review of each mockup.

7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

10. Demolish and remove mockups when directed unless otherwise indicated.

L. Specialty Mockups: See Section 014339 "Mockups" for additional construction requirements for integrated exterior mockups, preconstruction laboratory mockups, and room mockups.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Payment for these services will be made from testing and inspection allowances specified in Section 012100 "Allowances," as authorized by Change Orders.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform quality-control services.

    a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Commissioning Authority, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.

1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.

2. Distribution: Distribute schedule to Owner, Architect, Commissioning Authority, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency and/or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in the Statement of Special Inspections attached to this Section, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Commissioning Authority, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, and authorities' having jurisdiction reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms, including "requested," "authorized," "selected," "required," and "permitted," have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms, including "shown," "noted," "scheduled," and "specified," have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations, List: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. Abbreviations and acronyms not included in this list are to mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States." The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; (see FGIA).
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; www.concrete.org.
9. ACP - American Clean Power; (Formerly: American Wind Energy Association); www.cleanpower.org.
10. ACPA - American Concrete Pipe Association; www.concretepipe.org.
11. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
12. AF&PA - American Forest & Paper Association; www.afandpa.org.
13. AGA - American Gas Association; www.aga.org.
14. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
15. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
16. AI - Asphalt Institute; www.asphaltinstitute.org.
17. AIA - American Institute of Architects (The); www.aia.org.
18. AISC - American Institute of Steel Construction; www.aisc.org.
19. AISI - American Iron and Steel Institute; www.steel.org.
20. AITC - American Institute of Timber Construction; (see PLIB).
21. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
22. AMPP - Association for Materials Protection and Performance; www.ampp.org.
23. ANSI - American National Standards Institute; www.ansi.org.
24. AOSA/SCST - Association of Official Seed Analysts (The)/Society of Commercial Seed Technologists (The); www.analyzeseeds.com.
25. APA - APA - The Engineered Wood Association; www.apawood.org.

26. APA - Architectural Precast Association; www.archprecast.org.
27. API - American Petroleum Institute; www.api.org.
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASA - Acoustical Society of America; www.acousticalsociety.org.
30. ASCE - American Society of Civil Engineers; www.asce.org.
31. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (see ASCE).
32. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
33. ASME - ASME International; American Society of Mechanical Engineers (The); www.asme.org.
34. ASSE - ASSE International; (American Society of Sanitary Engineering); www.asse-plumbing.org.
35. ASSP - American Society of Safety Professionals; www.assp.org.
36. ASTM - ASTM International; www.astm.org.
37. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
38. AVIXA - Audiovisual and Integrated Experience Association; www.avixa.org.
39. AWI - Architectural Woodwork Institute; www.awinet.org.
40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
41. AWPA - American Wood Protection Association; www.awpa.com.
42. AWS - American Welding Society; www.aws.org.
43. AWWA - American Water Works Association; www.awwa.org.
44. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
45. BIA - Brick Industry Association (The); www.gobrick.com.
46. BICSI - BICSI, Inc.; www.bicsi.org.
47. BIFMA - Business and Institutional Furniture Manufacturer's Association; www.bifma.org.
48. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
49. BWF - Badminton World Federation; www.bwfbadminton.com.
50. CARB - California Air Resources Board; www.arb.ca.gov.
51. CDA - Copper Development Association Inc.; www.copper.org.
52. CE - Conformite Europeenne (European Commission); www.ec.europa.eu/growth/single-market/ce-marking.
53. CEA - Canadian Electricity Association; www.electricity.ca.
54. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
55. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
56. CGA - Compressed Gas Association; www.cganet.com.
57. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
58. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
59. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
60. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
61. CPA - Composite Panel Association; www.compositepanel.org.
62. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
63. CRRC - Cool Roof Rating Council; www.coolroofs.org.
64. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
65. CSA - CSA Group; www.csagroup.org.
66. CSI - Cast Stone Institute; www.caststone.org.
67. CSI - Construction Specifications Institute (The); www.csiresources.org.
68. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
69. CTA - Consumer Technology Association; www.cta.tech.

70. CTI - Cooling Technology Institute; www.coolingtechnology.org.
71. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
72. DHA - Decorative Hardwoods Association; www.decorativehardwoods.org.
73. DHI - Door and Hardware Institute; www.dhi.org.
74. ECIA - Electronic Components Industry Association; www.ecianow.org.
75. EIMA - EIFS Industry Members Association; www.eima.com.
76. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
77. EOS/ESD - EOS/ESD Association, Inc.; Electrostatic Discharge Association; www.esda.org.
78. ESTA - Entertainment Services and Technology Association; www.esta.org.
79. EVO - Efficiency Valuation Organization; www.evo-world.org.
80. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
81. FGIA - Fenestration and Glazing Industry Alliance; https://fgiaonline.org.
82. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
83. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
84. FM Approvals - FM Approvals LLC; www.fmapprovals.com.
85. FM Global - FM Global; www.fmglobal.com.
86. FRSA - Florida Roofing and Sheet Metal Contractors Association, Inc.; www.floridaroof.com.
87. FSA - Fluid Sealing Association; www.fluidsealing.com.
88. FSC - Forest Stewardship Council U.S.; www.fscus.org.
89. GA - Gypsum Association; www.gypsum.org.
90. GS - Green Seal; www.greenseal.org.
91. HI - Hydraulic Institute; www.pumps.org.
92. HMMA - Hollow Metal Manufacturers Association; (see NAAMM).
93. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
94. IAS - International Accreditation Service; www.iasonline.org.
95. ICC - International Code Council; www.iccsafe.org.
96. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
97. ICPA - International Cast Polymer Association (The); www.theicpa.com.
98. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
99. IEC - International Electrotechnical Commission; www.iec.ch.
100. IEEE SA - IEEE Standards Association; https://standards.ieee.org.
101. IES - Illuminating Engineering Society; www.ies.org.
102. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
103. IGMA - Insulating Glass Manufacturers Alliance; (see FGIA).
104. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.org.
105. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
106. Intertek - Intertek Group; www.intertek.com.
107. ISA - International Society of Automation (The); www.isa.org.
108. ISFA - International Surface Fabricators Association; www.isfanow.org.
109. ISO - International Organization for Standardization; www.iso.org.
110. ITU - International Telecommunication Union; www.itu.int.
111. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
112. LPI - Lightning Protection Institute; www.lightning.org.
113. MBMA - Metal Building Manufacturers Association; www.mbma.com.
114. MCA - Metal Construction Association; www.metalconstruction.org.
115. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
116. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.

117. MHI - Material Handling Industry; www.mhi.org.
118. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
119. MPI - Master Painters Institute; www.paintinfo.com.
120. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry, Inc.; www.msshq.org.
121. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
122. NACE - NACE International; (National Association of Corrosion Engineers International); (see AMPP).
123. NADCA - National Air Duct Cleaners Association; www.nadca.com.
124. NAIMA - North American Insulation Manufacturers Association; www.insulationinstitute.org.
125. NALP - National Association of Landscape Professionals; www.landscapeprofessionals.org.
126. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
127. NBI - New Buildings Institute; www.newbuildings.org.
128. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
129. NCMA - National Concrete Masonry Association; www.ncma.org.
130. NEBB - National Environmental Balancing Bureau; www.nebb.org.
131. NECA - National Electrical Contractors Association; www.necanet.org.
132. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
133. NEMA - National Electrical Manufacturers Association; www.nema.org.
134. NETA - InterNational Electrical Testing Association; www.netaworld.org.
135. NFHS - National Federation of State High School Associations; www.nfhs.org.
136. NFPA - National Fire Protection Association; www.nfpa.org.
137. NFPA - NFPA International; (see NFPA).
138. NFRC - National Fenestration Rating Council; www.nfrc.org.
139. NGA - National Glass Association; www.glass.org.
140. NHLA - National Hardwood Lumber Association; www.nhla.com.
141. NLGA - National Lumber Grades Authority; www.nlga.org.
142. NOFMA - National Oak Flooring Manufacturers Association; (see NWFA).
143. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
144. NRCA - National Roofing Contractors Association; www.nrca.net.
145. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
146. NSF - NSF International; www.nsf.org.
147. NSI - Natural Stone Institute; www.naturalstoneinstitute.org.
148. NSPE - National Society of Professional Engineers; www.nspe.org.
149. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
150. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
151. NWFA - National Wood Flooring Association; www.nwfa.org.
152. NWRA - National Waste & Recycling Association; www.wasterecycling.org.
153. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
154. PDI - Plumbing & Drainage Institute; www.pdionline.org.
155. PLASA - PLASA; www.plasa.org.
156. PLIB - Pacific Lumber Inspection Bureau; www.plib.org.
157. PVCPA - Uni-Bell PVC Pipe Association; www.uni-bell.org.
158. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
159. RFCI - Resilient Floor Covering Institute; www.rfci.com.
160. RIS - Redwood Inspection Service; (see WWPA).
161. SAE - SAE International; www.sae.org.
162. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.

163. SDI - Steel Deck Institute; www.sdi.org.
164. SDI - Steel Door Institute; www.steeldoor.org.
165. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
166. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (see ASCE).
167. SIA - Security Industry Association; www.securityindustry.org.
168. SJI - Steel Joist Institute; www.steeljoist.org.
169. SMA - Screen Manufacturers Association; www.smainfo.org.
170. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
171. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
172. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
173. SPIB - Southern Pine Inspection Bureau; www.spib.org.
174. SPRI - Single Ply Roofing Industry; www.spri.org.
175. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
176. SSINA - Specialty Steel Industry of North America; www.ssina.com.
177. SSPC - SSPC: The Society for Protective Coatings; (see AMPP).
178. STI/SPFA - Steel Tank Institute/Steel Plate Fabricators Association; www.steeltank.com.
179. SWI - Steel Window Institute; www.steelwindows.com.
180. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
181. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
182. TCNA - Tile Council of North America, Inc.; www.tcnatile.com.
183. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.kbcdco.tema.org.
184. TIA - Telecommunications Industry Association (The); www.tiaonline.org.
185. TMS - The Masonry Society; www.masonrysociety.org.
186. TPI - Truss Plate Institute; www.tpinst.org.
187. TPI - Turfgrass Producers International; www.turfgrasssod.org.
188. TRI - Tile Roofing Industry Alliance; www.tileroofing.org.
189. ULSE - UL Standards & Engagement Inc.; www.ulse.org.
190. UL - UL Solutions Inc.; www.ul.com.
191. USAV - USA Volleyball; www.usavolleyball.org.
192. USGBC - U.S. Green Building Council; www.usgbc.org.
193. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
194. WA - Wallcoverings Association; www.wallcoverings.org.
195. WCLIB - West Coast Lumber Inspection Bureau; (see PLIB).
196. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
197. WDMA - Window & Door Manufacturers Association; www.wdma.com.
198. WI - Woodwork Institute; www.woodworkinstitute.com.
199. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
200. WWPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
2. ICC - International Code Council; www.iccsafe.org.
3. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. USAB - United States Access Board; www.access-board.gov.
2. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (see USAB).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 014339 - MOCKUPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Integrated exterior mockups.
2. Preconstruction laboratory mockups.
3. Room mockups.

B. Related Requirements:

1. Section 014000 "Quality Requirements" for quality assurance requirements for aesthetic and workmanship mockups specified in other Sections.

1.2 DEFINITIONS

A. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as part of permanent construction, consisting of multiple products, assemblies, and subassemblies.

B. Preconstruction Laboratory Mockups: Integrated exterior mockups constructed at testing facility to verify performance characteristics.

C. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting as indicated.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, testing and inspecting agency representative, and installers of major systems whose Work is included in integrated exterior mockups.
2. Review coordination of equipment and furnishings provided by the Owner for room mockups.
3. Review locations and extent of mockups.
4. Review testing procedures to be performed on mockups.
5. Review and finalize schedule for mockups, and verify availability of materials, personnel, equipment, and facilities needed to complete mockups and testing and maintain schedule for the Work.

1.4 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior and room mockups.

1. Include plans, elevations, sections, and mounting, attachment, and support details.
2. Indicate manufacturer and model number of individual components, subassemblies, and assemblies.
3. Include site location drawing indicating orientation of mockup.
4. Revise and resubmit Shop Drawings to reflect approved modifications in details and component interfaces resulting from changes made during testing procedures.

B. Delegated Design Submittal: For temporary structural supports for mockups not attached to building structure, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Room Mockup Coordination Drawings: Drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved.

B. Qualification Data: For testing agency.

C. Preconstruction Test Reports: For integrated exterior mockups.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated and acceptable to Owner and Architect.

B. Build mockups to do the following:

1. Verify selections made under Sample submittals.
2. Demonstrate aesthetic effects.
3. Demonstrate the qualities of products and workmanship.
4. Demonstrate acceptable coordination between components and systems.
5. Perform preconstruction testing, such as window air- and water-leakage testing.

C. Fabrication: Before fabricating or installing portions of the Work requiring mockups, build mockups for each form of construction and finish required. Use materials and installation methods as required for the Work.

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed unless otherwise indicated.

D. Notifications:

1. Notify Architect seven days in advance of the dates and times when mockups will be constructed.
2. Notify Architect 14 days in advance of the dates and times when mockups will be tested.
3. Allow seven days for initial review and each re-review of each mockup.

E. Approval: Obtain Architect's approval of mockups before starting fabrication or construction of corresponding Work.

1. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 COORDINATION

A. Coordinate schedule for construction of mockups, so construction, testing, and review of mockups do not impact Project schedule.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design support structure for free-standing mockups.

B. Structural Performance:

1. Seismic Performance: Mockups and support structure to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
2. Wind Loads: As indicated on Drawings.

C. Mockup Testing Performance Requirements: Perform tests using design pressures and performance criteria indicated for assemblies and products that are specified in other Sections and incorporated into integrated exterior mockups.

2.2 INTEGRATED EXTERIOR MOCKUPS

A. Construct integrated exterior mockups according to approved mockup Shop Drawings. Construct mockups to demonstrate constructability, coordination of trades, and sequencing of Work; and to ensure materials, components, subassemblies, assemblies, and interfaces integrate into a system complying with indicated performance and aesthetic requirements.

B. Design and construct foundation and superstructure to support free-standing integrated exterior mockups.

C. Build integrated exterior mockups using installers and construction methods that will be used in completed construction.

D. Use specified products that have been approved by Architect. Coordinate installation of materials and products specified in individual Specification Sections that include Work included in integrated exterior mockups.

E. The Work of integrated exterior mockups includes, but is not limited to, the following:

1. Precast architectural concrete.
2. Masonry veneer.
3. Stone cladding.
4. Cold-formed metal framing and sheathing.
5. Air and weather barriers.
6. Thermal insulation.
7. Through-wall flashing.
8. Flashing and sheet metal trim.
9. Joint sealants.
10. Metal wall panels.
11. Aluminum-framed entrances and storefront.
12. Glazed curtain walls.
13. Aluminum windows.
14. Glazing.

F. Photographic Documentation: Document construction of integrated exterior mockups with photographs in accordance with Section 013233 "Photographic Documentation." Provide photographs showing details of interface of different materials and assemblies.

1. Document testing procedures, including water leakage and other deficiencies. Photograph modifications to component interfaces intended to correct deficiencies.

G. Provide and document modifications to construction details and interfaces between components and systems required to properly sequence the Work, or to pass performance testing requirements. Obtain Architect's approval for modifications.

H. Retain approved mockups constructed in place. Incorporate fully into the Work.

2.3 ROOM MOCKUPS

A. Build room mockups according to approved mockup Shop Drawings to evaluate constructability, demonstrate the coordination of trades and sequencing of Work, and to demonstrate aesthetic requirements. Include each visible finish, component, and equipment item within room mockups; include operable lighting.

B. Provide room mockups of the following rooms:

1. Pre/Post Patient Holding Bay.

C. The Work of room mockups includes, but is not limited to, the following:

1. Millwork and casework.
2. Glazing.
3. Metal framing.
4. Gypsum board.
5. Acoustical ceilings.
6. Resilient flooring.
7. Painting.
8. Registers and grilles.
9. Wiring devices.
10. Lighting.

PART 3 - EXECUTION

3.1 TESTING OF INTEGRATED EXTERIOR MOCKUPS

A. Integrated Exterior Mockup Testing Agency: Engage a qualified testing agency to perform tests and inspections.

1. Testing and inspecting agency will interpret tests and state in each report whether tested Work complies with or deviates from requirements.

B. Integrated Exterior Mockup Testing Services: Perform the following tests in the following order:

1. Water-Spray Test: Before installation of interior finishes has begun, test areas designated by Architect in accordance with AAMA 501.2 for evidence of water penetration.

a. Perform a minimum of two tests in areas as directed by Architect.

2. Air Leakage: Test in accordance with ASTM E783 at 1.5 times the rate specified in "Mockup Testing Performance Requirements" Paragraph in "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

a. Perform a minimum of two tests in areas as directed by Architect.

3. Water Penetration: Test in accordance with ASTM E1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Mockup Testing Performance Requirements" Paragraph in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and verify no evidence of water penetration.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and installations, including connections, and also to observe testing for the following systems and assemblies.

1. Insert systems and assemblies.

D. Integrated exterior mockup will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 014339

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Owner will pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Owner will pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service: Owner will pay electric-power-service use charges for electricity used by all entities for construction operations.

E. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

F. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

C. Project Signs and Construction Site Banners: Depending on type of signage required for Project, show fabrication and installation details., including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

D. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste-handling procedures.
5. Other dust-control measures.

F. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:

1. Methods used to meet the goals and requirements of the Owner.
2. Concrete cutting method(s) to be used.
3. Location of construction devices on the site.
4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.
6. Indicate locations of sensitive patient and equipment areas or other areas requiring special attention as identified by Owner. Indicate means for complying with Owner's requirements.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized-steel bases for supporting posts.

B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.

C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.

D. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.

E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
3. Drinking water and private toilet.

4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures."

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

E. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.

F. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

G. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.

a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.

b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

H. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

I. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service overhead unless otherwise indicated.
2. Connect temporary service to Owner's existing power source, as directed by Owner.

J. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

K. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment and one land-based telephone line(s) for each field office.

1. Post a list of important telephone numbers.

a. Police and fire departments.
b. Ambulance service.
c. Contractor's home office.
d. Contractor's emergency after-hours telephone number.
e. Architect's office.
f. Engineers' offices.
g. Owner's office.
h. Principal subcontractors' field and home offices.

L. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

M. Project Computer: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications. Equip computer with not less than the following:

1. Operating System: Microsoft Windows 10 Professional.
2. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
3. Backup: External hard drive, minimum 2 terrabytes, with automated backup software providing daily backups.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
2. Utilize designated area within existing building for temporary field offices.
3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with the Civil Drawings.
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course in accordance with the Civil Drawings.

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

F. Storage and Staging: Provide temporary offsite area or Use designated areas of Project site for storage and staging needs.

G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

H. Project Signs and Construction Site Banners: Coordinate and verify requirements of project signage and/or construction site banners with Architect. LS3P Marketing available to assist with layout and design of signage.

I. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

J. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

K. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 011000 "Summary."

C. Temporary Erosion and Sedimentation Control: Comply with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

K. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.

1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
2. Paint and maintain appearance of walkway for duration of the Work.

L. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

M. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard, with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.

2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.

    a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.

3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
4. Insulate partitions to control noise transmission to occupied areas.
5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
6. Protect air-handling equipment.
7. Provide walk-off mats at each entrance through temporary partition.

N. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 24 hours are considered defective and require replacing.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

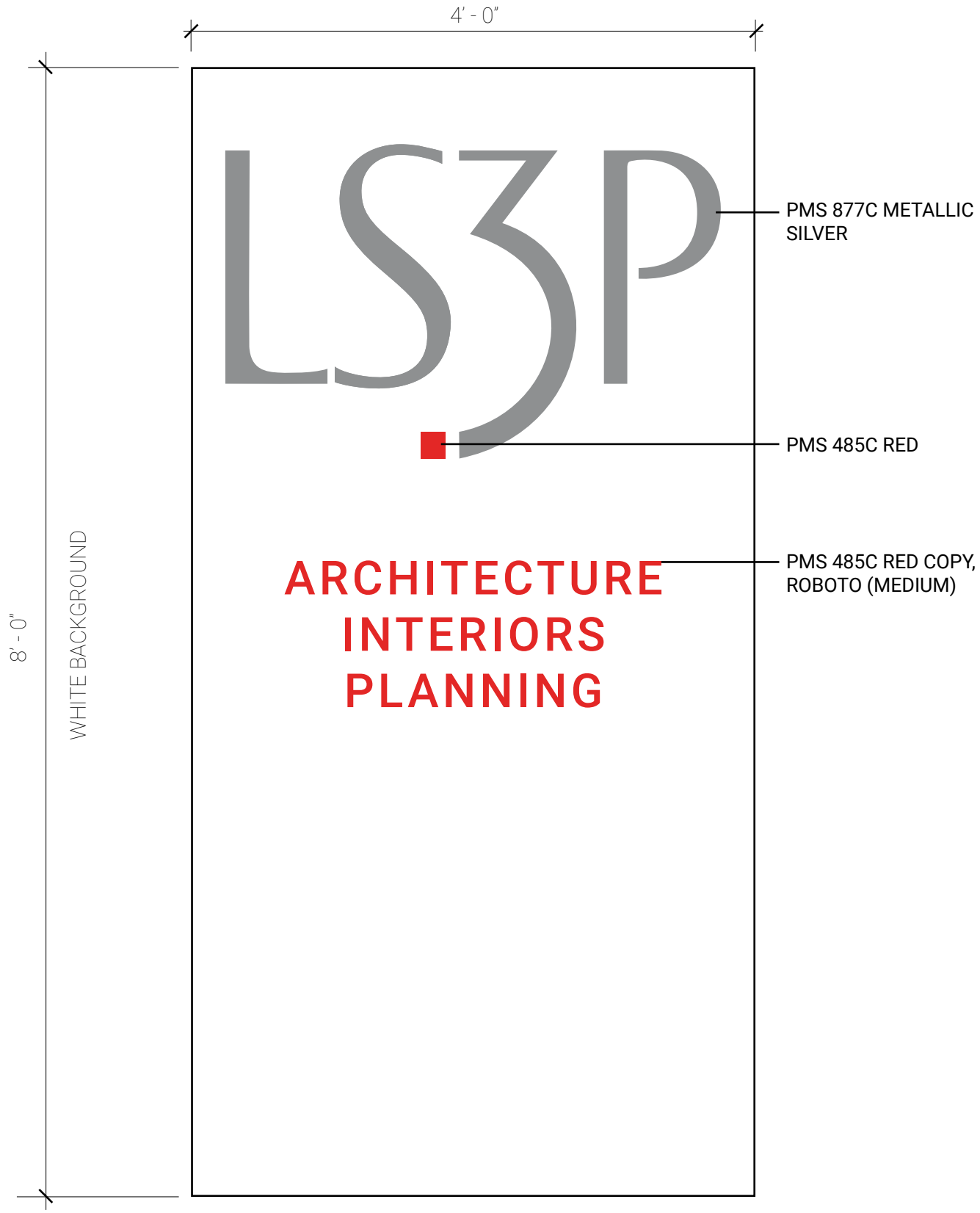
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000



101 N. THIRD STREET, SUITE 500
WILMINGTON, NC 28401
TEL. 910.790.9901
WWW.LS3P.COM

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

LS3P-ONLY OPTION
WOODEN 4'X8'
PROJECT CONSTRUCTION SIGN

01

COPYRIGHT 2015 ALL RIGHTS RESERVED PRINTED OR ELECTRONIC DRAWINGS AND DOCUMENTATION MAY NOT BE REPRODUCED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM LS3P ASSOCIATES LTD.



LS3P
101 N. THIRD STREET, SUITE 500
WILMINGTON, NC 28401
TEL. 910.790.9901
WWW.LS3P.COM
MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

LS3P-ONLY OPTION
WOODEN 8'X4'
PROJECT CONSTRUCTION SIGN

01

COPYRIGHT 2015 ALL RIGHTS RESERVED PRINTED OR ELECTRONIC DRAWINGS AND DOCUMENTATION MAY NOT BE REPRODUCED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM LS3P ASSOCIATES LTD.

4' - 0"

8' - 0"



GRAPHICS DETERMINED BASED ON PROJECT OWNER AND TEAM, DESIGNED BY LS3P MARKETING

1 - 0"

PMS 485C RED

North Carolina Department of Health and Human Services

Opening Summer of 2024

ROBOTO (BLACK)

ROBOTO (REGULAR)

NC DOA Department of Administration

OWNER

ROBOTO (MEDIUM)

LS3P

ARCHITECT

BARNHILL CONTRACTING COMPANY

Balfour Beatty Construction

d.a. everett construction group

CONTRACTOR - JOINT VENTURE

LS3P
101 N. THIRD STREET, SUITE 500
WILMINGTON, NC 28401
TEL. 910.790.9901
WWW.LS3P.COM

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

LS3P TEAM SIGN OPTION
WOODEN 4'X8'
PROJECT CONSTRUCTION SIGN

01

COPYRIGHT 2015 ALL RIGHTS RESERVED PRINTED OR ELECTRONIC DRAWINGS AND DOCUMENTATION MAY NOT BE REPRODUCED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM LS3P ASSOCIATES LTD.

ROBOTO (BLACK)

ROBOTO (MEDIUM)

8’ - 0”

4’ - 0”



NC DOA Department of Administration | LS3P | BARNHILL CONTRACTING COMPANY | Balfour Beatty Construction | d.a. everett construction group

OWNER | ARCHITECT | CONTRACTOR - JOINT VENTURE

ROBOTO (MEDIUM)

GRAPHICS DETERMINED BASED ON PROJECT OWNER AND TEAM, DESIGNED BY LS3P MARKETING

LS3P
101 N. THIRD STREET, SUITE 500
WILMINGTON, NC 28401
TEL. 910.790.9901
WWW.LS3P.COM
MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

LS3P TEAM SIGN OPTION
WOODEN 8’X4’
PROJECT CONSTRUCTION SIGN

01

COPYRIGHT 2015 ALL RIGHTS RESERVED PRINTED OR ELECTRONIC DRAWINGS AND DOCUMENTATION MAY NOT BE REPRODUCED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM LS3P ASSOCIATES LTD.



WHITE COPY, ROBOTO (MEDIUM) TYPE FONT

101 N. THIRD STREET, SUITE 500
WILMINGTON, NC 28401
TEL. 910.790.9901
WWW.LS3P.COM

MEMBERS OF THE AMERICAN INSTITUTE OF ARCHITECTS

LS3P BANNER
PERFORATED VINYL 6'X4'
PROJECT CONSTRUCTION BANNER

01

COPYRIGHT 2015 ALL RIGHTS RESERVED PRINTED OR ELECTRONIC DRAWINGS AND DOCUMENTATION MAY NOT BE REPRODUCED IN ANY FORM WITHOUT WRITTEN PERMISSION FROM LS3P ASSOCIATES LTD.

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of This Section Includes: Administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 011000 "Summary" for Contractor requirements related to Owner-furnished products.
2. Section 012100 "Allowances" for products selected under an allowance.
3. Section 012500 "Substitution Procedures" for requests for substitutions.
4. Section 014200 "References" for applicable industry standards for products specified.
5. Section 017700 "Closeout Procedures" for submitting warranties.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products unless otherwise indicated.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluating Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements

for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
2. Data indicating compliance with the requirements specified in "Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."

F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Resolution of Compatibility Disputes between Multiple Contractors:

a. Contractors are responsible for providing products and construction methods compatible with products and construction methods of other contractors.
b. If a dispute arises between the multiple contractors over concurrently selectable but incompatible products, Architect will determine which products will be used.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is inconspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

    a. Name of product and manufacturer.
    b. Model and serial number.
    c. Capacity.
    d. Speed.
    e. Ratings.

3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.4 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections are to be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of Owner or endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of Owner or endorsed by manufacturer to Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.

5. Descriptive, performance, and reference standard requirements in Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

    a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by Architect, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

    a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.

    a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
    b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.

a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.

1. Select products for which sustainable design documentation submittals are available from manufacturer.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following

conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for a comparable product. Architect will notify Contractor of approval or rejection of proposed comparable product within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

1. Architect's Approval of Submittal: Marked with approval notation from Architect's action stamp. See Section 013300 "Submittal Procedures."
2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

C. Submittal Requirements, Two-Step Process: Approval by Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:

1. Section 042200 "Concrete Unit Masonry" for disposal requirements for masonry waste.

1.2 DEFINITIONS

A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.

C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner’s property.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition and construction waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 7 days of date established for commencement of the Work.

1.5 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste management coordination of projects with similar requirements. Superintendent may serve as Waste Management Coordinator.

B. Refrigerant Recovery Technician Qualifications: Universal certified by EPA-approved certification program.

C. Refrigerant Recovery Technician Qualifications: Comply with requirements in Section 024119 "Selective Demolition."

D. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

E. Waste Management Conference(s): Conduct conference(s) at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Use. Include estimated quantities and assumptions for estimates.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Comply with requirements in Section 024119 "Selective Demolition" for salvaging demolition waste.

B. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

C. Salvaged Items for Sale and Donation: Not permitted on Project site.

D. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site.
5. Protect items from damage during transport and storage.

E. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

F. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

G. Plumbing Fixtures: Separate by type and size.

H. Lighting Fixtures: Separate lamps by type and protect from breakage.

I. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall be shared equally by Owner and Contractor.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.

5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.4 RECYCLING DEMOLITION WASTE

A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch size.

1. Crush asphaltic concrete paving and screen to comply with requirements for use as general fill.

B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.

C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 1-1/2-inch size.
2. Crush concrete and screen to comply with requirements for use as satisfactory soil for fill or subbase.

D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 1-1/2-inch size.

a. Crush masonry and screen to comply with requirements for use as general fill and satisfactory soil for fill or subbase.
b. Crush masonry and screen to comply with requirements for use as mineral mulch.

2. Clean and stack undamaged, whole masonry units on wood pallets.

E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

F. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

H. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

J. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.

K. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by carpet reclamation agency or carpet recycler.

L. Carpet Tile: Remove debris, trash, and adhesive.

1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.

M. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.

N. Conduit: Reduce conduit to straight lengths and store by material and size.

O. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

a. Comply with requirements for use of clean sawdust as organic mulch.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

a. Comply with requirements for use of clean ground gypsum board as inorganic soil amendment.

D. Paint: Seal containers and store by type.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner’s property.

C. Burning: Do not burn waste materials.

D. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

END OF SECTION 017419

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect and Commissioning Authority will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit on digital media acceptable to Architect or by uploading to web-based project software site. Enable reviewer comments on draft submittals.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.

1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

1.5 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual to contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.
7. Name and contact information for Commissioning Authority.
8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
9. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation in accordance with ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.6 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:

1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.7 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.

4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.

3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and

flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.

1.10 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:

1. Section 017300 "Execution" for final property survey.
2. Section 017700 "Closeout Procedures" for general closeout procedures.
3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal:

1) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit PDF electronic files of scanned Record Prints and three sets of file prints.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report weekly indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.3 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

    a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    b. Accurately record information in an acceptable drawing technique.
    c. Record data as soon as possible after obtaining it.
    d. Record and check the markup before enclosing concealed installations.
    e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

    a. Dimensional changes to Drawings.
    b. Revisions to details shown on Drawings.
    c. Depths of foundations.
    d. Locations and depths of underground utilities.
    e. Revisions to routing of piping and conduits.
    f. Revisions to electrical circuitry.
    g. Actual equipment locations.
    h. Duct size and routing.
    i. Locations of concealed internal utilities.
    j. Changes made by Change Order or Construction Change Directive.
    k. Changes made following Architect's written orders.
    l. Details not on the original Contract Drawings.
    m. Field records for variable and concealed conditions.
    n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as for the original Contract Drawings.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
4. Refer instances of uncertainty to Architect for resolution.
5. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.

    a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
    b. Architect will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

1.4 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

B. Format: Submit record specifications as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Specifications.

1.5 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

C. Format: Submit Record Product Data as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Product Data.

1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.6 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file or scanned PDF electronic file(s) of marked-up miscellaneous record submittals.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.7 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

B. Allowances: Furnish demonstration and training instruction time under the demonstration and training allowance as specified in Section 012100 "Allowances."

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.3 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Contractor.
e. Date of video recording.

2. Transcript:

   a. Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
   b. Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.

3. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.6 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.
    h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.

c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

1.7 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

F. Cleanup: Collect used and leftover educational materials and remove from Project site or give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.9 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode with vibration reduction technology.

1. Submit video recordings by uploading to web-based Project software site.
2. File Hierarchy: Organize folder structure and file locations in accordance with Project Manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.

4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged in accordance with Project Manual table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. Email address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

    a. Produce segments to present a single significant piece of equipment per segment.
    b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017900

SECTION 024100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Limitations on Contractor's use of site and premises.

B. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 017419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

1.03 DEFINITIONS

A. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.

B. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.04 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2027.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Site Plan: Indicate:
   1. Areas for temporary construction and field offices.
   2. Areas for temporary and permanent placement of removed materials.

C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
   1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.
   2. Summary of safety procedures.

3. Demolition firm qualifications.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.06 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 DEMOLITION

A. Remove selected elements within the existing building as indicated on the Drawings.

B. Remove other items indicated, for recycling.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
1. Obtain required permits.
2. Comply with applicable requirements of NFPA 241.
3. Use of explosives is not permitted.
4. Provide, erect, and maintain temporary barriers and security devices.
5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
7. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
8. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

D. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

E. Hazardous Materials:
   1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
   1. Verify construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from areas that remain occupied.
   1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 015000 in locations indicated on drawings.

C. Remove existing work as indicated and required to accomplish new work.
   1. Remove items indicated on drawings.

D. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
   1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.

2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. See Section 011000 - Summary for limitations on outages and required notifications.
4. Verify that abandoned services serve only abandoned facilities before removal.
5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.
1. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
2. Repair adjacent construction and finishes damaged during removal work.
3. Patch to match new work.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 024100

SECTION 055000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2026.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.

F. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

G. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2025.

J. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

L. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi

Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2026.

M. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

N. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2026.

O. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).

P. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata (2020).

Q. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019, with Editorial Revision (2025).

R. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

S. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

T. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Design data: Submit drawings and supporting calculations, signed and sealed by a qualified professional structural engineer.
      a. Include the following, as applicable:
         1) Design criteria.
         2) Engineering analysis depicting stresses and deflections.
         3) Member sizes and gauges.
         4) Details of connections.
         5) Support reactions.
         6) Bracing requirements.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

D. Designer's Qualification Statement.

E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.05 QUALITY ASSURANCE

A. Design metal fabrications under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

C. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Slotted Channel Fittings: ASTM A1011/A1011M.

F. Mechanical Fasteners: Same material as or compatible with materials being fastened; type consistent with design and specified quality level.

G. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.

H. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

J. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

K. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.

C. Bolts, Nuts, and Washers: Stainless steel.

D. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

E. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 FABRICATED ITEMS

A. Slotted Channel Framing: Fabricate channels and fittings from structural steel complying with the referenced standards; factory-applied, rust-inhibiting thermoset acrylic enamel finish.

2.05 FINISHES - STEEL

A. Prime paint steel items.
1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and items specified for _____ finish.
2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

F. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

2.06 FINISHES - ALUMINUM

A. Interior Aluminum Surfaces: Class I natural anodized.

B. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

C. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.07 FABRICATION TOLERANCES

A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch (1.5 mm).

C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).

D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).

E. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated on drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed , except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION 055000

SECTION 061053
MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preservative treatment (PPT).

B. Fire-retardant treatment (FRT).

C. Concealed wood blocking, nailers, and supports.

1.02 Reference Standards

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel; 2021.

C. AWPA M4 - Standard for the Handling, Storage, Field Fabrication and Field Treatment of Preservative-Treated Wood Products; 2026.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.

E. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. ITS (DIR) - Directory of Listed Products; Current Edition.

G. PS 20 - American Softwood Lumber Standard; 2025.

H. SPIB (GR) - Standard Grading Rules; 2021.

I. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 Submittals

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Fire-retardant treatment.
   2. Pressure-preservative treatment.
   3. Field-applied preservative treatment product data and application instructions.

1.04 Delivery, Storage, and Handling

A. Cover wood products to protect against moisture. Support stacked products to prevent deformation and allow air circulation.

B. Fire-Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 General Requirements

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
1. Species: Spruce-Pine-Fir (South), unless otherwise indicated.
2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org), and that provides grading service for species and grade specified. Provide lumber stamped with grade mark unless otherwise indicated.
3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.02 Dimension Lumber

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
1. Lumber: S4S, No.2 or Standard Grade.
2. Boards: Standard or No.3.

2.03 Fire-Retardant Treatment (FRT)

A. Manufacturers:
1. Great Southern Wood Preserving, Inc; FlameFreez (FRTW): www.flamefreez.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.

B. Provide factory-treated wood members in accordance with AWPA U1 and use category indicated.

C. Fire-Retardant Treatment: Interior Type A, Use Category UCFA (LT), Low-Temperature (low hygroscopic).

D. Kiln-dry after treatment (KDAT) to maximum moisture content of 19 percent for sawn material and 15 percent for plywood.

E. Fabrication of FRT Wood:

1. Ripping or milling of boards, lumber, and timber after treatment is not permitted.
2. Field cutting to length and drilling of holes in boards, lumber, and timber are permitted without additional treatment.
3. Field cutting and drilling of holes in plywood are permitted.

F. Label or brand FRT wood with classification mark of UL (DIR) or ITS (DIR) or other approved inspection agency, the treatment plant, name of treatment, species of wood, flame spread and smoke-developed indexes, method of drying after treatment, and treating standard.

2.04 Pressure-Preservative Treatment (PPT)

A. Manufacturers:
1. Great Southern Wood Preserving, Inc; YellaWood (Pressure Treated Pine): www.yellawood.com/#sle.
2. Substitutions: See Section 016000 - Product Requirements.

B. Provide factory-treated wood members in accordance with AWPA U1 and use category indicated.

C. Preservative Limitations for Interior Use Categories UC1 and UC2:
1. Use SBX preservative with 0.28 pcf (4.5 kg/cu m) retention for resistance to Formosan termites.

D. Kiln-dry wood after treatment with waterborne preservative to maximum moisture content of 19 percent for lumber and 15 percent for plywood.

E. Perform fabrication such as cutting, boring, milling, and surfacing to maximum extent practicable before treatment.

F. Label preservative-treated wood with marking as required by AWPA U1 and ICC (IBC). Unless otherwise permitted by standard U1 and the building code, include the following markings: AWPA U1, accredited inspection agency's mark, treating plant identification, type of preservative, retention, and end use.

G. Field Treatment for Cuts and Holes in Preservative-Treated Wood: Comply with AWPA M4.

2.05 Accessories

A. Metal and Finish of Fasteners:
1. Fire-Retardant-Treated Wood:
a. Nails, timber rivets, wood screws, and lag screws: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.
b. Fasteners other than staples, nails, timber rivets, wood screws, and lag screws: Mechanically deposited zinc-coated steel, ASTM B695 Class 55 or better.
2. Preservative-Treated Wood:
a. Nails, timber rivets, wood screws, and lag screws - general use: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.
1) Exception: Fasteners in interior dry environment with SBX/DOT and zinc-borate treated wood only: Plain carbon steel is permitted.

b. Fasteners other than staples, nails, timber rivets, wood screws, and lag screws: Mechanically deposited zinc-coated steel, ASTM B695 Class 55 or better.

3. Untreated Wood: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.

B. Anchors:

1. Expansion shield and lag-bolt type for anchorage to solid masonry or concrete.

PART 3 EXECUTION

3.01 Preparation

A. Coordinate installation of rough carpentry members specified in other sections.

3.02 Installation - General

A. Select material sizes to minimize waste.

B. Reuse scrap to greatest extent possible; clearly separate scrap for use on-site as accessory components, including shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 Blocking, Nailers, and Supports

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items unless item can be securely fastened to two or more studs or another method of support is explicitly indicated.

D. Where ceiling mounting is indicated, provide blocking and supplementary supports above ceiling unless another method of support is explicitly indicated.

E. Provide the following specific nonstructural framing and blocking:

1. Cabinets and shelf supports.

3.04 Site-Applied Wood Treatment

A. Apply preservative treatment to field-cut surfaces in accordance with manufacturer's instructions wherever cuts, holes, sawing, or other fabrication of wood members is required after pressure-preservative treatment.

B. Apply preservative treatment in accordance with manufacturer's instructions.

C. Allow preservative to dry prior to erecting members.

3.05 Cleaning

A. Waste Disposal: See Section 017419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on ground or buried in fill.

C. Prevent sawdust and wood shavings from entering storm drainage system.

END OF SECTION 061053

SECTION 062000
FINISH CARPENTRY

PART 1 GENERAL

1.01 Section Includes

A. Finish carpentry items.

B. Hardware.

1.02 Related Requirements

1.03 Submittals

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:
1. Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.
2. Provide instructions for attachment hardware and finish hardware.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.
2. Provide information as required by AWI/AWMAC/WI (AWS).
3. Include certification program label.

1.04 Quality Assurance

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.
2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:
1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
2. Provide labels or certificates indicating that work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
3. Provide designated labels on shop drawings as required by certification program.
4. Provide designated labels on installed products as required by certification program.

5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.05 Delivery, Storage, and Handling

A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.

B. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

C. Protect from moisture damage.

D. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.01 Finish Carpentry Items

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.

B. Interior Woodwork Items:
1. Floating Shelf system as detailed on the Drawings.

2.02 Lumber Materials

A. Softwood Lumber: Spruce Pine Fir species, plain sawn, maximum moisture content of 6 percent; with vertical grain.

2.03 Sheet Materials

A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

B. Softwood Plywood, Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

C. Particleboard: ANSI A208.1 Composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.

2.04 Panel Core Materials

A. Medium Density Fiberboard (MDF): Composite panel composed of cellulosic fibers, additives, and bonding system; cured under heat and pressure; comply with ANSI A208.2.
1. Grade: 115; moisture resistance: MR10.
2. Panel Thickness: 1-1/2 inches (38.1 mm).
3. Products:

a. Roseburg Forest Products; Medium Density Fiberboard: www.roseburg.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

2.05 Plastic Laminate Materials

A. Plastic Laminate: NEMA LD 3; color as selected by Architect; textured, low gloss finish.
1. Products:
a. Arborite: www.arborite.com/#sle.
b. Panolam Industries International, Inc: www.panolam.com/#sle.
c. Substitutions: See Section 016000 - Product Requirements.

2.06 Fastenings

A. Adhesive for factory-fabricated units: Manufacturer's recommended adhesive for application.

B. Fasteners: Of size and type to suit application.

2.07 Accessories

A. Adhesive: Type recommended by fabricator to suit application.

B. Joint Adhesives: Single component, high strength ethyl cyanoacrylate PVC adhesive. Waterproof, impact resistant with high viscosity.
1. Color: Clear.
2. Products:
a. Titebond; Titebond PVC Trim Joint Adhesive: www.titebond.com/#sle.
b. Substitutions: Section 016000 - Product Requirements.

2.08 Hardware

A. Floating Shelf Brackets:
1. Material: Steel or extruded aluminum.
a. Finish: Black or manufacturer's standard finish.
b. Support Length: As indicated on the Drawings.
2. Products:
a. Shelfology: www.shelfology.com.
b. Sheppard Brackets: www.sheppardbrackets.com.
c. Hovr Bracket System: www.hovrbracketsystem.com
d. Substitutions: See Section 016000 - Product Requirements.

2.09 Fabrication

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Cap exposed plastic laminate finish edges with material of same finish and pattern.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.

PART 3 EXECUTION

3.01 Examination

A. Verify adequacy of backing and support framing.

3.02 Installation

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.

B. Install factory-fabricated units in accordance with manufacturer's printed installation instructions.

C. Set and secure materials and components in place, plumb and level.

D. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

3.03 Tolerances

A. Maximum Variation from True Position: 1/16 inch (1.6 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION 062000

SECTION 064100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 Section Includes

A. Wood casework with laminate cladding.

B. Cabinet and drawer hardware.

1.02 Related Requirements

A. Section 123600 - Countertops.

1.03 Abbreviations and Acronyms

A. AWI: Architectural Woodwork Institute.

B. HPDL: High-pressure decorative laminate.

C. MDF: Medium-density fiberboard.

D. MDO: Medium-density overlay.

E. TFL: Thermally-fused laminate.

1.04 Reference Standards

A. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

B. ANSI/AWI 0641 - Architectural Wood Casework; 2019.

C. ASTM D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials; 2012 (Reapproved 2020).

D. AWI 100 - Submittals; 2018.

E. AWI 200 - Care and Storage; 2018.

F. AWI 300 - Materials; 2018.

G. BHMA A156.9 - Cabinet Hardware; 2020.

H. BHMA A156.18 - Standard for Materials and Finishes; 2020.

I. ISO 4586-3 - High-Pressure Decorative Laminates (HPL, HPDL) – Sheets Based on Thermosetting Resins (Usually Called Laminates) – Part 3: Classification and Specifications for Laminates Less than 2 mm Thick and Intended for Bonding to Supporting Substrates; 2018.

J. PS 1 - Structural Plywood; 2023.

K. PS 20 - American Softwood Lumber Standard; 2025.

1.05 Administrative Requirements

A. Coordination:
1. Coordinate schedule of climate-controlled rooms with schedule of storage of wood and wood-based materials requiring climate-controlled environments.
2. Coordinate work of this section with installation of wood blocking, wood backing, metal strapping, and other anchorage that provides casework backing and structural support.
3. Coordinate work of this section with rough-in plumbing and rough-in electrical integrally-related with casework.

B. Preinstallation Meeting: Convene preinstallation meeting not less than one week prior to completion of framing behind casework; require attendance of contractor, framing contractor, and casework fabricator.
1. Review locations of casework backing and structural support.
2. Review backing attachment method to wall framing as indicated on drawings.

1.06 Submittals

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. AWI QCP Program Submittal Requirements: Comply with AWI 100.

C. Product Data: Submit manufacturer's published, product descriptive data.
1. Panel Cores for Wood Veneer and HPDL Panels: For each type, include thickness.
2. HPDL Laminates: For each type, indicate description, thickness, and color.

1.07 Quality Assurance

A. Fabricator/Installer Qualifications: Firm specializing in fabricating and installing products specified in this section with minimum five years of documented experience; with qualifications indicating ability to comply with requirements of this section.
1. Woodworking company with at least one project in past five years with value of casework within 20 percent of casework cost for this project.
2. Woodworking company must have at least one project in past five years where value of woodwork was within 20 percent of cost of woodwork for this project.
3. Single Source Responsibility: Provide fabrication and installation from single woodworking company.

1.08 Mock-Ups

A. See Section 014000 - Quality Requirements for additional requirements.

1.09 Delivery, Storage, and Handling

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver products in original packaging materials bearing product identification.

C. Store products prior to installation on flat, level, clean surfaces; elevate products above floors and protect from sunlight.

D. Store products in interior rooms with completed wet work and overhead work.

E. Relative Humidity Conditions for Storing Wood and Wood-Based Core Products:
1. Maintain relative humidity between 30 and 55 percent.

F. Store non-wood-based products under cover and elevated above grade.

G. For products other than wood and wood-based products, store and handle in accordance with fabricator's documented instructions.

H. Handle materials and products to prevent damage to edges, ends, or surfaces.

I. Handle wood products with clean hands or gloves; protect from marks or damage.

1.10 Field Conditions

A. Ambient Conditions for Acclimation, Installation, and Post-Installation of Wood-Based Products:
1. Acclimation Period Prior to Installation: 72 hours minimum, inside installation environment.
2. Temperature Conditions During Installation and Post-Installation: Maintain temperature between 60 degrees F (16 degrees C) and 90 degrees F (32 degrees C).
3. Relative Humidity Conditions During Acclimation, Installation, and Post-Installation: Maintain relative humidity between 25 and 45 percent.
4. Maximum Sustained Time outside Specified Relative Humidity Range: 24 hours.

PART 2 PRODUCTS

2.01 Manufacturers

A. Abet Laminati North America: https://na.abetlaminati.com.

B. Panolam Surface Systems: https://panolam.com.

C. PoliLam: www.polilam.com/#sle.

D. Formica Corporation: www.formica.com/#sle.

E. Wilsonart Engineered Surfaces: www.wilsonart.com.
1. **(PLM-1), (PLM-2)** Basis-of-Design.

F. Substitutions: See Section 016000 - Product Requirements.

G. Source Limitations: Furnish products provided by a single fabricator.

H. Single Source Responsibility: Provide and install this work from single fabricator.

2.02 Architectural Wood Casework

A. Casework Finish: Wood casework with laminate cladding.

B. Provide casework and casework components in sizes and profiles as indicated on drawings.
1. Interior Clearances: Comply with specified performance requirements.

C. Adjustable Shelves, Number of Shelves Per Cabinet Unit:
1. Base Cabinets: One shelf for each cabinet unit.
2. Wall Cabinets: Two shelves for each cabinet unit.

D. Scribed Fillers:
1. Finish and Materials: Same materials and finish as exposed surfaces.

2.03 Wood Casework with Laminate Cladding

A. Casework Construction:
1. Frameless Cabinet and Door Interface: Flush overlay.
2. Door and Drawer Front Profile: Flush.

B. Wood Drawer Boxes with Laminate Cladding:
1. Comply with specified performance requirements.
2. Cladding: HPDL.

C. Custom Grade - Laminate-Clad Wood Casework:
1. Exposed Exterior Surfaces, Panels to Receive Laminate Cladding:
a. HPDL Panels; Surface Finish: As specified.
2. Exposed Interior Surfaces at Door and Drawer Fronts:
a. Same laminate materials and thicknesses as exposed exterior surfaces.
1) Color to match exposed interior or face.
3. Exposed Interior Surfaces Except Door and Drawer Front Surfaces:
a. HPDL: Compatible laminate in color to exposed exterior surfaces.
4. Semi-Exposed Surfaces; Panels to Receive Laminate Cladding:

D. Edgebanding Applications for Laminate-Clad Wood Casework:
1. Drawer Box Top Edges:
a. Visible Cores: Provide edgebanding to match drawer side.

E. Edgebanding Materials for Laminate-Clad Wood Casework:
1. Thickness: 0.02 inch (0.50 mm) minimum; 0.12 inch (3.0 mm) maximum.
2. PVC: Well-matched to exposed face; radiused and beveled on edges and corners if thickness is greater than 0.039 inch (1.0 mm).

2.04 Edge Treatment APPLICATIONS

A. Front Edges of Frameless Cabinets:
1. Provide edgebanding.

B. Top Edges of Cabinets:
1. Provide edgebanding at top edges of cabinets less than 80 inches (2030 mm) above floor, or when top edges are visible from above.

C. Bottom Edges of Wall Cabinet Ends and Light Valances:
1. Provide edgebanding materials and color to match exposed exterior surfaces.

D. Bottom Edges of Aprons:
1. Provide edgebanding.

E. Hinged Door Edges:
1. Provide edgebanding on all four edges except for solid wood doors.
2. Miter wood edgebanding with thicknesses equal to or greater than 1/4 inch (6.4 mm).

F. Drawer Front and Drawer False Front Edges:

G. Adjustable Shelf Edges, Semi-Exposed Surfaces:
1. Provide edgebanding that matches exposed either exterior or interior surfaces at option of fabricator.

H. Edges of Cut-Outs:
1. Provide edgebanding at cut-outs with reveals greater than 1/8 inch (3.18 mm).

2.05 Solid Wood Components

2.06 HPDL-CLAD PANELS

A. Description: Panels consisting of High-Pressure Decorative Laminate (HPDL) faces applied to cores; panel layup with face ply, back ply, and core of either single ply or odd number of inner plies, to produce balanced construction panel.
1. Panels subject to size limitations, minimum thickness requirements, and fabrication tolerances of specified aesthetic grade and performance duty level in accordance with AWI 300 and ANSI/AWI 0641.

B. High-Pressure Decorative Laminate (HPDL): Sheet consisting of fibrous material impregnated with thermosetting resins; bonded by high-pressure process.

C. HPDL Laminates Less than 0.08 inch (2 mm) Thick: Comply with ISO 4586-3.
1. Horizontal Grades:

a. HPDL HGS; for _____ applications.
2. Vertical Grades:
a. HPDL VGS; for _____ applications.
3. Exposed Backer Materials:
a. Same materials, thickness and color as laminate face.
4. Concealed Backer Materials:
a. Laminate materials as required for balanced construction panel and recommended by laminate manufacturer for application.

D. Panel Cores:
1. Medium Density Fiberboard Core (MDF).
2. Medium Density Overlay (MDO).

2.07 Panel Cores

A. Medium Density Fiberboard (MDF):
1. Description: Composite panel composed of cellulosic fibers, additives, and bonding system cured under heat and pressure; comply with ANSI A208.2.
2. Grade and Thickness: As required to meet performance requirements.
3. Moisture Resistance: MR10; color-tinted to indicate moisture-resistance core.

B. Medium Density Overlay (MDO):
1. Description: General plywood with thermosetting phenolic resin impregnated cellulose-fiber sheets bonded to both working faces for balanced construction; comply with PS 1 for MDO General.
2. Performance Category: As required to meet performance requirements for specified applications.

2.08 Concealed Cabinet Base Components

A. Cabinet Base Toe-Kick Subfronts:
1. Materials: Plywood.

B. Cabinet Base Blocking and Stretchers:
1. Materials: As indicated on drawings.

C. Cabinet Base Sleepers:

2.09 Wood and Wood-Based Materials

A. AWI 200 Wood Moisture Content Requirements:
1. Climate Zone 3: Between 8 and 13 percent.

B. AWI 300 General Requirements for Wood.
1. Provide wood that is sound, free of decay, shake, pith, wane, and warp.
2. Provide wood in accordance with AWI 300.

C. Plywood: Comply with PS 1.

D. Wood Boards: Comply with PS 20.
1. Thickness: As indicated on drawings.

E. Moisture-Resistant Wood: Where moisture-resistant wood is specified or indicated on drawings for cabinet base components, provide wood with thickness swelling of not more than 5 percent when tested in accordance with ASTM D1037.

F. Wood Anchoring Strips:

2.10 Cabinet and Drawer Hardware

A. Hinges, Number of Hinges for Each Cabinet Door:
1. Door Heights Under 48 inches (1200 mm): Not less than two hinges per door.
2. Door Heights Between 48 inches (1200 mm) and 84 inches (2100 mm): Not less than three hinges per door.
3. Door Heights Greater than 84 inches (2100 mm): Not less than four hinges per door.

B. Hinges, Self-Closing, Integrated Damper Hinges:
1. Description: Self-closing hinges with integrated damper mechanisms.
2. Comply with BHMA A156.9, B01712.
3. Features: Provide soft-closing integrated damper hinges.
4. Opening Range: Between 115 to 150 to degrees.
5. Material and Finish: Satin anodized aluminum.

C. Cabinet Door Pulls:
1. Description: Back-mounted pulls.
2. Provide one pull for each drawer 24 inches (610 mm) or less in width.
3. Provide one pull for each drawer 24 inches (610 mm) or less in width.
4. Provide two pulls for each drawer over 24 inches (610 mm) in width.
5. Comply with BHMA A156.9, B02011.
6. Design: Square Drawer Pull.
7. Center-to-Center Mounting Dimension: 5-1/32 inches (128 mm).
8. Length: 5-7/16 inches (_____ mm).
9. Material and Finish: Bright chromium-plated nickel.
10. Products:
    a. Dave Mockett & Company, Inc: www.mockett.com/#sle.
        1) (CHW-1) Basis-of-Design: Model #DP105C/5.
    b. Substitutions: See Section 016000 - Product Requirements.

D. Shelf Rests:
1. Description: Metal shelf rests for installation into prepared holes in substrate.
2. Comply with BHMA A156.9, B04013.
3. Material and Finish: BHMA A156.18, 627 or 628 satin aluminum.
4. Products:
    a. Knape & Vogt Manufacturing Company: www.knapeandvogt.com/#sle.
    b. Substitutions: See Section 016000 - Product Requirements.

E. Drawer Slides:

1. Description: Hardware units that suspend drawers and provide controlled drawer sliding.
2. Comply with BHMA A156.9, Heavy Duty Grade 1HD-100.
3. Travel: Full extension.
4. Material and Finish: BHMA A156.18, 626 or 652 satin chromium.
5. Products:
   a. Accuride International, Inc; Heavy-Duty Drawer Slides: www.accuride.com/#sle.
   b. Knape & Vogt Manufacturing Company; Heavy-Duty Drawer Slides: www.knapeandvogt.com/#sle.

END OF SECTION 064100

SECTION 078400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

1.02 RELATED REQUIREMENTS

A. Section 017000 - Execution and Closeout Requirements: Cutting and patching.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2026.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2026.

C. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2024.

D. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2024.

E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

F. FM (AG) - FM Approval Guide; Current Edition.

G. ITS (DIR) - Directory of Listed Products; Current Edition.

H. UL (DIR) - Online Certifications Directory; Current Edition.

I. UL (FRD) - Fire Resistance Directory; Current Edition.

J. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance ratings, and limitations.

C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
   3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Verification of minimum three years documented experience installing work of this type.
   2. Verification of at least five satisfactorily completed projects of comparable size and type.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
   2. Fire Shield, LLC: www.fireshieldlv.com/#sle.
   3. Hilti, Inc: www.hilti.com/#sle.
   4. RectorSeal, a CSW Industrials Company; Metacaulk 150+ General Purpose Firestop Sealant: www.rectorseal.com/firestop-solutions/#sle.
   5. Specified Technologies Inc: www.stifirestop.com/#sle.
   6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
   7. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
4. Listing by ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.04 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

3.04 FIELD QUALITY CONTROL

A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174 and ASTM E2393.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 078400

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 092116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).

B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).

C. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.

G. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2022.

H. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2023.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.

3. Backing material recommended by sealant manufacturer.
4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
5. Substrates the product should not be used on.
6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Executed warranty.

1.05 QUALITY ASSURANCE

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

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
1. Adhesion Testing: In accordance with ASTM C794.
2. Compatibility Testing: In accordance with ASTM C1087.
3. Allow sufficient time for testing to avoid delaying the work.
4. Deliver sufficient samples to manufacturer for testing.
5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:
1. Bostik Inc: www.bostik-us.com/#sle.
2. Dow: www.dow.com/#sle.
3. Pecora Corporation: www.pecora.com/#sle.
4. Sika Corporation: usa.sika.com/#sle.
5. Specified Technologies Inc: www.stifirestop.com/#sle.
6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
7. Substitutions: See Section 016000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
1. Interior Joints:
a. Do not seal gaps and openings in gypsum board and suspended ceilings
b. Seal open joints except specific open joints indicated on drawings as not sealed.

B. Interior Wet Areas: kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.03 JOINT SEALANTS - GENERAL

A. Colors: As indicated on drawings.

2.04 NONSAG JOINT SEALANTS

A. Silicone Sealant: ASTM C920, Grade NS, Uses M, A, G, and O; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Cure Type: Single component, neutral moisture curing.
5. Service Temperature Range: Minus 65 to 180 degrees F (Minus 54 to 82 degrees C).
6. Products:
a. Dow; DOWSIL 758 Silicone Weather Barrier Sealant: www.dow.com/#sle.
b. Henry, a Carlisle Company; Moistop Sealant: www.henry.com/#sle.
c. Momentive Performance Materials, Inc/GE Silicones; SCS2000 SilPruf - Silicone Sealant and Adhesive: www.siliconeforbuilding.com/#sle.
d. Pecora Corporation; Pecora 860: www.pecora.com/#sle.
e. Sherwin-Williams Company; Silicone Rubber All Purpose Sealant: www.sherwin-williams.com/#sle.
f. Substitutions: See Section 016000 - Product Requirements.

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.
   2. Products:
      a. Adfast USA Inc; ADSEAL KB 4800 Series: www.adfastcorp.com/#sle.
      b. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
      c. Sika Corporation; Sikasil N Plus US: usa.sika.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

C. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, nonsagging; not intended for exterior use.
   1. Color: Standard colors matching finished surfaces, Type OP (opaque).
   2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
   3. Products:
      a. Pecora Corporation; AC-20 +Silicone: www.pecora.com/#sle.
      b. Sherwin-Williams Company; 850A Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
      c. Tremco Commercial Sealants & Waterproofing; Tremflex 834: www.tremcosealants.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

D. Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag; not expected to withstand continuous water immersion or traffic.
   1. Hardness Range: 10 to 30, Shore A, when tested in accordance with ASTM C661.
   2. Color: To be selected by Architect from manufacturer's standard range.
   3. Service Temperature Range: Minus 13 to 180 degrees F (Minus 25 to 82 degrees C).
   4. Products:
      a. H.B. Fuller Construction Products Inc; ElastiSeal B-100: www.hbfullerproducts.com/#sle.
      b. Pecora Corporation; Pecora BC-158 Butyl Rubber Sealant: www.pecora.com/#sle.
      c. Sherwin-Williams Company; Storm Blaster All Season Sealant: www.sherwin-williams.com/#sle.
      d. Substitutions: See Section 016000 - Product Requirements.

2.05 ACCESSORIES

A. Sealant Backing Rod, Closed-Cell Type:
   1. Cylindrical flexible sealant backings complying with ASTM C1330 Type C.
   2. Size: 25 to 50 percent larger in diameter than joint width.
   3. Products:
      a. Nomaco, Inc; HBR: www.nomaco.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.05 POST-OCCUPANCY

A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width, i.e., at low temperature in thermal cycle. Report failures immediately and repair them.

END OF SECTION 079200

SECTION 081613
FIBERGLASS DOORS

PART 1 GENERAL

1.01 Section Includes

A. Fiberglass doors.

B. Fiberglass door frames.

C. Fiberglass borrowed lite frames.

1.02 Related Requirements

A. Section 087100 - Door Hardware.

B. Section 088000 - Glazing.

1.03 Reference Standards

A. AAMA 1304 - Voluntary Specification for Determining Forced Entry Resistance of Side-Hinged Door Systems; 2018.

B. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

C. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2026.

D. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2026.

E. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

F. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2026.

G. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.

H. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.

I. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.

J. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2025.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

L. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2026.

M. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

N. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2023).

O. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2023.

1.04 Administrative Requirements

A. Coordination: Obtain hardware templates from hardware manufacturer prior to starting fabrication.

1.05 Submittals

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard details, installation instructions, hardware and anchor recommendations.

C. Shop Drawings: Indicate layout and profiles; include assembly methods.
1. Indicate product components, including hardware reinforcement locations and preparations, accessories, finish colors, patterns, and textures.
2. Indicate wall conditions, door and frame elevations, sections, materials, gauges, finishes, location of door hardware by dimension, and details of openings; use same reference numbers indicated on drawings to identify details and openings.

D. Selection Samples: Submit two complete sets of color chips, illustrating manufacturer's available finishes, colors, and textures.

E. Verification Samples: Submit door surface samples for each finish specified, 10 inches (254 mm) by 10 inches (254 mm) in size, illustrating finishes, colors, and textures.

F. Door Corner Sample: Submit corner cross sections, 10 inches (254 mm) by 10 inches (254 mm) in size, illustrating construction, finish, color, and texture.

G. Test Reports: Submit certified test reports from qualified independent testing agency indicating doors comply with specified performance requirements.

H. Manufacturer's qualification statement.

I. Installer's qualification statement.

J. Maintenance Data: Include instructions for repair of minor scratches and damage.

K. Specimen warranty.

L. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements for additional provisions.
2. Package products with protective coverings and identify with descriptive labels.

1.06 Quality Assurance

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum 5 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified, with minimum 5 years of documented experience.

1.07 Delivery, Storage, and Handling

A. Mark doors with location of installation, door type, color, and weight.

B. Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

C. Deliver pre-assembled doors and frames with braces, spreaders, and packaging as required to prevent damage.

D. Store materials in original packaging, under cover, protected from exposure to harmful weather conditions and from direct contact with water.
1. Store at temperature and humidity conditions recommended by manufacturer.
2. Do not use non-vented plastic or canvas shelters.
3. Immediately remove wet wrappers.

E. Store in position recommended by manufacturer, elevated minimum 4 inches (100 mm) above grade, with minimum 1/4 inch (6 mm) space between doors.

1.08 Field Conditions

A. Do not install doors until structure is enclosed.

B. Maintain temperature and humidity at manufacturer's recommended levels during and after installation of doors.

1.09 Warranty

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty covering materials and workmanship, including degradation or failure due to chemical contact. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 Manufacturers

A. Pultruded Fiberglass Reinforced Plastic (FRP) Doors:
1. Alpen High Performance Products; Zenith Series Doors Narrowline: www.thinkalpen.com/#sle.
2. Cascadia Windows & Doors; CASCADIA UNIVERSAL SERIES Doors: www.cascadiawindows.com/#sle.
3. Edgewater Door; EP Series: www.edgewaterdoor.com/#sle.
4. Marvin: www.marvin.com/#sle.
5. Special-Lite, Inc; AF-100: www.special-lite.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

2.02 Door and Frame Assemblies

A. Door and Frame Assemblies: Factory-fabricated, prepared and machined for hardware.
1. Operation: Manual.
2. Physical Endurance: Swinging door cycle test to ANSI/SDI A250.4, Level A (1,000,000 cycles) minimum; tested with hardware and fasteners intended for use on project.
3. Screw-Holding Capacity: Tested to 890 pounds (404 kg), minimum.
4. Surface Burning Characteristics: Flame spread index (FSI) of 0 to 25, Class A, and smoke developed index (SDI) of 450 or less, when tested in accordance with ASTM E84.
5. Flammability: Self-extinguishing when tested in accordance with ASTM D635.
6. Provide products that meet USDA requirements for incidental food contact.
7. Sizes: As indicated on the drawings.
8. Clearance Between Door and Frame: 1/8 inch (3 mm), maximum.
9. Clearance Between Meeting Stiles of Pairs of Doors: 1/8 inch (3 mm), maximum.
10. Clearance Between Bottom of Door and Finished Floor: 3/4 inch (19 mm), maximum; not less than 1/4 inch (6 mm) clearance to threshold.
11. Provide frame anchors that allow for variation in rough opening size; field cutting of doors or frames to fit is not permitted.

2.03 Components

A. Doors: Fiberglass construction with reinforced core.
1. Type: As indicated on drawings, including swinging and sliding doors.
2. Thickness: 1-3/4 inch (44 mm), nominal.
3. Core Material: Manufacturer's standard core material for application indicated.
4. Construction:
a. Pultruded as single monolithic fiberglass reinforced plastic (FRP) panel.
b. Molded in one piece including through color gel coating on each side; manufacturer's standard subframe, core and faces fused during curing; hardware reinforcements.
c. Molded fiberglass shells with color gel coating, bonded into seamless unit; manufacturer's standard subframe and hardware reinforcements.

1) Fill door panel with foam insulation.

d. Fiberglass faces laminated to core with an applied gel coating, or molded in one piece including gel coating on each side.

e. Fiberglass ultraviolet resistant mylar coated, with 1/8 inch (3 mm) thick through color face sheets laminated to core.

5. Face Sheet Texture: Smooth.
6. Door Panel Configuration: As indicated on drawings.
7. Subframe and Reinforcements: Manufacturer's standard materials.
8. Waterproof Integrity: Provide factory fabricated edges, cut-outs, and hardware preparations of fiberglass reinforced plastic (FRP); provide cut-outs with joints sealed independently of glazing, louver inserts, or trim.
9. Hardware Preparations: Factory reinforce, machine, and prepare for door hardware including field installed items; provide solid blocking for each item; field cutting, drilling or tapping is not permitted; obtain manufacturer's hardware templates for preparation as necessary.

B. Door and Borrowed Lite Frames: Provide type in compliance with performance requirements specified for doors.
1. Type: Factory assembled with chemically welded joints.
2. Profiles: As indicated on the drawings.
3. Door Stop: 5/8 inch (16 mm) wide, by 1-7/8 inches (48 mm) deep.
4. Non-Fire-Rated:
a. Fiberglass reinforced plastic (FRP) with gel-coating matching doors.
5. Mullions: Removable, fiberglass centerpost; 2 inches wide by 2-3/4 inches deep (50 mm wide by 70 mm deep), nominal.
6. Corner Joints: Mitered with concealed corner blocks or angles of same material as frame; fiberglass and aluminum joined with screws; steel and stainless steel spot welded; sealed watertight with silicone sealant; field assemble knock-down type frames as required.
7. Hardware Cut-outs: Provide continuous backing or mortar guards of same material as frame, with watertight seal.
8. Frame Anchors: Stainless steel, Type 304; provide three anchors in each jamb for heights up to 84 inches (2130 mm) with one additional anchor for each additional 24 inches (610 mm) in height.
9. Reinforcing: Provide manufacturer's standard reinforcing at hinge, strike, and closer locations.

2.04 Performance Requirements

A. Provide door assemblies that have been designed and fabricated in compliance with specified performance requirements.

B. Fiberglass Doors: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific door type:
1. Performance Class (PC): CW.
2. Performance Grade (PG): Equivalent to or greater than specified design pressure.

C. Design Pressure: In accordance with ASCE 7.

D. Forced Entry Resistance: Pass in accordance with AAMA 1304 test method.

E. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 7.5 psf (359 Pa).

F. Air Leakage: Maximum 0.1 cfm/sf (0.5 L/sec/sq m), when tested in accordance with ASTM E283/E283M at differential pressure of 6.24 psf (299 Pa) across assembly.

G. Structural Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.

H. Thermal Transmittance, Exterior Doors: AAMA 1503, U-factor of 0.29, maximum, measured on exterior door in size required for this project.

I. Fiberglass Reinforced Plastic (FRP) Face Sheet Properties:
1. Izod Impact Resistance: ASTM D256, 7 foot-pound force per inch of width (9.5 Nm per 25 mm of width), minimum, with notched izod.
2. Tensile Strength at Break: ASTM D638, 13,250 psi (91.4 MPa), minimum.
3. Water Absorption: ASTM D570, 0.16 percent, maximum, after 24 hours at 74 degrees F (23 degrees C).
4. Flexural Strength: ASTM D790, 27,000 psi (186.2 MPa), minimum.

2.05 Finishes

A. Gel Coating: Ultraviolet (UV) stabilized polyester finish.
1. Thickness: Minimum 15 mils, 0.015 inch (0.38 mm) wet thickness, plus/minus 3 mils, 0.003 inch (0.07 mm).
2. Color: As selected by Architect from manufacturer's standard line of colors.

2.06 Hardware

A. Door Hardware: See Section 087100.

2.07 Accessories

A. Stops for Glazing: Fiberglass, unless otherwise indicated or required by fire rating; provided by door manufacturer to fit factory made openings, with color and texture to match door; fasteners shall maintain waterproof integrity.
1. Exterior Doors: Provide non-removable stops on exterior side with continuous compression gasket weatherseal.
2. Glazed Openings: Provide removable stops on interior side.
3. Opening Sizes and Shapes: As indicated on drawings.

B. Glazing: See Section 088000- Glazing.

C. Door Vision Lite Frames: Frames with glazing securely fastened within door opening.
1. Size: As indicated on drawings.
2. Frame Material: 18 gauge, 0.0478 inch (1.21 mm), galvanized steel.

PART 3 EXECUTION

3.01 Examination

A. Verify actual dimensions of openings by field measurements before door fabrication; show recorded measurements on shop drawings.

B. Do not begin installation until substrates have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 Preparation

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

B. Clean and prepare substrate in accordance with manufacturer's directions.

C. Protect adjacent work and finish surfaces from damage during installation.

3.03 Installation

A. Install in accordance with manufacturer's instructions; do not penetrate frames with anchors.

B. Install exterior doors in accordance with ASTM E2112.

C. Install door hardware as specified in Section 087100.

D. Set units plumb, level, and true-to-line, without warping or racking doors, and with specified clearances; anchor in place.

E. Set thresholds in continuous bed of sealant.

F. Separate aluminum and other metal surfaces from sources of corrosion of electrolytic action at points of contact with other materials.

G. Repair or replace damaged installed products.

3.04 Adjusting

A. Lubricate, test, and adjust doors to operate easily, free from warp, twist or distortion, and to fit watertight for entire perimeter.

B. Adjust hardware for smooth and quiet operation.

C. Adjust doors to fit snugly and close without sticking or binding.

3.05 Cleaning

A. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance.

3.06 Protection

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 081613

SECTION 087100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for aluminum doors.

B. Lock cylinders for doors that hardware is specified in other sections.

C. Thresholds.

D. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealants for setting exterior door thresholds.

B. Section 080671 - Door Hardware Schedule: Schedule of door hardware sets.

C. Section 084313 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. BHMA A156.1 - Standard for Butts and Hinges; 2025.

C. BHMA A156.3 - Exit Devices; 2025.

D. BHMA A156.4 - Door Closers and Pivots; 2024.

E. BHMA A156.5 - Cylinders and Input Devices for Locks; 2020.

F. BHMA A156.21 - Thresholds; 2025.

G. BHMA A156.22 - Standard for Gasketing; 2021.

H. BHMA A156.26 - Standard for Continuous Hinges; 2025.

I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

J. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
1. Architect.
2. Installer's Architectural Hardware Consultant (AHC).
3. Hardware Installer.
4. Owner's Security Consultant.

C. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

D. Keying Requirements Meeting:
1. Architect will schedule meeting at project site prior to Contractor occupancy.
2. Attendance Required:
   a. Installer's Architectural Hardware Consultant (AHC).
   b. Hardware Installer.
3. Agenda:
   a. Establish keying requirements.
4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
6. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
2. Provide complete description for each door listed.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
1. Submit manufacturer's parts lists and templates.
2. Bitting List: List of combinations as furnished.

F. Keying Schedule:
   1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Supplier's qualification statement.

J. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Lock Cylinders: Ten for each master keyed group.
   3. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
   1. Closers: Five years, minimum.
   2. Exit Devices: Three years, minimum.
   3. Locksets and Cylinders: Three years, minimum.
   4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
1. Applicable provisions of federal, state, and local codes.
2. Accessibility: ADA Standards and ICC A117.1.
3. Applicable provisions of NFPA 101.

D. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. See Door Hardware Schedule.

E. Fasteners:
1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
a. Aluminum fasteners are not permitted.
b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
2. Provide machine screws for attachment to aluminum frames.
a. Self-drilling (Tek) type screws are not permitted.
3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
4. Provide wall grip inserts for hollow wall construction.

2.02 HINGES

A. Manufacturers:
1. McKinney; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Hager Companies: www.hagerco.com/#sle.
3. BEST, dormakaba Group: www.bestaccess.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

B. Hinges: Comply with BHMA A156.1, Grade 1.
1. Continuous Hinges: Comply with BHMA A156.26.
2. Provide hinges on every swinging door.
3. Provide ball-bearing hinges at each door with closer.
4. Provide non-removable pins on exterior outswinging doors.
5. Provide following quantity of butt hinges for each door:
a. Doors 90 inches (2.3 m) High up to 120 inches (3 m) High: Four hinges.

2.03 EXIT DEVICES

A. Manufacturers:
1. Corbin Russwin, Sargent, or Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. dormakaba; Architectural Hardware Series 8000: www.dormakaba.com/#sle.
3. Hager Companies: www.hagerco.com/#sle.
4. BEST, dormakaba Group; Precision 100/200/300 Series: www.bestaccess.com/#sle.
5. Von Duprin, an Allegion brand: www.allegion.com/us/#sle.

6. Substitutions: See Section 016000 - Product Requirements.

B. Exit Devices: Comply with BHMA A156.3, Grade 1.
1. Lever design to match lockset trim.
2. Provide cylinder with cylinder dogging or locking trim.
3. Provide exit devices properly sized for door width and height.
4. Provide strike as recommended by manufacturer for application indicated.
5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.

2.04 LOCK CYLINDERS

A. Manufacturers:
1. BEST, dormakaba Group: www.bestaccess.com/#sle.
2. dormakaba: www.dormakaba.com/#sle.

B. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
1. Provide standard, conventional, and full size interchangeable core (FSIC) type cylinders, Grade 1, with six-pin core in compliance with BHMA A156.5 at locations indicated.
2. Provide cylinders from same manufacturer as locking device.
3. Provide cams and/or tailpieces as required for locking devices.

2.05 CLOSERS

A. Manufacturers; Surface Mounted:
1. BEST, dormakaba Group; EHD9000: www.bestaccess.com/#sle.
2. Corbin Russwin, Norton, Rixson, Sargent, or Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.
3. dormakaba; Architectural Hardware 7300 Series, Architectural Hardware 7400 Series, Architectural Hardware 8600 Series, Architectural Hardware 8900 Series, Architectural Hardware STA Series, Architectural Hardware TS93 Series, Commercial Hardware QDC100 Series, Commercial Hardware QDC200 Series, and Commercial Hardware QDC300 Series: www.dormakaba.com/#sle.
4. Hager Companies: www.hagerco.com/#sle.
5. LCN, an Allegion brand: www.allegion.com/us/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

B. Closers: Comply with BHMA A156.4, Grade 1.
1. Type: Surface mounted to door.
2. Provide door closer on each exterior door.
3. At outswinging exterior doors, mount closer on interior side of door.

2.06 THRESHOLDS

A. Manufacturers:
1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Hager Companies: www.hagerco.com/#sle.

3. National Guard Products, Inc: www.ngpinc.com/#sle.
4. Reese Enterprises, Inc: www.reeseusa.com/#sle.
5. Zero International, Inc: www.zerointernational.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

B. Thresholds: Comply with BHMA A156.21.
1. Provide threshold at each exterior door, unless otherwise indicated.
2. Type: Flat surface.
3. Material: Aluminum.
4. Threshold Surface: Fluted horizontal grooves across full width.
5. Field cut threshold to profile of frame and width of door sill for tight fit.
6. Provide non-corroding fasteners at exterior locations.

2.07 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. National Guard Products, Inc: www.ngpinc.com/#sle.
3. Reese Enterprises, Inc: www.reeseusa.com/#sle.
4. Zero International, Inc: www.zerointernational.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
1. Head and Jamb Type: Adjustable.
2. Door Sweep Type: Encased in retainer.
3. Material: Aluminum, with brush weatherstripping.
4. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
5. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.08 FINISHES

A. Finishes: Identified in Section 08 0671 - Door Hardware Schedule.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, doors and frames are properly installed, and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
   1. For Aluminum-Framed Storefront Doors and Frames: See Section 084313.
   2. Mounting heights in compliance with ADA Standards:

D. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014000 - Quality Requirements.

3.04 ADJUSTING

A. Adjust work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.06 PROTECTION

A. Protect finished Work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION 087100

SECTION 080671
DOOR HARDWARE SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule of door hardware sets for swingingdoors as indicated on drawings.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware: Requirements to comply with in coordination with this section.

1.03 REFERENCE STANDARDS

A. BHMA A156.3 - Exit Devices; 2025.

B. BHMA A156.18 - Standard for Materials and Finishes; 2020.

C. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.

1.04 PROJECT INFORMATION

A. Project Name: Pender High School Food & Nutrition Lab Renovation.
   1. Location: Burgaw, North Carolina.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Comply with submittal requirements as indicated in Section 087100.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Only manufacturers listed in Door Hardware Schedule or Section 087100 are considered acceptable, unless noted otherwise.

B. Obtain each type of door hardware as indicated from a single manufacturer and single supplier.

C. Manufacturer's Abbreviations: Coordinate with manufacturers listed in Section 087100.
   1. AR - Adams Rite.
   2. BAS - Best Access Systems.

3. BOM - Bommer Industries.
4. CR - Corbin Russwin.
5. CUR - Curries.
6. DMA - Dorma.
7. FC - Falcon.
8. GJ - Glynn Johnson.
9. HGR - Hager.
10. HIA - Hiawatha.
11. IVE - Ives.
12. LCN - LCN.
13. McK - McKinney.
14. MED - Medeco.
15. NGP - National Guard Products.
16. NOR - Norton.
17. PEM - Pemko.
18. RIX - Rixson.
19. ROC - Rockwood.
20. SA - Sargent.
21. SCH - Schlage.
22. SDC - Stanley Door Closers.
23. SH - Stanley Hinges.
24. TR - Trimco.
25. VD - Von Duprin.
26. YA - Yale.
27. ZRO - Zero Industries, Inc.

2.02 DESCRIPTION

A. Door hardware sets provided represent the design intent, they are only a guideline and should not be considered a detailed or complete hardware schedule.
   1. Provide door hardware item(s) as required for similar purposes, even when item is not listed for a door in Door Hardware Schedule.
   2. Door hardware supplier is responsible for providing proper size and hand of door for products required in accordance with Door Hardware Schedule and as indicated on drawings.
   3. Quantities listed are for each Pair (PR) of doors, or for each Single (SGL) door, as indicated in hardware sets.

2.03 LOCK FUNCTION CODES

A. Function Codes for Exit Devices: Complying with BHMA A156.3.
   1. Code 02; Exit Device: Entrance by pull/trim when actuating bar is locked down (Dogged-Down). Note-Fire Exit devices cannot be locked down.

2.04 FINISHES

A. Finishes: Complying with BHMA A156.18.
1. Code 630: Satin stainless steel, with stainless steel 300 series base material (former US equivalent US32D).

PART 3 EXECUTION

3.01 DOOR HARDWARE SCHEDULE

A. Organize listing of door hardware components within each hardware set in compliance with 10-Part scheduling sequence indicated in DHI (H&S), unless otherwise indicated.

3.02 HARDWARE SET # 1:

A. For use on Door Number(s): 100A.

B. Provide for each Pair (PR) door(s).

UNITS	LOCK	ITEM	DESCRIPTION	FINISH	MFR
2		Continuous Hinges	Continued Geared Hinges		

END OF SECTION 080671

SECTION 088000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Insulated infill panels.

C. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 084313 - Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2026).

C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.

E. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

F. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.

G. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

H. GANA (SM) - GANA Sealant Manual; 2008.

I. NFRC 100 - Procedure for Determining Fenestration Product U-Factors; 2026.

J. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

K. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2026.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data on Insulating Glass Unit and insulated infill panels Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch (___ by ___ mm) in size of glass units.

E. Certificate: Certify that products of this section meet or exceed specified requirements.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum 3 years of documented experience.
   1. Provide certified glass products through ANSI accredited certifications that include plant audits and independent laboratory performance testing.
      a. Insulating Glass Certification Council (IGCC).
      b. Safety Glazing Certification Council (SGCC).

B. Installer Qualifications: Company specializing in performing work of type specified, with minimum 3 years of documented experience.
   1. Provide company, field supervisors, and installers that hold active ANSI accredited certifications in appropriate categories for work specified.
      a. North American Contractor Certification (NACC) for glazing contractors.

1.07 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Insulated Infill Panels:
1. Product Description: Insulated panel with polyisocyanurate insulation and aluminum sheet exterior and interior skins on 1/8-inch-thick tempered hardboard substrate.
2. Thickness: 1 inch.
3. Finish: Standard kynar with 20-year finish warranty.
4. Manufacturers:
a. Mapes Panels: www.mapespanels.com.
1) MP1: Basis-of-Design: Mapes-R.
2) Substitutions: See Section 016000 - Product Requirements .

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
1. Design Pressure: Calculated in accordance with ASCE 7.
2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
4. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
1. In conjunction with weather barrier related materials described in other sections, as follows:

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Factor: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer progam.

2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
1. Kind FT - Fully Tempered Type: Complies with ASTM C1048.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
2. Guardian Glass, LLC: www.guardianglass.com/#sle.
a. GLZ1: Basis-of-Design: Sunguard SNX 60+ on Clear.
3. Pilkington North America Inc: www.pilkington.com/na/#sle.Pilkington North America Inc: www.pilkington.com/na/#sle.
4. Viracon, Apogee Enterprises, Inc: www.viracon.com/#sle.
5. Vitro Architectural Glass (formerly PPG Glass); _____: www.vitroglazings.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

B. Fabricator: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

C. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Warm-Edge Spacers: Low-conductivity thermoplastic with desiccant warm-edge technology design.
a. Spacer Width: As required for specified insulating glass unit.
b. Spacer Height: Manufacturer's standard.
c. Products:
1) H.B. Fuller Construction Products Inc; Kodispace 4SG: www.hbfuller.com/#sle.
2) Quanex IG Systems, Inc; Super Spacer TriSeal: www.quanex.com/#sle.
3) Technoform Glass Insulation; TGI-Spacer: www.glassinsulation.us/#sle.
4) Substitutions: See Section 016000 - Product Requirements.
4. Spacer Color: Black.
5. Edge Seal:
a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
b. Color: Black.
6. Purge interpane space with dry air, hermetically sealed.

D. Type GLZ1 - Insulating Glass Units: Vision glass, double glazed; vacuum seal.
1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Vacuum seal space between lites.
4. Outboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
a. Tint: Clear.
5. Metal edge spacer.
6. Inboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
a. Tint: Clear.
7. Total Thickness: 1 inch (25.4 mm).
8. Visible Light Transmittance (VLT): 60 percent, nominal.
9. Solar Heat Gain Coefficient (SHGC): 0.24, nominal.
10. Visible Light Reflectance, Outside: 45 percent, nominal.
11. Glazing Method: Dry glazing method, gasket glazing.

2.05 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch (75 mm) long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
1. Width: As required for application.
2. Thickness: As required for application.
3. Manufacturers:
a. Tremco Global Sealants: www.tremcosealants.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

E. Glazing Clips: Manufacturer's standard type.

2.06 SOURCE QUALITY CONTROL

A. Provide shop inspection and testing for Type _____ glass.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

C. Verify that sealing between joints of glass framing members has been completed effectively.

D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove nonpermanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION 088000

SECTION 090561
SUBSTRATE PREPARATION FOR FLOORING INSTALLATION- USG

PART 1 GENERAL

1.01 Section Includes

A. Removal of existing floor coverings.

B. Testing of concrete floor slabs for moisture.

C. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.

D. Preparation of existing concrete floor slabs for installation of floor coverings.

E. Patching compound.

1.02 Related Requirements

A. Section 096700 - Fluid-Applied Flooring for additional substrate preparation requirements.

1.03 Reference Standards

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2026a.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.

C. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

E. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.04 Administrative Requirements

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.05 Submittals

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Visual Observation Report: For existing floor coverings to be removed.

C. Testing Agency's Report:
   1. Report Contents:
      a. Description of areas tested; include floor plans and photographs if helpful.
      b. Summary of conditions encountered.
      c. Recommendations for remediation of unsatisfactory surfaces.
      d. Product data for recommended remedial coating.
   2. Submission Requirements: Submit no more than two business days after conclusion of testing.
      a. Submit report to Architect.

D. Adhesive Bond and Compatibility Test Report: For each type of adhesive or setting material.

E. Copy of RFCI (RWP).

1.06 Quality Assurance

A. Moisture and alkalinity (pH) testing will be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
   1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
   1. Provide access for and cooperate with testing agency.
   2. Confirm date of start of testing at least 10 days prior to actual start.
   3. Allow at least 4 business days on site for testing agency activities.
   4. Achieve and maintain specified ambient conditions.
   5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.07 Delivery, Storage, and Handling

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.08 Field Conditions

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 Materials

A. Patching Compound: Suitable for conditions, and compatible with adhesive and floor covering.
1. Calcium aluminate floor patch and skim coat for interior use over wood, concrete and gypsum subfloors.
2. Mildew-, and alkali-resistant compound capable of being feathered to nothing at edges.
3. Compressive Strength: 3.000 psi (20.7 MPa), minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
4. Products:
   a. USG Corporation; Durock Brand Tuf-Skim Floor Patch: www.usg.com/#sle.
   b. Substitutions: See Section 016000 - Product Requirements.

B. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to patching compound mix materials.

PART 3 EXECUTION

3.01 Sequence of Procedures

A. Testing of concrete substrates, if authorized by Owner.

B. Patching, smoothing, and leveling of substrates, as required.

C. Other preparation specified.

D. Adhesive bond and compatibility test performed by affected flooring installer.

E. Protection.

3.02 Testing of Structural Concrete Floor Substrates

A. Partial Removal of Existing Flooring: Remove flooring at locations where testing of substrates is indicated.
1. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.
2. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

B. Concrete Slab Testing Protocol: Follow recommendations of testing agency.
1. Perform following operations in the order indicated:
   a. Review Existing Conditions: Perform visual inspection at slabs with existing floor coverings, coatings, or sealers to ascertain whether conditions exist that may be deleterious to successful installation of new flooring.

b. Testing: Perform tests indicated.
1) Initial Adhesive Bond and Compatibility Testing: Comply with requirements and recommendations of manufacturer of each affected type of flooring.
a) Positive Results: Results indicating that adequate bond can be achieved in application of affected flooring type.

3.03 Application of Remediation Systems

A. Preliminary Cleaning:
1. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
2. Do not use solvents or other chemicals for cleaning.

B. Preparation:
1. See individual floor covering section(s) for additional substrate preparation requirements.
a. See Section 096700 for fluid-applied flooring.
2. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
3. Do not fill expansion joints, isolation joints, or other moving joints.

3.04 Application of Patching Compound

A. Comply with manufacturer's written instructions and recommendations.

B. Ensure substrate surfaces are dry, clean, and free of contaminants that might prevent proper bonding.

C. Site mix materials in accordance with manufacturer's instructions and at recommended ratios.

D. Concrete Substrates:
1. Prepare surfaces by shot-blasting, scarification, or grinding if recommended by patching compound manufacturer.
2. Do not apply when the moisture content in the concrete/mortar bed substrate exceeds 5.0 lbs/1,000 sq ft/24 hours (282.55 µg/(s sq m)) when measured in accordance with ASTM F1869 or 80 percent relative humidity as measured by moisture probes.
3. Fill substrate cracks, cold joints, control joints with materials recommended by manufacturer.
4. Patch or skim-coat spalling, pitting, or chipping in concrete surfaces.

3.05 Protection

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION 090561

SECTION 092116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel ceiling framing.

D. Acoustic insulation.

E. Gypsum wallboard.

F. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 079200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

C. Section 092216 - Non-Structural Metal Framing.

1.03 REFERENCE STANDARDS

A. AISI S201 - North American Standard for Cold-Formed Steel Framing - Product Data; 2017.

B. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

C. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2020.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

E. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2025.

F. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

G. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.

H. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

I. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2025.

J. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

K. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

L. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.

M. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

N. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

O. ASTM E413 - Classification for Rating Sound Insulation; 2022.

P. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

C. Sequencing: Install service utilities in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:

C. Steel Framing Industry Association (SFIA) Certification:
1. Submit documentation that metal studs and connectors used on project meet or exceed requirements of International Building Code.

1.06 QUALITY ASSURANCE

A. SFIA Code Compliance Certification Program: www.CFSteel.org/#sle: Use metal studs and connectors certified for compliance with International Building Code.

B. Manufacturer Qualifications: Member of Steel Stud Manufacturers Association (SSMA): www.ssma.com/#sle.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.07 Delivery, Storage, and Handling

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

C. Store metal products to prevent corrosion.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.
1. See PART 3 for finishing requirements.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.02 METAL FRAMING MATERIALS

A. Material and Product Requirements: AISI S201 and AISI S220.

B. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
1. Structural Grade: As required to meet design criteria.
2. Corrosion Protection Coating Designation: G40, or equivalent in accordance with AISI S220.

C. Manufacturers - Metal Framing, Connectors, and Accessories:
1. CEMCO: www.cemcosteel.com/#sle.
2. ClarkDietrich: www.clarkdietrich.com/#sle.
3. MarinoWARE: www.marinoware.com/#sle.
4. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
5. Telling Industries: www.tellingindustries.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

D. Nonstructural Steel Framing for Application of Gypsum Board: See Section 092216.

E. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).

1. Studs: C-shaped with knurled or embossed faces.
   a. Products:
      1) MBA Building Supplies; ProSTUD: www.mbastuds.com/#sle.
      2) R-stud; R-stud: www.rstud.com/#sle.
      3) Steeler Inc; ELITE Steel Framing System and accessories: www.steeler.com/#sle.
      4) Super Stud Building Products, Inc; The EDGE: www.buysuperstud.com/#sle.
      5) Substitutions: See Section 016000 - Product Requirements.
2. Runners: U shaped, sized to match studs.
3. Ceiling Channels: C-shaped.
4. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
   a. Products:
      1) MBA Building Supplies; MBA Furring Channel: www.mbastuds.com/#sle.
      2) Substitutions: See Section 016000 - Product Requirements.
5. Sill Plate Isolation Pads: Acoustical separation between sole plate and subfloor.
   a. Products:
      1) AcoustiGuard – WILREP LTD; Iso-Sill Rubber Isolation Pad: www.acoustiguard.com/#sle.
      2) Substitutions: See Section 016000 - Product Requirements.

F. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

G. Nonstructural Framing Accessories:
1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
2. Framing Connectors: ASTM A653/A653M, G90 (Z275) galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.
   a. Products:
      1) ClarkDietrich; FastBridge Clip (FB33): www.clarkdietrich.com/#sle.
      2) Substitutions: See Section 016000 - Product Requirements.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
1. American Gypsum Company: www.americangypsum.com/#sle.
2. CertainTeed Corporation: www.certainteed.com/#sle.
3. Georgia-Pacific Gypsum: www.buildgp.com/#sle.
4. Gold Bond Building Products, LLC provided by National Gypsum Company: www.goldbondbuilding.com/#sle.
5. PABCO Gypsum: www.pabcogypsum.com/#sle.
6. USG Corporation: www.usg.com/#sle.
7. Substitutions: See Section 016000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Thickness:
   a. Ceilings: 5/8 inch (16 mm).
4. Mold-Resistant, Paper-Faced Products:
   a. American Gypsum Company; M-Bloc Type X: www.americangypsum.com/#sle.
   b. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
   c. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: www.buildgp.com/#sle.
   d. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.
   e. USG Corporation; Sheetrock Brand Mold Tough Firecode SCX Panels 5/8 in. (15.9 mm): www.usg.com/#sle.
   f. Substitutions: See Section 016000 - Product Requirements.

2.04 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness 2 inches (50.8 mm).

B. Finishing Accessories:
1. Types: As detailed or required for finished appearance.
2. Materials: 6063-T5 extruded aluminum alloy and G40 (Z120) galvanized steel sheet in accordance with ASTM A653/A653M.
3. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.
4. Products:
   a. Stockton Products; Extruded Aluminum: www.stocktonproducts.com/#sle.
   b. Trim-tex, Inc; ____: www.trim-tex.com/#sle.
   c. Substitutions: See Section 016000 - Product Requirements.

C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Fiberglass Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
2. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
3. Joint Compound: Drying type, vinyl-based, ready-mixed.
4. Joint Compound: Setting type, field-mixed.

D. Finishing Compound: Surface coat and primer, takes the place of skim coating.

E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
1. Level ceiling system to a tolerance of 1/1200.
2. Laterally brace entire suspension system.

C. Studs: Space studs at 16 inches on center (at 406 mm on center).
1. Extend partition framing to structure where indicated and to ceiling in other locations.
2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

D. Blocking: Install wood blocking for support of:
1. Wall-mounted cabinets and shelves.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

D. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of nonrated double-layer assemblies, which may be installed by means of adhesive lamination.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated on drawings.
   1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   3. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.
   4. Level 0: Temporary partitions.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

3.08 Cleaning

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

3.09 Protection

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION 092116

SECTION 095100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two samples ____ by ____ inch (____ by ____ mm) in size illustrating material and finish of acoustical units.

E. Samples: Submit two samples each, ____ inches (____ mm) long, of suspension system main runner, cross runner, and perimeter molding.

F. Evaluation Service Reports: Show compliance with specified requirements.

G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

H. Manufacturer's qualification statement.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.05 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels (ACT-1):
1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
2. Certainteed Architectural; Basis-of-Design: Vinylshield A 1102-CRF-1: www.certainteed.com/ceilings-and-walls/#sle.
3. Rockfon: www.rockfon.com/#sle.
4. USG Corporation: www.usg.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

B. Suspension Systems:
1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
2. Certainteed Architectural: www.certainteed.com/ceilings-and-walls/#sle.
3. Rockfon: www.rockfon.com/#sle.
4. USG Corporation: www.usg.com/#sle.
5. Substitutions: See Section 016000 - Product Requirements.

2.02 Performance Requirements

A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:
1. Local authorities having jurisdiction.

2.03 ACOUSTICAL UNITS

A. Acoustical Panels, Type ACT-1: Mineral fiber with membrane-faced overlay, with the following characteristics:
1. Classification: ASTM E1264 Type A.
a. Form: A2.2, wet formed.
b. Pattern: G - smooth.
2. Size: 24 by 24 inches (610 by 610 mm).
3. Thickness: 5/8 inch (16 mm).
4. Light Reflectance: 0.78 percent, in accordance with ASTM E1264.
5. Ceiling Attenuation Class (CAC): 39, in accordance with ASTM E1264.
6. Panel Edge: Square.
7. Tile Edge: Square.
8. Color: White.
9. Suspension System: Exposed grid.
10. Products:
a. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
b. Certainteed Architectural; Vinylshield A 1102-CRF-1: www.certainteed.com/ceilings-and-walls/#sle.
1) Basis-of-Design.
c. USG Corporation: www.usg.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

2.04 Suspension Systems

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold-down clips, stabilizer bars, clips, and splices as required.

B. Exposed Suspension System: Hot-dip galvanized steel grid with steel cap.
1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
2. Profile: Tee; 15/16 inch (24 mm) face width.
3. Finish: Baked enamel.
4. Color: White.
5. Products:
a. Armstrong World Industries, Inc; Prelude XL: www.armstrongceilings.com/#sle.
b. Certainteed Architectural; 15/16" EZ Stab Classic System: www.certainteed.com/ceilings-and-walls/#sle.
c. USG Corporation; Donn Brand ZXLA 15/16 inch Acoustical Suspension System: www.usg.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

2.05 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch (2 mm) galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Perimeter Moldings: Same metal and finish as grid.
1. Size: As required for installation conditions and specified Seismic Design Category.
2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.

E. Gypsum Board: Fire rated type; 5/8 inch (16 mm) thick, ends and edges square, paper faced.

F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 Preparation

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
1. Use longest practical lengths.
2. Overlap and rivet corners.

D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch (19 mm) clearance between grid ends and wall.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units with pattern parallel to longest room axis.

D. Fit border trim neatly against abutting surfaces.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
1. Make field cut edges of same profile as factory edges.

G. Where round obstructions occur, provide preformed closures to match perimeter molding.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

END OF SECTION 095100

SECTION 096623
RESINOUS MATRIX TERRAZZO FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precast epoxy terrazzo wall base.

1.02 RELATED REQUIREMENTS

A. Section 096700 - Fluid-Applied Flooring: Epoxy matrix flooring that is not ground.

1.03 REFERENCE STANDARDS

A. NTMA (EPOXY) - Epoxy Terrazzo Specifications; Current Edition.

B. NTMA (GRAD) - Aggregate Gradation Standards; Current Edition.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Manufacturer's Qualification Statement.

C. Installer's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with NTMA recommendations as posted at their web site at www.ntma.com.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section.
   1. Minimum five years of documented experience.

C. Installer Qualifications: Company specializing in performing the type of work specified in this section.
   1. Minimum five years of documented experience.

1.06 MOCK-UP

1.07 FIELD CONDITIONS

A. Do not install terrazzo when temperature is below 50 degrees F (10 degrees C) or above 90 degrees F (32 degrees C).

B. Maintain temperature within specified range 24 hours before, during, and 72 hours after installation of flooring.

C. Provide ambient lighting level of 50 ft candles (540 lx), measured at floor surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design - Resinous Matrix Terrazzo Flooring: Key Resin; Key Epoxy Terrazzo System: www.keyresin.com/#sle.

2.02 EPOXY MATRIX TERRAZZO APPLICATIONS

A. Wall Base: Precast epoxy terrazzo.(CB1)
1. Thickness: Same as floors.
2. Thickness: 3/8 inch (9 mm), minimum.
3. Style: Coved.
4. Color(s): As indicated on drawings.
5. Aggregate Type and Size: Same as floors.

2.03 MATERIALS

A. Epoxy Matrix Terrazzo: Aggregate and matrix mix applied to substrate, troweled flat, and ground smooth.
1. Mix Proportions: As required to achieve appearance specified.

B. Matrix: Two component resin and epoxy hardener with mineral filler and color pigment, non-volatile, thermo-setting.

C. Aggregate: Type as indicated; sized in accordance with NTMA aggregate gradation standards; color(s) as indicated, uniform in color.

D. Finishing Grout: Epoxy, color to match terrazzo matrix.

E. Precast Epoxy Terrazzo Units: Fabricate to sizes and profiles indicated on drawings.

2.04 ACCESSORIES

A. Divider Strips: 1/8 inch (3 mm) thick zinc exposed top strip, zinc coated steel concealed bottom strip, with anchoring features.

B. Base Cap, Base Divider Strip, and Separator Strip: Match divider strips.

C. Anchors and Reinforcement for Precast Units: As recommended by manufacturer for type of installation.

D. Primer: _____.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive terrazzo base.

3.02 PREPARATION

A. Clean substrate of foreign matter.

B. Apply primer in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install divider strips according to pattern approved on shop drawings.

B. Install base and border divider and control joint strips to match floor pattern.

C. Install terminating cap strip at top of base; attach securely to wall substrate.

D. Anchor precast units as indicated on drawings.

E. Install precast units using specified setting material.

3.04 FINISHING

A. Finish terrazzo to NTMA requirements.

B. Apply grout to fill voids exposed from grinding.

C. Remove grout coat by grinding, using a fine grit abrasive.

3.05 TOLERANCES

A. Maximum Variation from Level (Except Surfaces Sloping to Drain): 1/8 inch (3 mm).

3.06 CLEANING

A. Scrub and clean terrazzo surfaces with neutral pH cleaner in accordance with manufacturer's instructions. Let dry.

B. Polish surfaces in accordance with manufacturer's instructions.

3.07 PROTECTION

A. Protect finished terrazzo base from damage due to subsequent construction until Date of Substantial Completion.

END OF SECTION 096623

SECTION 096700
FLUID-APPLIED FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid-applied flooring and base.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between fluid-applied flooring and adjacent construction and fixtures.

1.03 REFERENCE STANDARDS

A. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available; and _____.

C. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

D. Manufacturer's Qualification Statement.

E. Applicator's Qualification Statement.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.05 QUALITY ASSURANCE

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

B. Applicator Qualifications: Company specializing in performing the work of this section.

C. Supervisor Qualifications: Trained by product manufacturer , under direct full time supervision of manufacturer's plant trained foreman.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.07 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F (13 degrees C).

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fluid-Applied Flooring:
1. Crossfield Products Corp: www.crossfieldproducts.com/#sle.
2. Patcraft: www.patcraft.com.
a. **(EPF-1)** Basis-of-Design: Stone Flake.
3. Sherwin-Williams Company: www.flooring.sherwin-williams.com/#sle.
4. Substitutions: See Section 016000 - Product Requirements.

2.02 Fluid-Applied Flooring Systems

A. Fluid-Applied Flooring: Epoxy base coat(s), polyurethane top coat, no aggregate.

B. Fluid-Applied Flooring Type _____: Epoxy base coats, with broadcast aggregate.
1. Aggregate: Quartz granules.
2. Top Coat: Polyurethane.
3. System Thickness: 1/8 inch (3.2 mm), nominal, dry film thickness (DFT).
4. Texture: Smooth.
5. Sheen: Matte.
6. Color: As selected by Architect.
7. Products:
a. Citadel Floor Finishing Systems by Rust-Oleum Corporation; Citadel Decorative Quartz System - Single : www.citadelfloors.com/#sle.
b. Patcraft; www.patcraft.com.
1) **(EFP-1)** Basis-of-Design: Stone Flake.
c. PPG Flooring; 912 LV Epoxy Primer/Sealer with 610 SL Self-Leveling Epoxy and 2550 WB Urethane: www.pittsburghpaintsco.com/#sle and www.ppgpmc.com/home.aspx/#sle.

d. Sherwin-Williams High-Performance Flooring; Resuflor Deco Flake BC: www.sherwin-williams.com/resin-flooring/#sle.

2.03 ACCESSORIES

A. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.

B. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).
1. Test in accordance with Section 090561.
2. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Prepare concrete surfaces according to ICRI 310.2R, _____.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.

E. Apply primer to surfaces required by flooring manufacturer.

3.03 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.

B. Apply each coat to minimum thickness required by manufacturer.

C. Finish to smooth level surface.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

3.05 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until fully cured.

END OF SECTION 096700

SECTION 097200
WALL COVERINGS

PART 1 GENERAL

1.01 Section Includes

A. Wall coverings.

B. Wall graphics.

1.02 Related Requirements

A. Section 099123 - Interior Painting: Substrate preparation.

1.03 Reference Standards

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

1.04 Submittals

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets for wall covering and adhesive. Indicate compliance with specified flame spread and smoke developed ratings.

C. Manufacturer's Instructions: Indicate installation special procedures.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

1.05 Quality Assurance

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum 3 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified, with minimum 3 years of documented experience.

1.06 Delivery, Storage, and Handling

A. Inspect roll materials for damage upon arrival.

B. Protect packaged adhesive from temperature cycling and cold temperatures.

C. Do not store roll goods on end.

1.07 Field Conditions

A. Maintain adhesive and wall covering manufacturer's recommended temperature ranges 24 hours before, during, and after installation.

PART 2 PRODUCTS

2.01 Wall Coverings

A. Performance Requirements:
1. Surface Burning Characteristics: Flame spread index of 25, maximum, and smoke developed index of 50, maximum, when tested in accordance with ASTM E84.

2.02 Accessories

A. Adhesive: Type recommended by wall covering manufacturer.

B. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

PART 3 EXECUTION

3.01 Examination

A. Verify substrate surfaces are primed and meet manufacturer's requirements to receive work.

B. Measure moisture content of substrates with electronic moisture meter. Do not apply wall coverings if moisture content of substrate exceeds level recommended by wall covering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet (3 mm in 3 m) or at rate greater than 1/16 inch/ft (5 mm/m).

D. Notify Architect of detrimental conditions affecting wall covering installation.

E. Correct detrimental conditions before starting installation.

3.02 Preparation

A. Remove wall plates and accessories impeding wall covering installation.

B. Substrate Priming and Preparation: See Section 099123 - Interior Painting.

C. Wash impervious surfaces with tetra-sodium phosphate; rinse and neutralize; wipe dry.

D. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings before preparing surfaces or finishing.

E. Correct surface defects affecting work of this section and clean surfaces. Remove existing coatings exhibiting loose surface defects.

F. Vacuum surfaces to remove loose particles.

3.03 Installation

A. Apply adhesive and wall covering in accordance with manufacturer's instructions.

B. Apply adhesive to wall immediately before applying wall covering.

C. Use wall covering in roll number sequence.

D. Razor trim edges of wall covering. Do not razor trim on gypsum board surfaces.

E. Smoothly apply wall covering without wrinkles, gaps, or overlaps. Eliminate air pockets and ensure full bond to substrate surface.

F. Horizontal seams are not permitted.

G. Do not seam within 2 inches (51 mm) of internal corners or within 6 inches (152 mm) of external corners.

H. Cover spaces above and below windows and above doors in pattern sequence from roll.

I. Where wall covering tucks into reveals, metal wallboard, or plaster stops, use contact adhesive within 6 inches (152 mm) of wall covering termination. Ensure complete contact bond.

J. Remove excess adhesive from seams while wet and before proceeding to next wall covering sheet.

K. Reinstall wall plates and accessories removed to accommodate work of this section.

3.04 Cleaning

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean wall coverings of dust, dirt, excess adhesive, and other contaminants.

3.05 Protection

A. Protect installed products from damage until date of Substantial Completion.

END OF SECTION 097200

SECTION 099123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
5. Floors, unless specifically indicated.
6. Glass.
7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

E. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system products to be used in project; include description of each system.
   4. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Manufacturer's Instructions: Indicate special surface preparation procedures.

D. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

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 Paint and Finish Materials: 1 gal (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
1. Benjamin Moore: https://www.benjaminmoore.com.
2. Pittsburgh Paints: www.pittsburghpaints.com/#sle.
3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 016000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
3. Supply each paint material in quantity required to complete entire project's work from a single production run.
4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Flammability: Comply with applicable code for surface burning characteristics.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

D. Colors: To be selected from manufacturer's full range of available colors.
1. Selection to be made by Architect after award of contract.

2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
3. Extend colors to surface edges; colors may change at any edge as directed by Architect.
4. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.
5. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, shop primed steel, and galvanized steel.
   1. Two top coats and one coat primer.
   2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 139 X-Green, 140, 141, or 142.
      a. Products:
         1) Pittsburgh Paints Pure Performance Interior Latex, 9-110XI Series, Flat. (MPI #142)
         2) Pittsburgh Paints Pure Performance Interior Latex, 9-310XI Series, Eggshell. (MPI #138)
         3) Pittsburgh Paints Pure Performance Interior Latex, 9-510XI Series, Semi-Gloss. (MPI #141)
         4) Sherwin-Williams ProMar 200 HP Series, Low Gloss Eg-Shel. (MPI #138)
         5) Sherwin-Williams ProMar 200 HP Series, Eg-Shel. (MPI #139)
         6) Substitutions: See Section 016000 - Product Requirements

B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
   1. Two top coats and one coat primer.
   2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, 141, or 142.
      a. Products:
         1) Pittsburgh Paints Pure Performance Interior Latex, 9-510XI Series, Semi-Gloss. (MPI #141)

C. Paint I-TR-C - Transparent Finish on Concrete Floors.
   1. 1 coat stain.
   2. Sealer: Water Based Sealer for Concrete Floors; MPI #99.
      a. Products:
         1) Pittsburgh Paints Perma-Crete Plex-Seal WB Interior/Exterior Clear Sealer, 4-6200XI, Satin. (MPI #99)
         2) Sherwin-Williams H&C Clarishield Water-Based Wet-Look Concrete Sealer. (MPI #99)
         3) Substitutions: See Section 016000 - Product Requirements
   3. Sealer Sheen:
      a. Eggshell: MPI gloss level 3; use this sheen at all locations.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.
      a. Products:
         1) Pittsburgh Paints Speedhide zero VOC Interior Latex Sealer, 6-4900XI. (MPI #149)
         2) Substitutions: See Section 016000 - Product Requirements
   2. Interior Drywall Primer Sealer.
      a. Products:
         1) Pittsburgh Paints Speedhide Zero Interior Latex Sealer, 6-4900XI.
         2) Substitutions: See Section 016000 - Product Requirements

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
   3. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

H. Galvanized Surfaces:

I. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

J. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Sand wood and metal surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 099123

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 Section Includes

A. Fire extinguishers.

B. Fire extinguisher cabinets.

1.02 Related Requirements

A. Section 061000 - Rough Carpentry: Wood blocking.

B. Section 099123 - Interior Painting.

1.03 Reference Standards

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2026.

B. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 Submittals

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide extinguisher operational features and extinguisher ratings and classifications.

C. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, rough-in measurements for recessed cabinets, and accessories required for complete installation.

D. Certificate: Certify products of this section meet or exceed specified requirements.

E. Manufacturer's Instructions: Indicate special criteria and wall opening coordination requirements.

F. Maintenance contract.

G. Operation and Maintenance Data: Include test, refill, or recharge schedules and recertification requirements.

1.05 Field Conditions

A. Do not install extinguishers when ambient temperature causes freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 Manufacturers

A. Fire Extinguishers:

B. Fire Extinguisher Cabinets and Accessories (FEC12):
1. Activar Construction Products Group, Inc. - JL Industries; Ambassador Series: www.activarcpg.com/#sle.
2. Kidde: www.kidde.com/#sle.
3. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
4. Potter-Roemer: www.potterroemer.com/#sle.
5. The Williams Brothers Corporation of America: www.wbdoors.com/#sle.
6. Substitutions: See Section 016000 - Product Requirements.

2.02 Fire Extinguishers

A. General Requirements: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
1. Provide extinguishers labeled by UL (DIR) or testing firm acceptable to authorities having jurisdiction for purpose specified and as indicated on drawings.

B. Wet-Chemical-Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
1. Class: K.
2. Size: 1.6 gal (6 L).
3. Finish: Polished stainless steel.
4. Temperature Range: Minus 20 to 120 degrees F (Minus 29 to 49 degrees C).

2.03 Fire Extinguisher Cabinets

A. Cabinet Construction: Non-fire rated.
1. Formed primed steel sheet; 20-gauge, 0.036-inch (0.9 mm) thick base metal.

B. Cabinet Configuration: Semi-recessed type.
1. Size to accommodate accessories.
2. Trim: Flat rolled edge, with 2-inch (51 mm) wide face.
3. Provide cabinet enclosure with right-angle inside corners and seams and with formed perimeter trim and door stiles.

C. Door: 20-gauge, 0.036-inch (0.9 mm) metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180-degree opening with two butt hinges.

D. Door Glazing: Tempered glass, clear, 1/8 inch (3 mm) thick, and set in resilient channel glazing gasket.

E. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.

F. Fabrication: Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: Primed for field paint finish.
   1. See Section 099123 for field painting.

H. Finish of Cabinet Interior: White colored enamel.

2.04 Accessories

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Cabinet Signage: .

C. Lettering: FIRE EXTINGUISHER text on decal or self-adhesive vinyl, prespaced black lettering in accordance with authorities having jurisdiction.

PART 3 EXECUTION

3.01 Examination

A. Verify dimensions, tolerances, and interfaces with other work.

B. Verify substrate and site conditions for product installation are in accordance with manufacturer's written instructions.

C. Verify rough openings for cabinet are sized and located in accordance with manufacturer's written instructions.

D. Notify Architect in writing of conditions detrimental to completion of work. Do not proceed with installation until detrimental conditions are corrected.

3.02 Installation

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 42 inches (1067 mm) from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.
   1. See Section 061000 for in-wall blocking requirements.

D. Place extinguishers and accessories in cabinets.

E. Position cabinet signage at top of cabinet.

3.03 Maintenance

A. Provide separate maintenance contract for specified maintenance service.

B. Provide separate maintenance contract for service and maintenance of fire extinguishers and fire extinguisher cabinets for 2 years from date of Substantial Completion.

END OF SECTION 104400

SECTION 113013
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

1.02 RELATED REQUIREMENTS

A. Section 260583 - Wiring Connections: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

A. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

C. Gas Appliances: Bearing design certification seal of American Gas Association (AGA).

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

C. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES (Owner Furnished / Owner Installed)

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Refrigerator, Type REF1: Free-standing, two section reach-in, side-by-side, and frost-free.
1. Capacity: Total minimum storage of 46.02 cubic ft (____ cu m).
2. Energy Usage: Minimum 20 percent more energy efficient than energy efficiency standards set by U.S. Department of Energy (DOE).
3. Features: Include adjustable, factory-installed coated wire shelves.
4. Exterior Finish: Stainless steel.
5. Manufacturers:
a. Traulsen: www.traulsen.com.
1) Basis-of-Design: Model #G20010-032.
b. Substitutions: See Section 016000 - Product Requirements.

C. Freezer, Type FZ1: Free-standing , two section, reach-in, side-by-side , and frost-free.
1. Capacity: Total minimum storage of 46.02 cubic ft (____ cu m) .
2. Features: adjustable, factory-installed coated wire shelves .
3. Exterior Finish: Stainless steel .
4. Manufacturers:
a. Traulsen: www.traulsen.com.
1) Basis-of-Design: Model #G22010-032.
5. Substitutions: See Section 016000 - Product Requirements .

D. Ice Maker, Type ICE1: ADA Compliant Height: Self-Contained Cublet Ice Machine with Built-In Storage Bin.
1. Ice production per 24 hours: 92 pounds.
2. Storage Capacity: 27 pounds.
3. Features: Power switch accessible without panel removal, easily disassembled water circuit for easy cleaning, front in and out airflow and equipped with 6 foot cord with NEMA 5-15 Plug.
4.
5. Exterior Finish: Stainless Steel.
6. Manufacturers:
a. Hoshizaki: www.hoshizakiamerica.com.
1) Basis-of-Design: Model #C-80BAK-AD
b. Substitutions: See Section 016000 - Product Requirements .

E. ADA Compliant Gas Range, Type RE1: Natural gas, free-standing, with standard burners and removable drip pans.
1. Size: 30 inches (762 mm) wide.
2. Oven: Self-cleaning with electronic ignition.
3. Elements: Four (4).
4. Controls: Solid state electronic.

5. Features: Include automatic meat thermometer, storage drawer, oven door window, broiler pan and grid, oven light, and ____.
6. Exterior Finish: Porcelain enameled steel, color as indicated.
7. Manufacturers:
   a. Frigidaire Home Products; ____: www.frigidaire.com/#sle.
   b. Substitutions: See Section 016000 - Product Requirements.

F. Gas Range, Type RE2: Natural gas , free-standing with standard burners and removable drip pans .
1. Size: 30 inches (762 mm) .
2. Oven: Self-cleaning with electronic ignition .
3. Elements: Four (4) .
4. Features:
5. Exterior Finish:
6. Manufacturers:
   a. Frigidaire Home Products: www.frigidaire.com.
      1) Basis-of-Design: Model #FCFG3062AS.
   b. Substitutions: See Section 016000 - Product Requirements .

G. Cooking Exhaust, Type ____: Range hood.
1. Size: 42 inches (1067 mm) wide.
2. Fan: Two-speed, 500 cfm (236 L/s)
3. Exhaust: Rectangular, vented to exterior.
4. Features: Include cooktop light, night light, backdraft damper, removable grease filter, retractable visor, and ____.
5. Exterior Finish: Painted steel, color as indicated.

H. Dishwasher, Type DW1: Undercounter.
1. Controls: Solid state electronic.
2. Wash Levels: Three (3).
3. Cycles: Four (4), including normal, rinse and hold, short, china/crystal, and pot and pan.
4. Features: Include rinse aid dispenser, optional no-heat dry, optional water temperature boost, and adjustable upper rack.
5. Finish: Porcelain enameled steel , color white.
6. Manufacturers:
   a. GE Appliances; ____: www.geappliances.com/#sle.
      1) Basis-of-Design: Model #GDF550PGRWW.
   b. Substitutions: See Section 016000 - Product Requirements.

I. Dishwasher, Type DW2: Undercounter ADA-Compliant Dishwasher.
1. Controls: Solid state electronic.
2. Wash Levels: {CH#67344}
3. Cycles: Four (4) .
4. Features: Includes rinse aid dispenser, optional no-heat dry, and optional water temperature boost.
5. Finish: Stainless Steel.
6. Manufacturers:

a. Samsung: www.samsung.com.
   1) Basis-of-Design: Model #DW60R2014US.
b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor built-in equipment in place.

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION 113013

SECTION 123600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

1.02 RELATED REQUIREMENTS

A. Section 064100 - Architectural Wood Casework

B. Section 093000 - Tiling: Tile for countertops.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 012300 - Alternates.

1.04 REFERENCE STANDARDS

A. ANSI A108.19 - Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2025.

B. ANSI A137.3 - American National Standard Specification for Gauged Porcelain Tile and Gauged Porcelain Tile Panels/Slabs; 2022 .

C. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).

D. PS 1 - Structural Plywood; 2023.

E. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2026.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

G. Installer's qualification statement.

H. Installation Instructions: Manufacturer's installation instructions and recommendations.

I. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Porcelain Slab Countertops **(Alternate No. 5)**: Gauged porcelain slabs bonded to substrate after installation of substrate on cabinet.
   1. Gauged Porcelain Slab, Type Veined: ANSI A137.3 standard grade.
      a. Manufacturers:
         1) Caesarstone: www.caesarstoneus.com.
            a) **(PSS-1)**: Basis-of-Design: Supernatural Collection, 530 Circa.
         2) Crossville Inc; _____: www.crossvilleinc.com/#sle.
         3) Dal-Tile Corporation: www.daltile.com/#sle.

4) Florim USA; _____: www.milestonetiles.com/#sle.
5) Optimum Surfaces: www.optimumsurfaces.com/#sle.
6) Terrazzo & Marble Supply Companies; Antolini Tech Porcelain: www.tmsupply.com/#sle.
7) Substitutions: See Section 016000 - Product Requirements.

b. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
c. Size: 124.5 inch (3162 mm) by 61.5 inch (1562 mm), nominal.
d. Thickness: 0.787 inch (20 mm).
e. Surface Finish: Honed.
f. Color(s): As indicatedin the Arch-Material Finishes (Interior) schedule on the Drawings.
g. Pattern: As indicated by manufacturer's designations.

2. Large and Heavy Tile (LHT) Mortar: Materials and installation as specified in Section 093000.
3. Substrate: 3/4 inch (19 mm) thick plywood.
4. Bonding Agents for Miters and Repairs: Epoxy.
5. Exposed Edge Treatment: Built up to minimum 1-1/4 inch (32 mm) thick; square edge.
6. Back and End Splashes: Same sheet material, square top; minimum 4 inches (102 mm) high.
7. Fabricate in accordance with manufacturer's standard requirements.

2.02 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Joint Sealant: Mildew-resistant silicone sealant, white.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
1. Join lengths of tops using best method recommended by manufacturer.
2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches (102 mm), unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Install porcelain slab countertops and grout in accordance with applicable requirements of ANSI A108.19, manufacturer's instructions, and TCNA (HB) recommendations.

C. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.

B. Offset From Wall, Countertops: 1/8 inch (3 mm) maximum; 1/16 inch (1.5 mm) minimum.

C. Field Joints: 1/8 inch (3 mm) wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 123600

SECTION 220100 - BASIC PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. General.
2. Scope of Work.
3. Bidding Procedures.
4. Substitution requests.
5. Submittals.
6. As-Built Drawings.
7. Operating and maintenance manuals.
8. Quality Assurance.
9. Delivery, Storage, and Handling.
10. Coordination.
11. Demolition.
12. Cutting, Patching, Excavating, Trenching and Backfilling
13. Access panels.
14. Fixtures – Common Requirements.
15. Piping Systems – Common Requirements.
16. Equipment Installation – Common Requirements.
17. Kitchen Equipment Connections.
18. General electrical work.
19. Controls.
20. Placing in Service.

1.3 GENERAL

A. Information specified in this section shall apply to all Division 22 specification sections.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to Division 22.

C. Contractor shall provide coordination drawings for Division 01.

D. Plumbing work shall be performed as outlined in “Information for Bidders”.

E. These specifications and the accompanying plumbing drawings are intended to provide for all labor, materials and equipment necessary for the installation of complete:

1. Plumbing Fixtures.
2. Equipment.
3. Rough-Ins.
4. Waste and Vent Systems.
5. Domestic Cold Water System.
6. Domestic Hot Water System.
7. Fuel Gas System.
8. Accessories including necessary apparatus, valves, and fittings hereinafter described or called for on the Contract Documents.

F. All Division 22 work shall be installed in accordance with the following Codes and all Local Ordinances. Materials, equipment and workmanship shall be as specified throughout Division 22 specification sections.

1. North Carolina State Plumbing Code.
2. North Carolina State Fuel Gas Code.
3. ICC A117.1 Accessible and Usable Buildings and Facilities.
4. NSF Standard 61.
5. NSF Standard 372.

G. Contractor shall secure all required permits and inspection fees necessary for this work. Permits may be secured from the Building Inspections Department.

H. The Plumbing Contractor shall provide the Owner with a one-year warranty for all plumbing labor, equipment, fixtures, and all other work specified in the Division 22 specifications and plumbing Contract Drawings, including the work of the Plumbing Contractor's subcontractors. Warranty period shall begin upon final acceptance by the Owner of the Plumbing Contractor's work.

1.4 SCOPE OF WORK

A. The Contractor shall be required to perform all the following work, in general and provide a complete plumbing system as shown on the plans. The items in general are to be as follows:

1. Furnish and install complete waste and vent system with connections to services as shown on the plumbing drawings and here-in specified.
2. Furnish and install cold water system complete with connections to point as shown on the plumbing drawings and here-in specified.
3. Furnish and install hot water system complete with connections to equipment as shown on the plumbing drawings and here-in specified.
4. Furnish and install fuel gas piping system with connections to equipment as noted and/or as shown on the plumbing drawings and here-in specified.
5. Provide connections to equipment furnished and installed by other trades or Owner as shown on the plumbing drawings and here-in specified.

1.5 BIDDING PROCEDURE

A. The Contractor shall provide bidding for Alternate Bids in accordance with Division 01. Contractor shall refer to Division 01 for any required unit prices and allowances.

1.6 SUBSTITUTION REQUESTS

A. The Plumbing Contractor shall obtain written approval from the Engineer/Architect for the use of substitute materials claimed as equal to those specified. Substitution requests must be sent as soon after contract awards as possible and before any materials are ordered. Substitution requests are subject to deadlines posed by the Architect and/or Owner, as well as the requirements of Division 01.

B. Applications approval of substitutions shall be made by the Plumbing Contractor and not by subcontractors or manufacturer representative.

C. Substitution requests shall be manufacturer's original published material.

D. Once the allowable period for substitution requests has ended, no further substitutions will be permitted except in unusual or extenuating circumstances.

E. **Private labeled materials are not acceptable.**

1.7 SUBMITTALS

A. Submittals shall be sent to the Architect after the contract has been awarded and before any materials, fixtures, and equipment to be incorporated in the work has been ordered.

B. Submit shop drawings and/or catalog data for the material and equipment as indicated in individual Division 22 Sections.

C. Submittals shall include the name and address of the manufacturer and their catalog numbers and trade names clearly marked.

D. Submittal data shall be manufacturer's original published material.

E. All items shall be referenced to the plans and specifications by **fixture designation or specification paragraph number.**

F. If data submitted deviates from the contract documents, the Plumbing Contractor shall point out such deviations in writing and also state reasons for same.

G. **FAXED COPIES WILL NOT BE ACCEPTABLE.**

H. Review of materials will be based upon the manufacturer's published information.

I. Contractor should note that all items shall be submitted by specification section.

J. Once submittals are reviewed and no exceptions are taken, no changes in materials will be permitted except in unusual or extenuating circumstances.

K. The Plumbing Contractor shall review and stamp the submittals as being in accordance with his/her bid and the Contract Documents.

L. Shop drawings and/or submittal review comments shall not relieve the Plumbing Contractor of the responsibility to comply with the requirements and intent of the plans and specifications with regard to dimensions, capacities, quality, quantity, performance characteristics, etc.

M. If the Contractor fails to submit any of the required materials, equipment, fixtures, etc., it shall be assumed that such items shall be installed as specified.

N. **MANUFACTURERS MODEL NUMBERS ARE PROVIDED FOR GENERAL INFORMATION ONLY.** Description of product shall take precedence over model numbers.

1.8 AS-BUILT DRAWINGS

A. The Plumbing Contractor, shall maintain a set of the Engineer of Record's drawings marked up to show the work as installed, including dimensions to and elevations of buried work (hereafter referred to as "as-built drawings"). Contractor shall initial and date all changes to the contract drawings. The Architectural Observer may check this set of documents monthly for compliance. Upon completion of the work, return this set of drawings to the Architect. Coordination drawings shall not be used for or as as-built drawings.

1.9 OPERATING AND MAINTENANCE MANUAL

A. Operating and Maintenance Manuals shall be delivered in a format per Division 01. The manuals **shall** contain the following items as a minimum:

1. Index and page numbers.
2. Plumbing Contractor's signed one-year warranty .
3. Plumbing Contractor's contact information.
4. List of subcontractors and suppliers with names, addresses, and phone numbers.
5. Third-party water quality test report.
6. Owner training sign-in sheet(s) with training subject, date, time, and participants listed.
7. Backflow preventer certificate of operation. This shall include all backflow preventers located within the building, including, but not limited to, double check backflow preventers at water heaters, backflow preventers at ice makers, and backflow preventers at HVAC make up water connections.
8. Submittal data, installation and operation manuals, and manufacturer's warranty info for the following (as applicable):

    a. **EVERY** item listed in the "Plumbing Fixture Schedule" on the Contract Drawings
    b. Gas regulators
    c. Each piece of equipment specified under Division 22

9. All startup reports for equipment, as specified by Division 22. This shall include, but not be limited to, water heaters, pumps, and other equipment as applicable.

B. ***FAXED COPIES WILL NOT BE ACCEPTABLE***.

1.10 QUALITY ASSURANCE

A. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

B. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

C. Materials shall be delivered, stored, and handled in accordance with manufacturers recommendations to protect finishes and prevent damages. Materials shall be elevated off the ground, with adequate ventilation, and protected from UV when necessary. Storage environment shall be free of standing water.

D. Contractor shall inspect shipments for completeness and damages. Use appropriate methods and equipment for loading, transport, and unloading to prevent impacts, scrapes, and other forms of damage.

1.12 COORDINATION

A. Plumbing Contractor shall be responsible to coordinate all work with the work of all other trades.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces.

PART 2 - EXECUTION

2.1 DEMOLITION

A. General Requirements: The work includes the demolition or removal of all construction indicated, specified or necessary to accomplish the work under this contract. The drawings define the scope of work but it is not intended that all items of demolition work be specifically indicated. After carefully reviewing the drawings and specifications to determine intent, the Contractor shall visit the site and determine the extent of demolition work required to properly complete the work under his contract.

B. Protection of Materials and Work: Before beginning any cutting or demolition work, the Contractor shall carefully survey the existing work and examine the drawings and specifications to determine the extent of work required. The Contractor shall take all necessary precautions to insure against damage to existing work to remain in place, to be reused, or to remain the property of the Owner and any damage to such work shall be repaired or replaced at no additional cost to the Owner.

2.2 CUTTING, PATCHING, EXCAVATION, TRENCHING, AND BACKFILLING

A. All cutting and patching shall be in accordance with Division 01.

B. Do all excavation in connection with the work in this contract. All such excavation shall be done in a manner as not to endanger the stability of the structure or any part thereof, or any work in place by other contractors. All backfilling shall be done in uniform layers of 6" of earth and shall be thoroughly tamped. Location of all trenching shall be approved by the Architect before excavating and no work shall be done until work has been tested, inspected, and approved by the Architect.

C. Trenches for waste and drainage piping shall have a smooth bottom with material removed to receive the pipe bell and shall support the pipe barrel the full length.

D. All surplus earth shall be removed by this contractor from the building and disposed of at his own expense, where directed by the Architect. Provide all necessary shoring for protection of trenches.

E. It is assumed that all materials to be excavated is earth and shall include all materials not classified as rock excavation and shall include sand, clay silt, muck, gravel, shale, hardpan, loose stone in masses, and boulders measuring less than 1/2 cubic yard in volume.

F. The Contractor shall include in his bid for excavation 10 cubic yards of rock, computed at the unit price quoted by him/her.

G. If more or less than 10 C.Y. of rock excavation is encountered in the work, the contractor will be compensated for or the owner will be refunded the actual difference based on the unit price quoted. If no rock is encountered, the owner will be refunded the full 10 C.Y. at the unit price quoted.

H. The Architect/Engineer or his/her representative on the job will determine the actual amount of rock by measurement, upon notice from the Contractor that rock, as defined, has been encountered.

2.3 ACCESS PANELS

A. The Plumbing Contractor shall provide access doors in accordance with Division 08. Access doors shall be provided for all valves and shock arrestors located behind hard ceilings and in walls to provide access. Ceiling access doors shall be steel and a minimum of 24" x 24" with concealed hinges, flush door and flange. Coordinate finish with architect.

2.4 FIXTURES - COMMON REQUIREMENTS

A. The Contract Drawings are schematic only unless specifically dimensioned. Follow drawings as closely as possible. Plumbing drawings should not be scaled. Secure dimensions and exact locations of plumbing fixtures from Architectural drawings. Refer to drawings of other trades and coordinate with other contractors. All items of equipment shall be installed in accordance with the manufacturer's published installation instructions and diagrams

B. All fixtures and equipment shall be installed in accordance with manufacturer's written installation instructions.

C. Refer to fixture and equipment specifications in other Sections of these Specifications for roughing-in requirements.

D. All exposed piping and metal parts shall be chrome plated.

E. Slip joints will not be permitted except on fixture side of trap.

F. Where rigid supplies are specified for fixtures and it is intended that they be installed true and plumb from fixture to wall rough in. Connections for water closets shall be made by use of metal reinforced flanges compatible to waste piping materials and verminproofed wax gaskets.

G. Connections for water closets shall be made by use of metal reinforced flanges compatible to waste piping materials and verminproofed wax gaskets.

H. All wall-hung fixtures shall be sealed between wall and fixture with clear "G.E. Silicone Seal" caulking.

I. All counter mounted fixture rims shall be sealed with clear "G.E. Silicone Seal" caulking.

J. The Contractor shall be responsible for all plumbing fixtures at time of final inspection. Any broken fixtures will be replaced by the Contractor at no cost to the owner regardless of by whom the fixture was broken.

2.5 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Install piping according to the following requirements and Division 22 Sections.

C. The Contract Drawings are schematic only and are not intended to show all fittings, bolts, connections, offsets, etc., unless specifically dimensioned. Follow drawings as closely as possible, provide all adjustments as necessary to conform to the structural conditions, machinery, equipment, work of other contractors and the intent of the drawings, without additional cost to the Owner. Plumbing drawings should not be scaled. Secure dimensions and exact locations of plumbing fixtures and other items from Architectural drawings. Refer to drawings of other trades and coordinate with other contractors. All items of equipment shall be installed in accordance with the manufacturer's published installation instructions and diagrams.

D. Furnish and install all necessary sleeves, inserts, bolts, etc., for concrete floor slabs, roof, walls, and partitions. Failure to install such items in time to avoid delaying the project schedule shall result in the Plumbing Contractor doing all cutting and repairing at his/her own expense.

E. Verify final equipment locations for roughing-in.

F. All equipment shall be installed in accordance with manufacturer's written installation instructions.

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

H. Indirect waste piping that is to drain via air gap shall have an air gap of two times the inside pipe diameter of the indirect waste pipe.

I. The Plumbing Contractor shall be responsible for all work damaged by him/her. Any plumbing work damaged by any other contractor shall be replaced by the Plumbing Contractor and placed in perfect working condition without extra cost to the Owner. All fixtures and fittings shall be adequately protected before, during and after installation.

J. The Contractor shall notify the Engineer a minimum of forty-eight (48) hours in advance of all tests. The Contractor shall make all necessary preliminary tests to insure a tight system. Any joint found to leak under test shall be broken, cleaned and remade.

K. Make connections according to the following, unless otherwise indicated:

1. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
2. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals

2.6 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

2.7 KITCHEN EQUIPMENT CONNECTIONS

A. The Plumbing Contractor should note that the following items of equipment will be furnished and installed by the Food Service Equipment Contractor. The Contractor shall rough-in hot water, cold water and waste and make final connections to the equipment. Rough-in drawings showing locations and elevation of rough-ins will be provided by the Contractor. The Contractor shall provide chrome plated cast brass escutcheons with setscrew on all piping at the wall, floor, or entrance to the base cabinet.

1. Domestic water supplies to equipment shall be installed using type ‘L’ hard copper equipped with ball valve stops. Food Service Equipment Contractor shall furnish in-line water filters to be installed by the Plumbing Contractor.
2. Plumbing Contractor shall pipe drain tailpieces from equipment other than sinks to over floor sinks using type ‘DWV’ copper. Terminate drain piping with air gap above drain.
3. Plumbing Contractor shall provide gas connections per Specification Section 220000 and Contract Drawings.

2.8 GENERAL ELECTRICAL WORK

A. The Electrical Contractor shall furnish all disconnects and motor starters and wire and make all final electrical connections to equipment provided under Division 22. See Electrical Drawings.

1. EXCEPTION: Plumbing Contractor shall provide Aquastat(s) as indicated on Contract Drawings and in “CONTROLS” section of Specification Section 220100 “Basic Plumbing Requirements”. The Plumbing Contractor shall be responsible for Aquastat wiring connections

B. Motors shall comply with Section 220513 “Common Motor Requirements for Plumbing Equipment.”

C. Disconnect switches shall be provided for all Water Heaters.

D. Emergency Cut-off Solenoid Valves: The Electrical Contractor will provide a switched 120 volt power supply in a junction box above the ceiling. The Plumbing Contractor shall connect at this point and wire solenoid valve complete.

E. Motor Starters and Fused Disconnect Switches shall be neatly arranged, and securely fastened to walls with expansion bolts, lead shields, etc. Each starter or switch shall have its usage or letter designation indicated on its cover with engraved plastic laminated labels with 1/2" high contrasting letters. Where connections are made to motors not near walls or columns, a vertical conduit attached to floor and ceiling shall be installed and the wiring carried in and out of this conduit by means of condulets. An 18-inch length of flexible metallic conduit shall be installed in the circuit to each connection to a motor. Liquid tight shall be used in all wet locations. Grounding wire shall run inside of flexible conduit.

2.9 CONTROLS

A. General:

1. The Controls Contractor will provide a DDC-controlled circuit in the Mechanical Room. The Contractor shall connect at this point and provide water heating system controls as here in after specified.
2. Furnish and install an electric control system to fulfill the intent of the drawings and specifications. The system shall include all necessary labor, materials, electrical wiring and devices for a complete installed control system.
3. All electric wiring in connection with the temperature controls and all interlock wiring shall be furnished under this section of the specifications. The wiring shall be installed by licensed electricians employed by Contractor in strict accordance with all local, State, and National Codes. All control and interlock wiring whether line or low voltage shall be run in EMT conduit or as specified under the electrical section of these specifications. Installation of all concealed conduit shall be coordinated with contractor for general construction so it may be installed before slabs are poured or walls are erected.
4. The control diagrams indicated on the drawings and specified herein show the intended sequences of operation of the various control systems and shall be followed as closely as practicable.

B. Temperature Sensing Devices:

1. Strap-on Aquastat shall have an adjustable range and be mounted directly on the building hot water recirculating line. Aquastat shall be set to 135°F.
2. Each water heater shall be equipped with an integral adjustable thermostat.

C. Sequence of Operation:

1. The schedule set by the Building Automation System (BAS) shall power the circulator pump. The circulator pump shall only run during hours set by the BAS.
2. During the hours in which the BAS allows the circulator pump to run, the aquastat shall control the circulator pump, causing it to run when a domestic hot water return temperature of 135F or less is sensed and shall stop the circulator pump from running if a temperature of 140F or higher is sensed.

D. Instructions and Diagrams:

1. The Contractor shall provide to the owner a complete instruction manual covering the function and operation of all control components. The manual shall also contain a

schematic drawing of each control system properly marked and keyed with the equipment list to identify each item of control equipment.

2. The Contractor shall also provide a complete schematic control diagram framed under glass and mounted on the wall in the equipment room.

2.10 PLACING IN SERVICE

A. Upon completion of the entire system installation, the entire system and all equipment shall be tested by actual operation to provide that it will function as intended.

B. The Plumbing Contractor shall place the entire system in a satisfactory operating condition and shall furnish all assistance and instructions required by the Owner's representative during initial operating period. The Contractor shall acquaint the Owner's representative with the special parts required for the operation plumbing fixtures and equipment furnished and installed on the project.

C. It is the Contractor's responsibility to turn over to the owner all fixtures and floor drains in a clean condition.

END OF SECTION 220100

SECTION 220513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 220513

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Grout.
3. Sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. For penetrations in fire and smoke rated partitions, provide UL Detail for fire stop system.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe.

B. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, with plain ends.

C. PVC pipe sleeves are not acceptable.

2.2 FIRE/SMOKE BARRIER PENETRATION SYSTEMS

A. Provide U.L. listed systems by Metacaulk, 3M, or Hilti.

2.3 SEALANTS

A. Watertight sealants as manufactured by Holdrite, Proset, Metacaulk, or 3M.

2.4 GROUT

A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2" inches above finished floor level.
    b. Exception: Extend sleeves on piping passing through foundation walls 6” beyond wall footing on both sides.
    c. Exception: Extend sleeves on piping installed below structural footings as indicated on contract drawings.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

C. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.

D. Pipe sleeves shall be two pipe sizes larger than piping passing through the sleeve.

E. Sleeves for insulated piping shall be large enough to allow the insulation to pass thru sleeve unbroken.

F. Install sleeves concentric and centered on pipes.

G. Ream all sleeves to prevent cutting of piping.

H. Core drill openings for all floor openings may be utilized in lieu of sleeved openings. All openings shall be sized two pipe sizes larger than pipe passing thru the opening. All cored openings shall be fireproofed as required and shall be made water tight.

I. All openings through floors shall be protected by watertight sealant.

J. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: All penetrations in rated floors, firewalls and any other rated separations shall be protected using a through-penetration firestopping method with an “F” rating equivalent to the rating of the membrane being penetrated for particular piping materials used and membrane construction type. Floor penetrations shall additionally have a “T” rating equivalent to the rating of the floor being penetrated. Through–penetration firestop systems shall be installed and tested in accordance with ASTM E814 or UL 1479 with a minimum positive pressure differential 0.01 inch w.g. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping." All openings through horizontal fire separations shall be protected by U.L. listed systems.

3.2 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

   a. Piping Smaller Than NPS 10: Cast-Iron pipe sleeves.

2. Exterior Concrete Walls below Grade:

   a. Piping Smaller Than NPS 10: Cast-iron pipe sleeves.

3. Concrete Slabs above Grade:

   a. Piping Smaller Than NPS 10: Steel pipe sleeves.

4. Interior Partitions:

   a. Piping Smaller Than NPS 10: Steel pipe sleeves.

END OF SECTION 220517

SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated and rough brass finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished, chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

D. Split-Casting, Brass Type: With polished, chrome-plated and rough-brass finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed and exposed-rivet hinge; and spring-clip fasteners.

2.2 FLOOR PLATES

A. Split Floor Plates: Cast brass with concealed hinge.

B. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons snug against room finish.

C. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
b. Chrome-Plated Piping: One-piece cast brass or split-casting brass with polished, chrome-plated finish.
c. Insulated Piping: One-piece stamped steel type or split-plate, stamped steel with concealed hinge with polished, chrome-plated finish.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece cast brass or split-casting brass type with polished, chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece cast brass or split-casting brass type with polished, chrome-plated finish.
f. Bare Piping in Unfinished Service Spaces: One-piece cast brass or split-casting brass type with polished, chrome-plated finish.
g. Bare Piping in Equipment Rooms: One-piece cast brass or split-casting brass type with rough-brass finish.

D. Install floor plates for piping penetrations of equipment-room floors.

E. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor plate.

3.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION 220518

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.
5. Test plugs.
6. Test-plug kits.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. See specification section 220100 – Basic Plumbing Requirements” for required closeout documentation.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Compliance: NSF 61, NSF 372.

B. Weiss Model 3VBM Series, or approved equal by Omega or Tel-Tru Mfg. Co.

C. Standard: ASME B40.200.

D. Case: Type 304 Stainless steel, 3-inch nominal diameter.

E. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F. Thermometers’ range shall be such that the operating temperature shall be in the middle portion of the dial.

F. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

G. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

H. Stem: Stainless steel.

I. Window: Plain glass.

J. Ring: Stainless steel.

K. Element: Bimetal coil.

L. Pointer: Dark-colored metal.

M. Accuracy: Plus or minus 1 percent of scale range.

2.2 THERMOWELLS

A. Compliance: NSF 61, NSF 372.

B. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES or CSA.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

C. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 PRESSURE GAGES

A. Compliance: NSF 61, NSF 372.

B. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Weiss Model 3PG1, or approved equal by Omega or Tel-Tru Mfg. Co.
2. Standard: ASME B40.100.
3. Case: Cast aluminum or drawn steel; 3-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.

7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi. Range shall be such that the operating temperature shall be in the middle portion of the dial.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Metal.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

A. Compliance: NSF 61, NSF 372.

B. Snubbers: ASME B40.100, brass; with NPS 1/4, ASME B1.20.1 pipe threads and piston or porous-metal-type surge-dampening device. Include extension for use on insulated piping.

C. Valves: Brass ball or brass or stainless-steel needle, with NPS 1/4, ASME B1.20.1 pipe threads.

2.5 TEST PLUGS

A. Compliance: NSF 61, NSF 372.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending a minimum of 2 inches into fluid and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install valve and snubber in piping for each pressure gage for fluids.

I. Install test plugs in piping tees.

J. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlet and outlet of each domestic hot-water storage tank.
3. Inlet and outlet of each master mixing valve.
4. Locations indicated on Contract Drawings.

K. Install pressure gages in the following locations:

1. Building water service entrance into building.
2. Suction and discharge of each domestic water pump.
3. Locations indicated on Contract Drawings.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.

B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F.

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Water Piping: 0 to 200 psi.

END OF SECTION 220519

SECTION 220523 – GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bronze ball valves.
2. Iron ball valves.
3. Bronze swing check valves.
4. Iron swing check valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, and soldered ends.
3. Set ball valves open to minimize exposure of functional surfaces.
4. Set check valves in either closed or open position.
5. Set butterfly valves closed or slightly open.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.18 for solder-joint connections.

C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as connected piping unless otherwise indicated.

G. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
2. Handlever: For quarter-turn valves smaller than NPS 4.
3. Butterfly valves: Lock handle with memory stop.

H. Valves in Insulated Piping:

1. Include stem extensions for insulation thicknesses specified.
2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.

2.2 BRONZE BALL VALVES

A. Bronze Ball Valves, Two-Piece with Bronze Trim:

1. Description:

a. CWP Rating: 200 psig.
b. Body Design: One piece.
c. Body Material: Bronze.
d. Ends: Threaded or soldered.

e. Ball: Chrome-plated brass.
f. Port: Full.

2.3 IRON BALL VALVES

A. Iron Ball Valves, Class 200 WOG:

1. Description:

a. CWP Rating: 200 psig.
b. Body Design: Split body.
c. Body Material: ASTM A 126, gray iron.
d. Ends: Flanged .
e. Ball: Stainless steel.
f. Port: Full.

2.4 BRONZE SWING CHECK VALVES

A. Bronze Swing Check Valves, Class 125:

1. Description:

a. CWP Rating: 125 psig.
b. Body Design: Horizontal flow.
c. Ends: Threaded.

2.5 IRON SWING CHECK VALVES

A. Iron Swing Check Valves with Metal Seats, Class 125:

1. Description:

a. CWP Rating: 120 psig.
b. Body Material: Cast iron with bolted bonnet.
c. Ends: Flanged.
d. Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Check Valves: Install check valves for proper direction of flow.

1. Swing Check Valves: In horizontal position with hinge pin level.

F. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Valves shall be provided from same manufacturer.

C. Select valves types with the end connections as specified in as specified in Section 221116 “Domestic Water Piping.”

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal hanger-shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Pipe-positioning systems.
10. Equipment supports.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 220516 "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

B. Pipe Welding Qualifications: Qualify procedures and operators according to 2015 ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated or epoxy powder coated.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel or stainless steel.
6. Vertical Piping: Riser Clamp design and shall be Modern Fig. 500, Grinnell/Anvil Fig. 261, or approved equal by Elite Components.
7. Horizontal Piping: Clevis type and shall be Modern Fig. 590, Grinnell/Anvil Fig. 260 or approved equal by Elite Components.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
4. Vertical Piping: Riser Clamp design, stainless steel, and shall be Anvil Fig. 261SS, Eaton B-Line B3373, or Empire Industries Fig. 50.
5. Horizontal Piping: Clevis type, stainless steel and shall be Anvil Fig. 260SS, Eaton B-Line B3100, or Empire Industries.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 INSULATION PROTECTION SADDLES

A. Material: 16 gauge galvanized steel.

B. Length: 12”, centered on each hanger.

C. Insulation Shields shall cover lower 180 degrees of pipe in the case of clevis hangers, and entire circumference of pipe in the case of trapeze hangers or clamps.

2.4 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-carbon-steel shapes.

2.5 MATERIALS

A. Aluminum: ASTM B 221.

B. Carbon Steel: ASTM A 1011/A 1011M.

C. Structural Steel: ASTM A 36/A 36M carbon-steel plates, shapes, and bars; black and galvanized.

D. Stainless Steel: ASTM A 240/A 240M.

E. Grout: ASTM C 1107/C 1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

D. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

E. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

F. Install building attachments to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping.

G. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

I. Hangers for insulated piping shall extend around the insulation.

J. Provide Insulation Protection Saddles on all insulated piping.

K. Hangers shall be spaced per the NC State Plumbing Code in accordance with the piping material.

L. A hanger shall be provided within one (1) foot of each bend in horizontal piping. Vertical piping shall be supported at each floor or at intervals not exceeding ten (10) feet. Support cast iron soil pipe to each joint.

M. For piping 4” in diameter and larger, rigid support sway bracing shall be provided at changes in direction greater than 45 degrees.

N. Hangers shall be fastened by means of threaded rods to steel beam clamps, center of bar joist, center of trusses, etc. All hangers shall permit adequate adjustment after erection while still supporting the load. All hanger rods attached to bar joist and trusses shall be install between bottom or top cords of the structural member. Structural members to span from building structure to structure shall be provided by the Contractor.

O. Hangers shall only be hung with drilling into the slab with “drop-in” hangers with the approval of the Structural Engineer of record and the Mechanical Engineer of record with complete dead and operating load information provided for each location. Loading information shall be provided by the Plumbing Contractor.

P. Hangers SHALL NOT be fastened to joist bridging or roof deck.

Q. Piping supported on a trapeze hanger shall be secured to the trapeze hanger by means of a pipe clamp around the pipe insulation and insulation saddle. Bare piping shall be secured by a pipe clamp and isolated by an isolation cushion.

3.2 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections, so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.3 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.4 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment. Hanger and support requirements in this Section apply to all piping systems.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of uninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.

F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.

G. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

END OF SECTION 220529

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Valve tags.

1.3 ACTION SUBMITTALS

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

B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

C. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel self-tapping screws.

B. Fasteners for Nameplates and Signs:

1. Two-part, permanent epoxy adhesive that is weatherproof and sunlight/UV resistant.
2. High performance, double coated tape with adhesive. Design Basis: 3M #06383, or approved equivalent.

C. Label Content: Include equipment's unique equipment number, capacity, final date of acceptance for equipment item and warranty information.

D. Signage shall be provided for the following items:

1. Water Heaters

2.2 PIPE LABELS

A. Custom MS-790 as manufactured by Marketing Service Incorporated or approved equal Steton, Emed or DuraLabel.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to **cover full** circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Pipe identification markers shall comply with ANSI A13.1.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Per ANSI.
3. Colors: Per ANSI.
4. Wording on markers shall be as follows where more stringent than ANSI Standards:

a. Cold Water
b. Hot Water
c. Hot Water Return
d. Vent
e. LP Gas (with pressure noted)

2.3 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 19 gauge, and having predrilled or stamped holes for attachment hardware.

2. Fasteners: Brass wire-link chain, beaded chain, or S-hook.

B. Valve Schedules: Provide a valve chart listing all valves with size and service framed and mounted under glass in the main mechanical room .

1. Valve-tag schedule shall be included in operation and maintenance data.

C. Valve Ceiling Labels: Provide a self-sticking 1/2" diameter dot on lay-in ceiling grid at all valve locations. Red dot for domestic hot water supply and return, Blue for cold water.

2.4 PAINTING

A. The Contractor should note that plumbing piping may be exposed in various areas. The contractor should specifically note that all exposed cast iron piping be uncoated.

B. All exposed plumbing pipe and plumbing pipe insulation in areas other than mechanical rooms shall be left clean and free from oil ready for painting by the Painter. All finished painting will be by the Painter with colors to match the surrounding areas.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Permanently fasten labels on each major item of equipment with two-part, permanent epoxy adhesive or high performance double coated adhesive tape.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures, on both sides.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Near origination and termination points.
7. Spaced at maximum intervals of 1**5** on center along each run. Reduce intervals to **10 feet** on center in areas of congested piping and equipment, such as Mechanical and Boiler Rooms.
8. On piping above removable acoustical ceilings.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

C. Stenciling of piping and/or insulation is not acceptable.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic hot-water return piping.
4. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Indoor Piping Insulation Schedule," articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Fibrous Glass Pipe Insulation: Incombustible, pre-molded, Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. CertainTeed Manson, Knauf FiberGlass GmbH, Owens-Corning Fiberglas Corp., Schuller International, Inc.
2. Preformed Pipe Insulation with Factory-Applied ASJ.
3. Thermal Conductivity: 0.24 BTU/in/hr/ft^2 at 100°F.

E. Flexible Elastomeric Insulation: Closed-cell materials. Comply with ASTM C 534, Type I for tubular materials.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. PVC Jacket Adhesive: Compatible with PVC jacket.

2.4 MASTICS

A. Mastics shall be as recommended by insulation material manufacturer, and shall be compatible with all insulation materials.

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.6 FIELD-APPLIED JACKETS

A. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Adhesive: As recommended by jacket material manufacturer.
2. Color: White.
3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing. Any materials subjected to moisture shall be removed and replaced.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Apply adhesives and mastics at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

P. Rigid pipe insulation inserts shall be provided for all insulated piping 2" and larger.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Pipe insulation at all fire separations shall be butted tightly to the firewall or to the floor after fire stop material has been installed .

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

C. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF GLASS-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet to form a vapor retarder between pipe insulation and segments.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
3. All pipe insulation for pipe fittings shall be pre-molded to fit fittings and shall be enclosed under pre-molded PVC fitting jacket.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. All insulated piping exposed to the weather shall be protected with color coded 30 mil PVC jacket cemented in place with PVC fitting covers. Color coding shall be in accordance with ANSI standards.

3.8 FINISHES

A. Paint finished insulation as specified in Division 9 Section “Painting”, and Section 220553 “Identification of Plumbing Piping and Equipment”.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

3.9 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Underground piping.
2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. Insulation shall be the following:

a. Glass-Fiber: 1” thick.
b. Where installed below grade, insulation shall be 1/2” thick closed cellular plastic foam insulation.
c. Where installed within CMU walls or chases made using CMU walls, insulation shall be 1” thick flexible elastomeric insulation.

B. Domestic Hot Water and Hot Water Return:

1. NPS 1-1/2 and Smaller: Insulation shall be the following:

a. Glass-Fiber: 1” thick.

2. NPS 2 and Larger: Insulation shall be the following:

a. Glass-Fiber: 2” thick.

3. Where installed within CMU walls or chases made using CMU walls, insulation shall be 1" thick flexible elastomeric insulation.

C. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. A.D.A. approved premolded insulation assembly as manufactured by Truebro, McGuire or Mainline .

D. Contractor **may request** that closed cellular foam insulation be used on insulated piping when the building structure is not "dried in" to protect fibrous glass insulation from getting wet. Foam insulation thermal properties shall match or exceed the specified thermal insulation properties for the intended usage. Insulation shall be secured with 16 gauge copper wire at 16 inch centers.

3.11 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Exposed to Exterior:

1. PVC Jacket.

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Piping joining materials.
3. Transition fittings.
4. Dielectric fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Water quality test report.

1.5 QUALITY ASSURANCE

A. Piping material shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: **ASTM B 88, Type L** water tube, drawn temper.

B. Soft Copper Tube: **ASTM B 88, Type K** water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

F. Copper, Brass, or Bronze Pressure Seal Joint Fittings:

1. Manufacturers: Viega Propress, Mueller, or NIBCO.
2. Fittings: Cast-brass, cast-bronze or wrought-copper with EPDM O-ring seal in each end. Sizes NPS 2-1/2 and larger with stainless steel grip ring and EPDM O-ring seal. Fittings shall conform to ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS117.
3. Minimum 200-psig working-pressure rating at 250 deg F.
4. Pressure Seal Joint shall conform to ASME B16.51.

2.3 PIPING JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys, minimum melting point of 410 degrees Fahrenheit.

B. Flux: ASTM B 813, water flushable.

C. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated. Minimum melting point of 1000 degrees Fahrenheit.

2.4 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Standard: ASSE 1079.
2. Pressure Rating: 125 psig minimum at 180 deg F.
3. End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 220100 "Basic Plumbing Requirements" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

D. Arrange all pipes to freely drain through a ball valve when water is cut off.

E. Branch valves shall be installed adjacent to the water piping main.

F. All supplies to fixtures shall have individual stop valves.

G. Install shutoff valve immediately upstream of each dielectric fitting.

H. Provide water hammer shock arrestors as required to prevent water hammer. Air chambers are not acceptable. 12” x 12” access door shall be provided for all shock arrestors.

I. Install domestic water piping level and plumb.

J. All exposed piping to fixtures shall be chrome plated installed true and plumb.

K. Install piping concealed from view in walls, below floors, or above ceilings and protected from physical contact by building occupants except where exposed for connections to fixtures and as otherwise indicated and except in equipment rooms and service areas. Install and secure all piping as walls are built. Wedging of piping will not be permitted. All piping shall be isolated from mortar.

L. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

M. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

N. Install piping to permit valve servicing.

O. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

P. Install piping free of sags and bends.

Q. Install fittings for changes in direction and branch connections.

R. All tees shall be installed such that the flow shall be straight thru the tee and/or out the side. Tees **shall not** be installed where the flow is into the side and out of both ends of the tee (bullhead tee). Bullhead tees installations are not acceptable and shall not be used.

S. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty, and as indicated in the Contract Drawings.

T. All water piping shall be routed with a minimum clearance of ten (10) feet from any electrical panels, electrical switchboards, panel boards, telephone backboards or any other energized components.

U. Extend water lines to water mains where shown on the plans.

V. Insulate all water piping inside the building. Comply with requirements in Section 220719 “Plumbing Piping Insulation.”

W. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."

X. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

Y. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools and procedure recommended by pressure-seal-fitting manufacturer. Leave insertion marks on pipe after assembly. Upon completion of the project, the press fitting manufacturer's tools used for installation shall be turned over to the Owner.

G. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

   a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
   b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

      1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
      2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

   c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
   d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

   a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
   b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
   c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   d. Cap and subject piping to static water pressure of 150 psig. Isolate test source and allow it to stand for a minimum of four hours. Leaks and loss in test pressure constitute defects that must be repaired.

e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained. No caulking of joints will be permitted.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. The Contractor shall furnish all necessary equipment, materials and labor to perform the above-specified test.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) The solution shall remain in the piping for a minimum period of 6 hours, during which time valves shall be opened and closed to permit a small flow of the solution. At the end of the six (6) hours, the solution shall be tested and must contain a residual of at least 5 to 10 ppm chlorine.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Repeat procedures if biological examination shows contamination.
e. The Contractor shall contract with an independent Testing Laboratory for a certification letter that the system sterilization meets or exceed standards for potable water.
f. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Underground, domestic water piping shall be the following:

1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings.

C. Aboveground domestic water piping shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.
2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.

3.13 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves with solder ends for piping NPS 1-1/4 and smaller. Use ball valves with threaded ends for piping NPS 1-1/2 and 2. Use flanged end iron body ball valves for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use ball valves.
3. Check Valves: Check valves 2 inch and small shall be Class 125, lead free design cast bronze body with threaded ends. Valves 2-1/2 inch and larger shall be Class 125, cast iron body with flanged ends.
4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Temperature-actuated, water mixing valves.
4. Strainers.
5. Hose bibbs.
6. Water-hammer arresters.

B. Related Requirements:

1. Section 220519 "Meters and Gauges for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. See specification section 220100 – Basic Plumbing Requirements” for required closeout documentation.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 and NSF 14.

B. Comply with NSF 372 for low lead.

2.2 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Watts, Zurn, Conbraco.
2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Chrome plated.

2.3 BACKFLOW PREVENTERS

A. Double-Check, Backflow-Prevention Assemblies:

1. Watts LF007S, or approved equal by Wilkins, Febco, or Conbraco.
2. Standard: AWWA C-510, ASSE 1015.
3. Operation: Continuous-pressure applications unless otherwise indicated.
4. Size: Same as connected pipe size, see Contract Drawings.
5. Body: Bronze.
6. End Connections: Threaded for NPS 2 and smaller.
7. Configuration: Designed for horizontal, straight-through flow.
8. Accessories:

    a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.

2.4 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Individual-Fixture, Water Tempering Valves (Lavatories, Counter Sinks and Showers):

1. Watts LFMMV or approved equal by Conbraco or Heatguard.
2. Standard: Thermostatically controlled, water tempering valve, and ASSE 1070 or CSA B125.3.
3. Body: Lead Free cast copper silicon alloy.
4. Temperature Control: Adjustable with locking set point.
5. Inlets and Outlet: Threaded
6. Finish: Rough or chrome-plated bronze.
7. Tempered-Water Setting: 110 deg F.
8. Tempered-Water Design Flow Rate: 0.5 gpm.
9. Accessories: Integral filter washers and check valves.

2.5 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated for NPS 2-1/2 and larger.
2. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.

3. Screen: Stainless steel with round perforations unless otherwise indicated.
4. Drain: Factory-installed, hose-end drain valve.

2.6 HOSE BIBBS

A. Hose Bibb HB-1 :

1. Woodford Model 26P-1/2, Mifab MHY-9240, T & S Brass B-0702/B-972 or Preir C-257CP.75.
2. Body Material: Polished chrome plated brass.
3. Seat: Bronze, replaceable.
4. Supply Connections: Threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral hose-connection vacuum breaker complying with ASSE 1011.
8. Operation: Operating key.
9. Include operating key with each operating-key hose bibb.
10. Include integral wall flange with each chrome-plated hose bibb.

2.7 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Precision Plumbing Products, Inc. or approved equal by Zurn, Josam, J.R. Smith, or Sioux Chief.
2. Standard: ASSE 1010.
3. Type: **Copper tube with piston**.
4. Size: ASSE 1010, Sizes AA and A through F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Backflow Preventers: Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Do not install bypass piping around backflow preventers.
3. Install piping to drain air gap fittings indirectly over nearest floor drain, unless otherwise indicated on Contract Drawings.
4. Install pressure gauges at inlet and outlet of backflow preventers per Section 220519 “Meters and Gages for Plumbing Piping.”

B. Temperature-Actuated, Water Mixing Valves: Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.

C. Y-Pattern Strainers: For water, install on supply side of each pump and mixing valve serving an individual fixture.

D. Water-Hammer Arresters: Install in water piping according to PDI-WH 201, and manufacturer's instructions and recommendations.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

C. Comply with requirements for grounding equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each pressure vacuum breaker and backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard. All backflow preventers shall be tested and certified by an approved and licensed backflow prevention company.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare backflow preventer test and inspection reports.

3.4 ADJUSTING

A. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

SECTION 221123 - DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. In-line, sealless centrifugal pumps.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction materials, rated capacities, certified performance curves with operating points plotted on curves, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. See specification section 220100 – Basic Plumbing Requirements” for required closeout documentation.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with pump manufacturer's written instructions for handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: UL 778 for motor-operated water pumps.

C. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.

2.2 IN-LINE, SEALLESS CENTRIFUGAL PUMPS

A. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, sealless, overhung-impeller centrifugal pumps.

B. Taco, B&G, or Grundfos.

C. Capacities and Characteristics: As indicated on Contract Drawings.

D. Pump shall be specifically designed for domestic hot water service.

E. Pump Construction:

1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
2. Casing: Bronze, with threaded or companion-flange connections.
3. Impeller: Plastic.
4. Motor: Single speed.
5. Pump shall be direct connected to motor.
6. Motor shall be rubber mounted and shall be equipped with overload protection.

2.3 CONTROLS

A. Aquastats: Electric, adjustable for control of domestic hot water circulator pumps.

1. Type: Strap-on type, with adjustable range, mounted directly on the building hot water recirculating lines.
2. Operation of Pump: On or off.
3. Transformer: Provide if required.
4. Power Requirement: 120 V ac.
5. Settings: As indicated on Contract Drawings.
6. Connection to DDC-Controlled Circuit: DDC-Circuit shall energize pump during occupied hours, as set by the Owner. See Controls Schematics for full list of items to be monitored.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for domestic-water-piping system to verify actual locations of piping connections before pump installation.

3.2 PUMP INSTALLATION

A. Circulator pumps shall be supported by appropriate hangers to avoid piping strain.

B. Circulator pumps shall be mounted horizontally.

C. Install Circulator Pumps in locations and at heights to allow access for maintenance from floor.

D. Install Aquastats as indicated on Contract Drawings. Temperature settings shall be as indicated on Contract Drawings.

E. See Contract Drawings for delineation of work between Divisions 22 and 26.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment" for identification of pumps.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Set Aquastats for automatic starting and stopping operation of pumps.
5. Perform the following startup checks for each pump before starting:

    a. Verify bearing lubrication.
    b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    c. Verify that pump is rotating in the correct direction.

6. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
7. Start motor.
8. Open discharge valve slowly.
9. Complete startup report to be submitted at closeout.

3.5 ADJUSTING

A. Adjust inline, domestic-water pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points.

C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train the Owner's Maintenance Personnel to adjust, operate, and maintain pumps.

END OF SECTION 221123

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. PVC pipe and fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

2.2 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 COPPER TUBE AND FITTINGS

A. Copper Type DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.4 PVC PIPE AND FITTINGS

A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

D. Adhesive Primer: ASTM F 656. Adhesive primer shall be by the same manufacturer as piping, or by a manufacturer approved by the piping manufacturer.

E. Solvent Cement: ASTM D 2564. Solvent Cement shall be by the same manufacturer as piping, or by a manufacturer approved by the piping manufacturer.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 220100 "Basic Plumbing Requirements."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install all horizontal and vertical piping true and plumb to building structure and connect all piping with ‘Y’ branches and 1/8 or 1/16 bends.

D. Run all piping as directly as possible, avoiding unnecessary bends and turns so as not to interfere with proper installation of work of other contractors.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Grade all waste lines 2" and smaller 1/4" per foot.

H. Grade all waste lines 3" and larger 1/4" per foot, where possible, 1/8" per foot minimum. Grade shall be 1/8” per foot where indicated on Contract Drawings.

I. Grade all condensate drain lines 1/8" per foot.

J. All underground piping shall be graded by the use of a laser beam alignment system.

K. Install piping free of sags and bends.

L. Install fittings for changes in direction and branch connections.

M. Install piping to allow application of insulation (where applicable).

N. Tapped tees and crosses will not be permitted. Tapped sanitary tees and crosses shall be used.

O. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

P. Reducing size of waste piping in direction of flow is prohibited

Q. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

R. Install aboveground PVC piping according to ASTM D 2665.

S. Install underground PVC piping according to ASTM D 2321.

T. All PVC-DWV and PVC drainage lines shall be bedded per the manufacturer’s recommendations and shall be maintained under a continuous head of 10-feet until after all concrete slabs are poured and/or all heavy equipment has been removed from the site. Contractor shall be responsible for the protection of the piping system at all times including freezing weather.

U. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."

V. Do not enclose, cover, or put piping into operation until it is tested, and inspected and approved by authorities having jurisdiction.

W. Vents shall be tied together as shown with minimum number of vents extending through roof. All vents extended through the roof shall be a minimum of 12" above roof level.

X. Flashing of plumbing vents will be provided by the Roof Contractor.

Y. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

Z. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

AA. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1.

1. Cut threads full and clean using sharp dies.
2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
c. Do not use pipe sections that have cracked or open welds.

B. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

C. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Support horizontal cast iron soil pipe with a minimum of one hanger for each pipe length. Location close to hub or no-hub connector. Support vertical pipe at each floor or at intervals not exceeding 10-feet.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect waste piping as indicated.

C. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.6 IDENTIFICATION

A. Identify sanitary waste and vent piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. All sanitary waste vent and condensate drainage piping shall be tested in the following manner: Plug all openings and fill entire waste and vent system to overflow with water and sustain a constant level for a minimum period of three hours. All portions of the floor system shall be tested under a minimum of a 10-foot head including roof vent terminal.

D. All tests shall be applied before any work is concealed or covered in any manner.

E. The Contractor shall furnish all necessary equipment, materials and labor to perform the above-specified tests.

F. Piping will be considered defective if it does not pass tests and inspections.

3.8 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Repair damage to adjacent materials caused by waste and vent piping installation.

E. The Contractor shall flush all waste piping prior to final connection to existing system, to ensure that no foreign materials are in these lines, and that a continuous flow of water and waste can be affected.

3.9 PIPING SCHEDULE

A. Aboveground, waste, vent and condensate discharge piping shall be one of the following:

1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

B. Underground, waste, vent and condensate piping shall be one of the following:

1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

C. Copper DWV piping shall only be used for connections to Kitchen Equipment as specified in Section 220100 “Basic Plumbing Requirements.”

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Floor drains.
2. Floor sinks.
3. Cleanouts.
4. Air-admittance valves.
5. Miscellaneous sanitary drainage piping specialties.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene.

B. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 CLOSEOUT SUBMITTALS

A. See specification section 220100 – Basic Plumbing Requirements” for required closeout documentation.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

2.2 FLOOR DRAINS

A. Floor Drain FD-1:

1. Zurn ZN415-BZ1-VP, Sioux Chief 832 Series, Watts Pronto Series, or pre-approved equal.
2. Pattern: Floor drain.
3. Body Material: Cast iron.
4. Outlet: 3” Bottom.
5. Top or Strainer Material: Nickel bronze.
6. Top of Body and Strainer Finish: Nickel bronze.
7. Top Shape: Round top for exposed finished floors and Square top where applicable.
8. Dimensions of Top or Strainer: 6” diameter or 6” x 6”.
9. Top Loading Classification: Medium Duty.
10. Trap Material: Same as connected piping.
11. Trap Pattern: Deep-seal P-trap.
12. Features: Heelproof top, flashing device, post pour adjustable, concrete shield and vandal resistant securing screws.
13. Provide owner with tool to remove grates.

2.3 FLOOR SINKS

A. Floor Sink FS-1:

1. Zurn Z-1901-K-2-33, or approved equal by Josam or J. R. Smith.
2. Pattern: Floor drain.
3. Body Material: Cast iron.
4. Anchor Flange: Required.
5. Outlet: 3” Bottom.
6. Coating on Interior Surfaces: White acid-resistant enamel.
7. Internal Strainer: Dome.
8. Internal Strainer Material: White acid resistant dome.
9. Top Grate Material: Nickel Bronze.
10. Top of Body and Grate Finish: Nickel bronze.
11. Top Shape: Square, 1/2 grate.
12. Dimensions of Top Grate: 12” x 12”.
13. Depth: 8”.
14. Trap Material: Same as connected piping.
15. Trap Pattern: Deep-seal P-trap.

2.4 CLEANOUTS

A. Cast-Iron Exposed Cleanouts CO:

1. Size: Same as connected branch, maximum of 4”.
2. Body Material: As required to match connected piping.
3. Description: Pipe cap installed using a no-hub band and clamp.

B. Cast-Iron Wall Cleanouts WCO:

1. Zurn ZS-1468, Josam 58600-PLG, or J. R. Smith 4472.
2. Size: Same as connected drainage piping, maximum of 4”.
3. Body: As required to match connected piping.
4. Closure Plug:

    a. Cast Bronze slotted plug.

5. Wall Access: Round, stainless steel, vandalproof securing screw.

C. Cast-Iron Exposed Floor Cleanouts FCO:

1. Zurn ZN-1400, or approved equal by Josam or J. R. Smith.
2. Size: Same as connected branch, maximum of 4”.
3. Type: Threaded, adjustable housing.
4. Body or Ferrule: Cast iron.
5. Closure: Cast brass plug, lead seal with straight threads and watertight gasket.
6. Frame and Cover Material and Finish: Nickel-bronze.
7. Frame and Cover Shape: Round.
8. Top Loading Classification: Medium Duty.

D. Cast-Iron Exposed Exterior Cleanouts ECO:

1. Zurn Z-1402-BP-NL, or approved equal by Josam or J. R. Smith.
2. Size: Same as connected branch, maximum of 4”.
3. Type: Non-adjustable.
4. Body or Ferrule: Cast iron.
5. Closure: ABS taper threaded plug.
6. Frame and Cover Material and Finish: Cleanout shall be installed in 24” x 24” x 6”concrete pad.
7. Top Loading Classification: Heavy Duty.

2.5 AIR-ADMITTANCE VALVES

A. Air-Admittance Valves:

1. Standard: ASSE 1051.
2. Housing: Plastic.
3. Operation: Mechanical sealing diaphragm.
4. Size: Same as connected fixture or branch vent piping.

B. Wall Box for Air-Admittance Valves:

1. Description: White plastic housing with white plastic grille, made for recessed installation. Include bottom pipe connection and space to contain one air-admittance valve.

2.6 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Hub Drains :

1. Description: Shop or field fabricate from piping material as specified for condensate drainage piping in Section 221316 “Sanitary Waste and Vent Piping.”.
2. Size: Same as connected waste piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.

a. Maintain integrity of waterproof membranes where penetrated.

2. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 135 degrees.
3. Locate at minimum intervals of 100 feet.
4. Locate at base of each vertical soil and waste stack.
5. Locate wall cleanouts located in group toilet rooms 18" above finished floor to the centerline, unless otherwise required due to coordination with other trades.
6. Where indicated on Contract Drawings.

C. Removable caps and plugs for cleanouts shall have at least six threads engaged.

D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

F. For exterior cleanouts, install flush with grade and within 24" x 24" x 6" thick concrete pad per Contract Drawings.

G. Install air-admittance valves on vent piping.

H. Install air-admittance-valve wall boxes recessed in wall.

I. Air admittance valves shall be installed a minimum of 6” above the fixture(s) being vented, and a minimum of 6” above insulation materials.

J. Air admittance valves shall not be installed until after testing of the waste and vent system is complete.

K. Install through-penetration firestop assemblies.

1. Comply with requirements in Section 078413 "Penetration Firestopping" and Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

L. Assemble Hub Drains and install with top of hub 1 inch above floor.

M. Install deep-seal traps on floor drains and other waste outlets, if indicated.

N. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane. Comply with requirements of Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

O. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

A. Flashing shall be provided and installed by Roof Contractor.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

C. All floor drains, floor sinks and hub drains shall be covered immediately after installation.

END OF SECTION 221319

SECTION 221500 – FUEL GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Manual gas shutoff valves.
5. Pressure regulators.
6. Dielectric fittings.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 CLOSEOUT SUBMITTALS

A. See specification section 220100 – Basic Plumbing Requirements” for required closeout documentation.

1.6 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern, with threads conforming to ASME B1.20.1.
2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.

B. Corrugated Stainless Steel Tube (CSST): LC 1/CSA 6.26b.

1. Factory applied polyethylene (PE) jacket.
2. Fittings: Non-applicable.
3. Transition Fittings: CSST manufacturer’s CSST to NPS transition fittings.

C. Polyethylene (PE) Pipe: ASTM D 2513, SDR 11.

1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
3. Anodeless Service-Line Risers: Factory fabricated and leak tested.

a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
b. Casing: Rigid conduit encasement shall be Schedule 40 PVC pipe and fittings conforming to ASTM D-2665. Joints shall be made using piping manufacturer’s approved solvent cement.
c. Aboveground Portion: PE transition fitting.

d. Outlet shall be threaded or flanged or suitable for welded connection.
e. Tracer wire connection.
f. Ultraviolet shield, suitable for unprotected outdoor storage for at least four (4) days.
g. Pipe and fittings shall be opaque yellow in color.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors: AGA approved.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for LP gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 MANUAL GAS SHUTOFF VALVES

A. One-Piece, Full-Port Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. Body: Bronze, complying with ASTM B 584 and ASME B16.44.
2. Ball: Chrome-plated brass.
3. Stem: Bronze; blowout proof.
4. Seats: Reinforced TFE; blowout proof.
5. Packing: Separate packnut with adjustable-stem packing threaded ends.
6. Ends: Threaded,.
7. Listing: UL or AGA.
8. Service: Suitable for LP-gas service with "WOG" indicated on valve body.
9. Provide gauge tapping on each ball valve controlling a single piece of equipment.
10. Valve must be labeled “2G” per the NC State Fuel Gas Code.

2.5 MOTORIZED GAS VALVES

A. Electrically Operated Valves: Comply with UL 429.

1. Pilot operated.
2. Body: Brass or aluminum.
3. Seats and Disc: Nitrile rubber.
4. Springs and Valve Trim: Stainless steel.
5. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable. Coil to fail closed when power is cut-off to the valve.
6. NEMA ICS 6, Type 4, coil enclosure.
7. Normally closed.
8. Visual position indicator.

2.6 PRESSURE REGULATORS

A. General Requirements:

1. Maxitrol, American Meter Company, or Invensys
2. Comply with ANSI Z21.80.
3. Single stage and suitable for LP gas.
4. Capacities as indicated on Contract Drawings.
5. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.
6. Regulators installed inside the building shall be of the limited venting design.

2.7 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Description:

a. Standard: ASSE 1079.
b. Pressure Rating: 125 psig minimum at 180 deg F.
c. End Connections: Solder-joint copper alloy and threaded ferrous.

2.8 PIPING ENCASEMENT

A. Rigid conduit encasement shall be Schedule 40 PVC pipe and fittings conforming to ASTM D-2665. Joints shall be made using piping manufacturer’s approved solvent cement.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for LP-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off LP gas to premises or piping section.

B. Inspect LP-gas piping according to NFPA 58 and the NC Fuel Gas Code to determine that LP-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 58 and the NC Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 58 and the NC State Fuel Gas Code for installation and purging of lp-gas piping.

B. Install underground, LP-gas piping buried at least 36 inches below finished grade. Comply with requirements in Section 220100 "Basic Plumbing Requirements" for excavating, trenching, and backfilling.

C. Install underground, PE, LP-gas piping according to ASTM D 2774.

D. Install fittings for changes in direction and branch connections.

E. Plastic pipe joints shall be made using heat fusion method in accordance with written procedures of pipe manufacturer and using proper heating device. Heat shall not be applied with a torch or other open flame. Joints shall be made by qualified person pursuant to 49 CFR, part 192.283.

F. Gas piping encasement shall be graded to point where vented to atmosphere.

G. The Contractor shall install an electrically conductive tracer wire with the plastic piping distribution system and plastic conduit. Provide 12" clearance between plastic pipe/conduit and tracer wire. The tracer and wire shall be a single solid AWG #12 copper conductor with Type TW 600 volt insulation and electrically continuous throughout the system. Each main branch and service line shall be equipped with this conductor. Splices shall be made with a split bolt connector with splice being covered with splicing tape and plastic electrical tape to provide a waterproof splice. The conductor shall be continuous by all valves.

H. Warning tape shall be yellow plastic tape labeled “Gas” in black letters. Tape shall be place 6” above tracer wire.

3.4 INDOOR PIPING INSTALLATION

A. Comply with NFPA 58 and the NC Fuel Gas Code for installation and purging of LP-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Locate valves for easy access.

G. Install LP-gas piping at uniform grade of 1/4" per 15 feet down toward drip and sediment traps.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Verify final equipment locations for roughing-in.

K. The Plumbing Contractor shall coordinate the rough-in connection for the boiler gas train with the Mechanical Contractor. The Plumbing Contractor shall make the final connection to the boiler gas train.

L. The Plumbing Contractor shall coordinate the rough-in connection for the mechanical equipment with the Mechanical Contractor. The Plumbing Contractor shall make the final connections with an approved AGA flexible connector.

M. The Plumbing Contractor shall coordinate the rough-in connection for the cooking island connections with the Kitchen Equipment Contractor and make final connections with an approved AGA flexible connector.

N. Emergency energy solenoid valve for the kitchen hood will be provided by the Plumbing Contractor. The Plumbing Contractor shall install the valve on the hood gas supply line where shown on the Contract Drawings. Control connection of the valve is outside of Division 22.

O. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

P. Prohibited Locations:

1. Do not install LP-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
2. Do not install LP-gas piping in solid walls or partitions.

Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

R. Connect branch piping from top or side of horizontal piping.

S. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

T. Do not use LP-gas piping as grounding electrode.

U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

C. Each valve shall be lubricated and turned during the installation to assure good working order. Plug valves shall be greased again after turning to aid the shut off.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Joints for threaded piping shall be made using pipe dope applied sparingly to the male thread of pipe. Pipe dope shall be resistant to actions of gas.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

3.8 CONNECTIONS

A. Install LP-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

B. Install piping adjacent to appliances to allow service and maintenance of appliances.

C. Connect piping to appliances using manual gas shutoff valves and unions. Install union between valve and appliances or equipment.

D. Drip Leg: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance. Drip legs shall be full size of the main and shall be 6 inches in length.

3.9 LABELING AND IDENTIFYING

A. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for piping and valve identification.

3.10 PAINTING

A. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for painting of piping.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. All tests shall be applied before any work is concealed or covered in any manner.

C. Tests and Inspections:

1. All fuel gas piping shall be tested by applying an air pressure of 100-lbs. per square inch and shall be maintained for minimum of eight (8) hours. Air receivers shall be charged with peppermint for odor test and any indication of leakage will be checked by applying a soap and water solution at each joint to determine leaking joint. Test shall be conducted using an eight inch pressure-temperature recorder with a pressure range of 0-150-psi with a 24 hour recording time. Pressure measuring elements shall be heat treated to prevent hystersis-related inaccuracies. The original chart with copies shall be included in the “Owners and Operating Manuals.

D. LP-gas piping will be considered defective if it does not pass tests and inspections.

E. The Contractor shall furnish all necessary equipment, materials and labor to perform the above-specified test.

F. Prepare test and inspection reports.

3.12 INDOOR PIPING SCHEDULE

A. Aboveground piping NPS 2 and smaller shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground piping NPS 2-1/2” and larger shall be the following:

1. Steel pipe with wrought-steel fittings and welded joints.

C. Below Ground piping under the building slab shall be the following:

1. Corrugated Stainless Steel Tube in PVC Conduit.

D. Below Ground piping outside of the building shall be the following:

1. Polyethylene Pipe.

END OF SECTION 221500

SECTION 223400 - FUEL-FIRED, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Commercial, gas-fired, high-efficiency, storage, domestic-water heaters.
2. Commercial, atmospheric, gas-fired, high efficiency, domestic-water heaters.
3. Domestic-water heater accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. See specification section 220100 – Basic Plumbing Requirements” for required closeout documentation.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.

C. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.6 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.
d. Failure due to thermal shock.

2. Warranty Periods: From date of Substantial Completion.

a. Commercial, Gas-Fired, Storage, Domestic-Water Heaters:

1) Storage Tank: Three years.
2) Controls and Other Components: One year.

PART 2 - PRODUCTS

2.1 COMMERCIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS

A. Water Heater WH-1:

1. A.O. Smith BTH-145(A), or approved equal by State or Bradford White.
2. Characteristics: Per Contract Drawings.
3. Storage-Tank Construction: Galvanized steel.

a. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
b. Lining: Glass complying with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

4. Factory-Installed Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.

c. Insulation: Foam glass tank insulation, complying with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
d. Jacket: Steel with enameled finish.
e. Burner: UL 795 for pre-set power-burner, gas-fired, domestic-water heaters and LP gas fuel.
f. Automatic Ignition: ANSI Z21.20/CSA C22.2 No. 199, electric, automatic, gas-ignition system.
g. Temperature Control: Adjustable thermostat.
h. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.
i. Combination Temperature-and-Pressure Relief Valves: ASME rated. Include one relief valve with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Relief valve shall have sensing element that extends into storage tank.
j. Hand hole cleanouts.
k. Flame sensor.

5. Electrical Characteristics: Burner motor and controls shall be factory wired for 120-volt, single-phase electrical service.

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Expansion Tanks:

1. Amtrol, Bell and Gossett, Thrush or Taco.
2. Description: ASME, steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:

a. Fittings shall include test cocks, hose bibb drain and air control fitting.
b. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
c. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
d. Air-Charging Valve: Factory installed.

4. Capacity and Characteristics:

a. Working-Pressure Rating: 150 psig.
b. Working-Temperature Rating: 200°F.
c. Capacity Acceptable: Minimum capacity as indicated on Contract Drawings.

B. Comply with requirements for ball shutoff valves specified in Section 220523 "General-Duty Ball Valves for Plumbing Piping."

C. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."

D. Comply with requirements for gas valves, pressure regulators, and connections as specified in Section 221500 "Fuel Gas Piping"

E. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect assembled domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test domestic-water heaters to minimum of one and one-half times pressure rating before shipment.

C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Maintain manufacturer's recommended clearances.
2. Arrange units so controls and devices that require servicing are accessible.
3. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
5. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
6. Install anchor bolts to elevations required for proper attachment to supported equipment.
7. Anchor domestic-water heaters to substrate.

B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."

C. Install gas-fired, domestic-water heaters according to NFPA 58 and the NC State Fuel Gas Code.

1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
4. Comply with requirements for gas shutoff valves and gas pressure regulators specified in Section 221500 "Fuel Gas Piping."

D. Install combination temperature-and-pressure relief valves in water piping for domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain if not otherwise indicated on Contract Drawings.

E. Install water-heater drain piping as indirect waste to spill by positive air gap over floor drains if not otherwise indicated on Contract Drawings. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."

F. Install thermometers and pressure gauges as indicated on Contract Drawings. Comply with requirements specified in Section 220519 "Meters and Gages for Plumbing Piping."

G. Fill domestic-water heaters with water.

H. Charge domestic-water expansion tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."

B. Comply with requirements for gas piping specified in Section 221500 "Fuel Gas Piping."

C. Drawings indicate general arrangement of piping, fittings, and specialties.

D. Where installing piping adjacent to fuel-fired, doestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

E. Intake and exhaust connections to heaters shall be made using Schedule 80 CPVC pipe. Transition from manufacturer’s included PVC intake or exhaust piping, if applicable, shall be made using transition couplings conforming to ASTM C 1460, comprised of neoprene gasket conforming to ASTM C 564 and stainless steel clamping band. Intake shall be equipped with manufacturer’s recommended screen.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

C. Water heater shall be started by a factory-authorized service representative.

D. Prepare test, inspection, and startup reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain domestic-water heaters.

END OF SECTION 223400

SECTION 224216.13 - COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 RELATED REQUIREMENTS

A. Section 221119 “Domestic Water Piping Specialties” for temperature-actuated water mixing valves.

1.3 SUMMARY

A. Section Includes:

1. Lavatories.
2. Faucets.
3. Supply fittings.
4. Waste fittings.
5. Supports.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1.5 CLOSEOUT SUBMITTALS

A. See specification section 220100 – Basic Plumbing Requirements” for required closeout documentation.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 VITREOUS CHINA, COUNTER-MOUNTED LAVATORIES

A. Countertop Lavatory L-1: Oval, vitreous china, drop-in.

1. American Standard No. 0476.047 or approved equal by Kohler, Sloan, or Toto.
2. Fixture:

    a. Nominal Size: 20 by 17 inches.
    b. Faucet-Hole Punching: Single center hole.
    c. Faucet-Hole Location: Top.
    d. Color: White.
    e. Features: Front overflow, unglazed rim, mounting hardware.

3. Faucet: Manual Single Push-Button Metering.

2.2 VITREOUS CHINA, WALL-HUNG LAVATORIES

A. Handwash Sink (Adult ADA) SK-3: Rectangular, vitreous china, wall mounted.

1. Zurn Z5361, Sloan SS-3103, or American Standard.
2. Fixture:

    a. Standard: ASME A112.19.1/CSA B45.2.
    b. Type: Straight-front apron with 4” backsplash.
    c. Nominal Size: 20 by 18 inches.
    d. Faucet-Hole Punching: Single hole, center.
    e. Faucet-Hole Location: Top.
    f. Color: White.
    g. Mounting Material: Wall hanger.
    h. Features: back ledge, front overflow.

3. Faucet: Manual Single Lever.
4. Support: Lavatory Carrier.
5. Lavatory Mounting Height: As indicated on the Contract Drawings.

2.3 SOLID-BRASS, MANUALLY OPERATED FAUCETS

A. NSF Standard: Comply with NSF 372 for faucet materials that will be in contact with potable water.

B. Manual Single Lever:

1. Chicago 2200-E2805ABCP, T&S Brass B-2701-VF05 or approved equal by Zurn.
2. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
3. Body Type: Centerset.
4. Body Material: Commercial, solid brass.
5. Finish: Polished chrome plate.
6. Maximum Flow Rate: 0.5 gpm.
7. Mounting Type: Deck, exposed.
8. Valve Handle(s): Single lever.
9. Spout: Rigid type.
10. Spout Outlet: Vandal-Resistant Non-Aerated.
11. Mixing Valve: Individual-Fixture, Water Tempering Valve
12. Connect to Individual-Fixture Tempering Valve per Section 221119 “Domestic Water Piping Specialties”.

2.4 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF 372 for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated-brass, with 1/2” chrome plated nipple to wall and escutcheon with set screw and inlet connection matching supply piping. McGuire, Zurn, or Brass Craft.

E. Operation: Loose key.

F. Risers:

1. NPS 3/8.
2. Chrome-plated, braided stainless steel, flexible hose riser. McGuire, Brass Craft, or Watts.

2.5 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Chrome plated cast brass strainer with open grid, overflow openings, cast brass locknut and 1-1/4” 17 gauge tailpiece shall be McGuire Model 155A, Zurn Model Z-8743, or Engineered Brass Company Model SG7L05.

C. P-Trap:

1. Size: NPS 1-1/2 by NPS 1-1/4.
2. Chrome-plated, adjustable cast brass P-trap with 1-1/4” slip in inlet, cleanout, ground joint, 1-1/2” I.P.S. outlet, shall be McGuire, Zurn, or Engineered Brass Company.

3. 1-1/2” chrome plated nipple to wall with escutcheon and setscrew shall be McGuire, Zurn, or Engineered Brass Company.

2.6 SUPPORTS

A. Lavatory Carrier:

1. Zurn Model Z-1224, J. R, Smith Model 0800, or approved equal by Watts.
2. Chair carrier with floor anchor plate, upright supports, and bearing plate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

B. Examine counters and walls for suitable conditions where lavatories will be installed.

C. Examine wall cavities and chases for suitable conditions where carriers will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lavatories level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Sealant color shall be clear. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.13

SECTION 224216.16 - COMMERCIAL SINKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 RELATED REQUIREMENTS

A. Section 221119 “Domestic Water Piping Specialties” for temperature-actuated water mixing valves.

1.3 SUMMARY

A. Section Includes:

1. Counter mounted sinks.
2. Sink faucets.
3. Supply fittings.
4. Waste fittings.

B. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. See specification section 220100 – Basic Plumbing Requirements” for required closeout documentation.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 COUNTER MOUNTED SINKS

A. Counter Sink (Standard) SK-1: Stainless steel, double bowl, counter mounted.

1. Elkay EFRUFF23417 or approved equal by Just or Acorn.
2. Fixture:

a. Type: Undermount (Farmhouse).
b. Material: 16-gauge type 304 nickel bearing stainless steel.
c. Nominal Size: Approximately 36 inches by 20 inches by 9 inches deep.
d. Features: Sound deadening applied to under side.

3. Faucet: Counter Sink Faucet.

a. Location: Center set deck mounted.

4. Supply Fittings:

a. McGuire, Zurn, or Brass Craft.
b. 1/2” sweat x 1/2” compression sink supply stops shall be equipped with 5” extension, wheel handle ball valve angle stops.
c. Risers:

1) NPS 3/8.
2) Chrome-plated, braided stainless steel, flexible hose riser. McGuire, Brass Craft, or Watts.

5. Waste Fittings:

a. Stainless steel crumbcup strainer with 1-1/2" tailpiece shall be Elkay LK-99 or Just JB-99 or approved equal by Advance Tabco.
b. Center Waste Continuous Outlet: McGuire 113C16G17, or approved equal by Elkay, or Zurn.
c. P-Trap:

1) McGuire, Zurn, or Kohler.
2) Size: NPS 1-1/2 x NPS 1-1/2”.
3) Material: Chrome-plated cast brass.
4) Features: Adjustable, slip joint inlet, cleanout, ground joint.

B. Counter Sink (ADA) SK-2: Stainless steel, single bowl, counter mounted.

1. Elkay ELDSSF36279DBG, or approved equal by Acorn or Just.
2. Fixture:

a. Type: Undermount (Farmhouse).
b. Material: 16-gauge type 304 nickel bearing stainless steel.
c. Nominal Size: Approximately 36 by 27 inches by 9-1/2 inches deep.

d. Features: Sound deadening applied to under side, customized with front overflow.

3. Faucet: Counter Sink Faucet.

a. Location: Center set deck mounted.

4. Supply Fittings:

a. McGuire, Zurn, or Brass Craft.
b. 1/2” sweat x 1/2” compression sink supply stops shall be equipped with 5” extension, wheel handle ball valve angle stops.
c. Risers:

1) NPS 3/8.
2) Chrome-plated, braided stainless steel, flexible hose riser. McGuire, Brass Craft, or Watts.

5. Waste Fittings:

a. Stainless steel crumbcup strainer with 1-1/2" offset tailpiece shall be Elkay LKAD35 or Just J-ADA-35 GR or approved equal by Advance Tabco.
b. P-Trap:

1) McGuire, Zurn, or Kohler.
2) Size: NPS 1-1/2 x NPS 1-1/2”.
3) Material: Chrome-plated cast brass.
4) Features: Adjustable, slip joint inlet, cleanout, 1-1/2" 17-gauge tube outlet.

2.2 SINK FAUCETS

A. NSF Standard: Comply with NSF 372 for faucet-spout materials that will be in contact with potable water.

B. Counter Sink Faucet, manual type, single handle, pull-out spray, Gooseneck Spout.

1. Commercial, Solid-Brass Faucet.
2. Chicago 434-ABBN, Kohler K-24661 or Symmons S-2302-PD.
3. General: Coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor, adjust pull-out spray docking as needed.
4. Body Type: Centerset.
5. Body Material: Commercial, solid brass.
6. Finish: Chrome plated.
7. Maximum Flow Rate: 1.5 gpm.
8. Handle(s): Single handle with temperature control.
9. Mounting Type: Deck, single hole.
10. Spout Type: 8” Gooseneck swing spout with pull-out spray.
11. Spout Outlet: Vandal proof aerator.
12. Features: Renewable ceramic cartridge, pull-out spray, .
13. Connect to Individual-Fixture Tempering Valve per Section 221119 “Domestic Water Piping Specialties”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.

B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sinks level and plumb according to roughing-in drawings.

B. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.

C. Install water-supply piping with stop on each supply to each sink faucet.

1. Exception: Use ball valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping".
2. Install stops in locations where they can be easily reached for operation.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations, including within casework. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Sealant color shall be clear. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of sinks, inspect and repair damaged finishes.

B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed sinks and fittings.

D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.16

SECTION 230500 - BASIC HVAC REQUIREMENTS

PART 1 -GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 CONTENTS

A. See Table of Contents.

1.3 CODES AND STANDARDS

A. Contractor shall install all work and fired and unfired pressure vessels and their safety devices in accordance with the requirements of the latest edition of the Codes and Standards.

B. Building Codes:

1. North Carolina State Building Code, Latest Edition and Revisions (NCSBC).
2. National Fire Protection Association No. 70, 90A, 91, and any other applicable sections.

C. Industry Standards:

1. Underwriter's Laboratories, Inc. Standards and approved listings (UL)
2. Electrical Testing Laboratories Standards (ETL)
3. American National Standards Institute (ANSI)
4. American Society for Testing Materials Standards (ASTM)
5. Canadian Standards Association (CSA)

1.4 SCOPE OF WORK

A. The Contractor shall provide labor and materials required for a complete system ready for operation as shown on the drawings and hereinafter specified. This includes all equipment, ductwork, necessary plumbing, and all other services necessary whether they are specifically mentioned herein or not. The entire installation shall be installed in a first-class, neat, professional manner to the satisfaction of the Engineer and shall conform to all applicable codes and laws.

1.5 GENERAL

A. Equipment and Materials shall be new and shall bear the manufacturer's name, trade name, and UL label in every case where a standard has been established for the particular material. The equipment to be furnished under this specification shall be essentially the standard product of

manufacturers regularly engaged in the production of the required type of equipment and shall be the manufacturer's latest approved design.

B. Equipment and Materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.

C. Conditions shall be checked at the building before placing orders for apparatus and such apparatus shall be of such dimensions as to fit the spaces allotted. The Contractor shall not scale mechanical plans, but rather refer to architectural plans for dimensions.

D. Equipment and Materials shall be delivered to the site and stored in original containers tightly covered and protected against dirt, water and chemical or mechanical injury and theft. At the completion of the work, fixtures, equipment, and materials shall be cleaned and polished thoroughly and turned over to the OWNER in a condition satisfactory to the A/E. Damage or defects, developing before acceptance of the work shall be corrected at the CONTRACTOR's expense.

E. The Contractor shall warranty the entire heating and air conditioning system subject to the General Conditions of these specifications and as further required in individual Sections.

1.6 SUBMITTAL DATA AND SHOP DRAWINGS

A. The Contractor shall submit in accordance with Division 01 General Requirements and each Section of Division 23 a list of materials and the manufacturer to be used on this project. They shall submit multiple hard copies or electronic copies of submittal data for the Engineer’s use in approving materials and equipment. One hard or electronic copy will be returned. It is requested that all submittal data be sent to the Architect at one time. Unless special consideration is given, none of the submittal data will be checked until it has all been received by the Architect. Where called for, the Contractor shall submit multiple hard copy or electronic sets of shop drawings showing the detailed arrangement or connections that are shown schematically on the drawings. Data certified for the specified project and indicated manufacturer, type, or size, capacity, etc., shall be submitted for the systems, equipment, etc. as noted in each Division 23 Section.

1.7 APPROVAL OF EQUIPMENT, MATERIALS, ETC.

A. Manufacturers listed are to establish a standard of quality. All materials and equipment which are essential and have not been specified or shown shall be new and of the highest grade and quality, free from defect or other imperfections. Approval of equipment will not relieve the Contractor of compliance with the specifications even if such approval is made in writing, unless the attention of the Engineer is called to the non-complying features by letter accompanying the submittal data. Approval of submittal data by the Architect/Engineer shall not be construed as a complete check of approval of detailed dimensions, weights, gauges, and similar details with the proposed articles. The conformance with the necessary coordination between the various other contractors and suppliers shall be solely the responsibility of the Contractor.

1.8 DRAWINGS AND SPECIFICATIONS

A. The drawings and specifications are complementary each to the other, and what may be called for by one shall be as binding as if called for by both.

B. The drawings accompanying these specifications indicate diagrammatically the general location of the ducts, piping, and equipment and do not show all offsets, supports, fittings, bolts, connections, etc., required for a complete system. While the drawings are to be followed as closely as possible, if it is found necessary to change the location of same to accommodate the conditions at the building, such changes shall be made without additional cost to the Owner, and as directed by the Architect/Engineer. Any detail which is omitted, and which is necessary for the proper operation of any system included under the contract, shall be supplied and installed by the Contractor without extra cost to the Owner. All pipes and ducts shall be run as high as possible to maintain ceiling and head clearance. All equipment shall be installed in such a manner as to allow proper maintenance access.

C. It shall be understood that where the words “furnish,” “provide,” and/or “install” are used, it is intended that this CONTRACTOR shall purchase and install completely all material necessary and required for this particular item, system, equipment, etc.

D. Any omission from either the drawings or the specifications are unintentional, and it shall be the responsibility of the CONTRACTOR to call to the attention of the A/E any pertinent omissions before submitting a bid. Complete and working systems are required, whether every small item of material is shown and specified or not.

1.9 COORDINATION OF WORK

A. It is understood and agreed that by submitting a bid, the CONTRACTOR has, by careful examination, satisfied himself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the general and local conditions and all other matters which can and may affect the work under this contract. The CONTRACTOR shall be held responsible for visiting the site and thoroughly familiarizing himself with the existing conditions and also any contractual requirements as may be set forth in the other divisions of these specifications. No extras will be considered because of additional work necessitated by obvious job conditions that are not indicated on the drawings.

PART 2 -PRODUCTS (Not Used)

PART 3 -EXECUTION

3.1 INSTALLATION

A. Contractor shall cooperate with the contractors of other trades and shall install his work as fast as the progress of the balance of the work will permit.

B. All debris resulting from heating and air conditioning work shall be removed from the premises daily or as directed by the Architect/Engineer. Trash and rubbish shall not be allowed to accumulate either within or outside the building. Materials and debris, which in the opinion of

the Engineer cannot practicably be removed from the site the same day, may be temporarily stacked or stored in a designated location on the site as directed by the Architect/Engineer.

C. Manufacturer's directions shall be followed completely in the delivery, storage, protection, and installation of all equipment and materials. The CONTRACTOR shall promptly notify the A/E, in writing, of any conflicts between any requirements of the Contract Documents and the manufacturer's directions and shall obtain the A/E's written instructions before proceeding with the work. Should the CONTRACTOR perform any work that does not comply with the manufacturer's instructions, recommendations, or requirements; it shall be corrected at the direction of the A/E at no additional cost to the Owner.

D. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations.

E. Guards shall be provided for all moving equipment, motor couplings, pump shafts, belt drives and similar exposed reciprocating or rotating components.

3.2 DEMOLITION

A. General Requirements: The work includes the demolition or removal of all construction indicated, specified, or necessary to accomplish the work under this contract. All items not to be reused shall become the property of the Heating and Air Conditioning Contractor. The drawings define the scope of work, but it is not intended that all items of demolition work be specifically indicated. After carefully reviewing the drawings and specifications to determine intent, and prior to bidding, the Heating and Air Conditioning Contractor shall visit the site and determine the extent of demolition work required to properly complete the work under his contract.

B. Protection of Materials and Work: Before beginning any cutting or demolition work, the Heating and Air Conditioning Contractor shall carefully survey the existing work and examine the drawings and specifications to determine the extent of work required. The Heating and Air Conditioning Contractor shall take all necessary precautions to insure against damage to existing work to remain in place, to be reused, or to remain the property of the Owner, and any damage to such work shall be repaired or replaced at no additional cost to the Owner.

C. The Contractor shall notify the Owner immediately in the event that any asbestos, lead, or other hazardous containing materials are encountered during demolition.

D. Refrigerant in Demolitioned Equipment: Recover all refrigerant in approved refrigerant containers and in compliance with section 608 of the EPA Clean Air Act. Removal must be conducted under supervision of an EPA certified technician.

3.3 ELECTRICAL

A. Electrical circuit sizes are based on capacities of the drawings and it shall be the responsibility of the Contractor to change any and all electrical work in order to fit mechanical equipment. The Contractor shall coordinate to assure that all equipment is properly connected and shall check wiring prior to starting units. Any damage to units resulting from improper wiring or connections

shall be the responsibility of Contractor. Flexible electrical conduits shall be 24 inches in length maximum.

B. All electrical work shall be installed in accordance with codes having jurisdiction and the Electrical Division, Division 26, of these specifications.

C. All power wiring and associated conduit shall be provided to HVAC equipment by the Contractor. The Contractor shall furnish and install all motor starters, disconnect switches, and combination starters for HVAC equipment, including variable speed drives. All final power wiring connections to HVAC equipment shall be made by the Contractor.

D. Provide all control wiring, in conduit, required to satisfactorily control all HVAC equipment. Furnish and wire all control devices such as thermostats, switches, relays and any other devices necessary to control the equipment furnished in this section.

E. Contractor shall provide power wiring and conduit to all damper and valve actuators.

F. Duct mounted smoke detectors shall be furnished by the Contractor and installed in duct work by the Contractor, including wiring to the fire alarm system.

3.4 OPENINGS

A. The Contractor shall furnish all blockouts, sleeves, and openings required for his work. Sleeves for piping, etc., shall be in accordance with Section 230517 “Sleeves and Sleeve Seals for HVAC Piping.” Specifically inform as to the correct size and location of openings and sleeves to insure that they shall be cast in their proper location. Sleeves and duct opening frames shall be furnished and installed by the Contractor. Failure to indicate such openings in time to avoid delaying the project shall result in the Contractor providing all cutting and repairing at their own expense. Repairing shall include sealing tight around pipe sleeves and duct frames in a neat and professional manner and in accordance with the “Cutting and Patching” section of this specification.

B. All penetrations in rated floors, firewalls and any other rated separations shall be protected using a through-penetration firestopping method with an “F” rating equivalent to the rating of the membrane being penetrated for particular piping materials used and membrane construction type. Floor penetrations shall additionally have a “T” rating equivalent to the rating of the floor being penetrated. Through-penetration firestop systems shall be installed and tested in accordance with ASTM E814 or UL 1479.

C. Through-penetration firestop details indicated on the drawings are suggestive only. Actual details to be used shall be submitted.

3.5 CUTTING AND PATCHING

A. The Contractor shall do all cutting and patching necessary to install all equipment as required under their contract in accordance with the General Conditions of these specifications and shall re-establish all finishes where cutting and patching occur to their original condition. All cutting of the structure, where unavoidable, must be approved by the Architect/Engineer and be done by not this Contractor, but shall be paid for by this Contractor.

3.6 EXCAVATION, TRENCHING AND BACKFILL

A. The Contractor shall perform all excavation and backfilling required for the installation of this work or whatever substance encountered, to the depths indicated and required in accordance with this section and Division 31 of these specifications. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from banks to avoid overloading and to prevent cave-ins. Provide adequate support of sidewalls for protection of the work and personnel and as required by regulation of the NC State Dept. of Labor and US Department of Labor, Occupational Safety and Health Administration, Occupational and Safety and Health Standards.

B. Contractor shall include in their bid on site utility location services.

C. Extreme caution shall be exercised in advance to avoid damage to existing utilities and structures. All existing utilities and structures shall be protected from damage and, if damaged, shall be repaired by this Contractor at their own expense. Should utility lines be encountered within the area of operations, the Contractor shall notify the Architect in ample time for necessary measures to be taken to prevent interruption of service.

3.7 STARTUP

A. See individual Sections for additional requirements for systems, equipment, etc.

3.8 OPERATION AND MAINTNANCE DATA

A. See Division 01 for any additional requirements for Operation and Maintenance Data.

B. Contractor shall deliver one complete set of bookmarked manuals in electronic PDF format of all operation and maintenance manuals to the Owner through the Architect, two (2) weeks before the pre-final inspection is held. The manuals shall be bookmarked to a minimum of one level – i.e.: each major piece of equipment (chiller, boiler switchboard, water closet, water heater, etc.) or document category (warranties, parts list, contact information, etc.) The manuals shall be delivered by one of the following:

1. USB Drive
2. CD/DVD
3. Downloadable file from FTP Site

C. Manuals shall include the following (at a minimum):

1. Index and page numbers
2. Certificate of Substantial Completion
3. Summary sheet of warranties with dates noted and a copy of all warranties
4. List of all subcontractors and suppliers with names, addresses, and phone numbers
5. Special Inspection Reports
6. Certified Test and Balance Report
7. Complete start-up, operation, and shutdown procedures for each system including sequence of events, locations of switches, emergency procedures, and any other critical items. Lubrication schedules and types of lubricants

8. Summary list of all HVAC equipment indicating filter size and numbers of filters in each piece of equipment.
9. Complete set of all submittal data and current shop drawings (including 3rd party generated shop drawings) and equipment description showing all capacities and other operation conditions
10. Equipment summary showing all capacities and ratings (HP, Tons, kW, filter size, etc.)

3.9 PROJECT RECORD DRAWINGS

A. See individual Sections for additional requirements for systems, equipment, etc.

B. See Division 01 for requirements for Project Record Documents.

3.10 DEMONSTRATION AND TRAINING

A. See individual Sections for additional requirements for systems, equipment, etc.

B. See Division 01 for requirements for Demonstration and Training.

END OF SECTION 230500

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

B. Work Included:

1. All power wiring and associated conduit shall be provided to HVAC equipment by the Contractor. The Contractor shall furnish and install all motor starters, disconnect switches, and combination starters for HVAC equipment, including variable speed drives. All final power wiring connections to HVAC equipment shall be made by the Contractor.
2. Provide all control wiring, in conduit, required to satisfactorily control all equipment included in this section. Furnish and wire all control devices such as thermostats, switches, relays and any other devices necessary to control the equipment furnished in this section.
3. Contractor shall provide power wiring and conduit to all damper and valve actuators.
4. Duct mounted smoke detectors shall be furnished by the Contractor and installed in duct work by the Contractor, including wiring to the fire alarm system.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F, unless otherwise indicated.

J. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width-modulated inverters.
2. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
5. Motors served by variable speed drives shall be provided with shaft grounding rings.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive field-installed motors for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in of conduit systems to verify actual locations of conduit connections before motor installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 MOTOR INSTALLATION

A. Anchor each motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and align with load transfer link.

B. Comply with mounting and anchoring requirements specified in Division 23 Section "Mechanical Vibration and Seismic Controls."

C. Equipment overcurrent protection and conductors in the electrical contract shall be sized to accommodate most major brands of HVAC equipment. If the Contractor choses to use an item of equipment that exceeds the capacity of the electrical overcurrent protection and conductors, or requires multiple circuits, the Contractor shall be responsible for any additional cost required to increase the size of the overcurrent protection and conductors or provide the additional circuits and disconnects at no additional cost to the Owner. Contractor shall also coordinate this work with any other Contractors to assure proper electrical service to the equipment.

3.3 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Run each motor with its controller. Demonstrate correct rotation, alignment, and speed at motor design load.
2. Test interlocks and control features for proper operation.
3. Verify that current in each phase is within nameplate rating.

3.4 ADJUSTING

A. Align motors, bases, shafts, pulleys and belts. Tension belts according to manufacturer's written instructions.

3.5 CLEANING

A. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean motors, on completion of installation, according to manufacturer's written instructions.

END OF SECTION 230513

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Plastic pipe hangers and supports.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Requirements:

1. Section 233113 "Metal Ducts" for duct hangers and supports.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions as required.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Hot-dip galvanized or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated, or epoxy powder-coated.
4. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe and Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-plated steel, or epoxy-coated steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.3 PLASTIC PIPE HANGERS

A. Description: Similar to MSS SP-58, Types 1 through 58, factory-fabricated steel pipe hanger except hanger is made of plastic.

B. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel.

C. Flammability: ASTM D 635, ASTM E 84, and UL 94.

2.4 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Description: Shop- or field-fabricated, pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Channels: Continuous slotted carbon-steel channel with inturned lips.
4. Channel Width: Selected for applicable load criteria.
5. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Manufacturer’s standard galvanized finish except nonmetallic coating for electrolytic protection where systems are in direct contact with copper tubing.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Description: Shop- or field-fabricated, pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Channels: Continuous slotted carbon-steel channel with inturned lips.
4. Channel Width: Select for applicable load criteria.
5. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: No coating.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psi or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psi minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: Water-repellent-treated, ASTM C 533, Type I calcium silicate with 100-psi or ASTM C 552, Type II cellular glass with 100-psi minimum compressive strength.

C. For Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type anchors for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Indoor Applications: Zinc-coated or stainless-steel.
2. Outdoor Applications: Stainless steel.

2.7 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand:

1. Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
2. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
3. Hardware: Galvanized steel or polycarbonate.
4. Accessories: Protection pads.

C. Low-Profile, Single Base, Single-Pipe Stand:

1. Description: Single base with vertical and horizontal members, and pipe support, for roof installation without membrane protection.
2. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
3. Vertical Members: Two, galvanized-steel, continuous-thread 1/2-inch rods.
4. Horizontal Member: Adjustable horizontal, galvanized-steel pipe support channels.
5. Pipe Supports: Strut clamps or Clevis hanger.
6. Hardware: Galvanized steel.
7. Accessories: Protection pads.
8. Height: 12 inches above finished roof.

D. High-Profile, Single Base, Single-Pipe Stand:

1. Description: Single base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: Single vulcanized rubber or molded polypropylene.
3. Vertical Members: Two, galvanized-steel, continuous-thread 1/2-inch rods.
4. Horizontal Member: One, adjustable height, galvanized-steel pipe support slotted channel or plate.
5. Pipe Supports: Clevis hanger.
6. Hardware: Galvanized steel.
7. Accessories: Protection pads, 1/2-inch continuous-thread galvanized-steel rod.
8. Height: 36 inches above finished roof.

E. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.9 MATERIALS

A. Aluminum: ASTM B 221.

B. Carbon Steel: ASTM A 1011/A 1011M.

C. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; galvanized.

D. Stainless Steel: ASTM A 240/A 240M.

E. Threaded Rods: Continuously threaded. Zinc-plated or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar materials as rods.

F. Grout: ASTM C 1107/C 1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled strut systems.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating Below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 2 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in Section 099113 "Exterior Painting" or Section 099123 "Interior Painting" per installed location for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780/A 780M.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal framing systems and attachments for general service applications.

F. Use copper-plated or epoxy-coated pipe hangers and similar attachments for copper piping and tubing.

G. Use plastic or carbon-steel hangers and supports for PP-R piping per piping manufacturer's installation instructions.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
8. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
9. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
10. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
11. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.

12. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
13. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
14. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
15. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is unnecessary.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.

11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

O. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction after concrete is placed and completely cured.

END OF SECTION 230529

SECTION 230549 - VIBRATION CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device type required.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
2. Size: Factory or field cut to match requirements of supported equipment.
3. Pad Material: Oil and water resistant with elastomeric properties.
4. Surface Pattern: Waffle pattern.
5. Infused nonwoven cotton or synthetic fibers.

6. Load-bearing core metal plates adhered to pads.

2.2 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:

1. Mounting Plates:

a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded.
b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

2. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.3 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:

1. Description: All-directional isolator with restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

a. Housing: Cast-ductile iron or welded steel.
b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 VIBRATION CONTROL DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete" or Section 033053 "Miscellaneous Cast-in-Place Concrete."

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

3.3 VIBRATION ISOLATION EQUIPMENT BASES INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete" or Section 033053 "Miscellaneous Cast-in-Place Concrete."

3.4 ADJUSTING

A. Adjust isolators after equipment and systems have been filled and/are operating condition.

END OF SECTION 230549

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Provide for new piping and equipment.

B. Section Includes:

1. Equipment and Access Panel and Door labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve tags.
5. Warning tags.
6. Accessible acoustical ceiling markers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Valve numbering scheme.

D. Equipment Schedules: For each HVAC system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND ACCESS PANEL AND DOOR LABELS

A. Plastic Labels for Equipment, Access Panels and Doors:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick and having predrilled holes if necessary for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content:

1. Equipment Number.
2. Area(s) Served.
3. Substantial Completion Date.
4. Number and Size of Filters.
5. Number and Size of Belts.
6. Design Capacity including Airflow CFM, Cooling, Heating, etc.
7. Labels on Access Panels and Doors shall have abbreviated terms and numbers corresponding to item accessed through panel or door.

C. Equipment Schedule: For each item of HVAC equipment in a mechanical room, on 8-1/2-by-11-inch bond paper, tabulate:

1. Equipment description.
2. Equipment designation
3. Model number.
4. Serial number.
5. WCPSS Maximo number.
6. Substantial Completion Date.
7. For Equipment Schedule for mechanical rooms with air handling units, etc., include filter size and quantity and belt size and quantity.

D. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

G. Fasteners: Stainless-steel self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

D. Lettering:

1. Refrigerant: REF.
2. Condensate: COND.

2.4 VALVE TAGS

A. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass, wire-link chain or beaded chain.

B. Valve Schedules: No valve schedules will be required for mounting in mechanical rooms or in operation and maintenance data.

2.5 WARNING TAGS

A. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Safety-yellow background with black lettering.

2.6 ACCESSIBLE ACOUSTICAL CEILING MARKERS

A. Description:

1. Self-adhering dot, 1-inch diameter maximum. For color see Accessible Acoustical Ceiling Marker Installation paragraph.
2. Printed self-adhering tape label, 1-inch maximum in height, 18-point font minimum lettering, black lettering on white tape.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT, ACCESS PANEL, AND DOOR LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment or door.

B. Locate equipment labels where accessible and visible.

C. Verify proposed fastener penetration area prior to penetrating surfaces with screws. Do not use screws for label attachment in any location where fastener will penetrate into an area of concealed wiring, electrical components, or sensitive equipment, or where the exposed tip of the

fastener may present a hazard to personnel performing maintenance. In such conditions, use adhesive as specified.

3.4 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 10 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings, omit intermediately spaced labels.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

C. All underground piping shall be marked with a bright colored continuous printed magnetic tape on top of the line, 6” wide x 4 mils thick multi-ply tape, solid aluminum foil core between two layers of plastic tape.

D. Pipe Label and Flow Arrow Color Schedule:

1. Color-coded according to ASME A13.1.

3.5 DAMPER MARKERS

A. Mark locations of manual balancing dampers by spray painting handles red.

3.6 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Refrigerant: 1-1/2 inches, round.

2. Valve-Tag Colors:

a. Refrigerant: Natural.

3.7 EQUIPMENT SCHEDULE INSTALLATION

A. Equipment schedule shall also be mounted on wall under glass in a frame in each major mechanical room.

3.8 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

3.9 ACCESSIBLE ACOUSTICAL CEILING MARKER INSTALLATION

A. Install dot and label on accessible acoustical ceiling grid below items located above the ceiling in the following dot color codes:

1. Neon Yellow: For mechanical equipment, dampers including fire and combination dampers, access doors, etc.

B. Label shall indicate the type of device or valve and its associated service (e.g. “Shutoff Valve – HW”; “VAV 2-21”).

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.

2. Testing, Adjusting, and Balancing Equipment:

a. Motors.
b. Heat-transfer coils.

3. Control system verification.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. BAS: Building automation systems.

C. NEBB: National Environmental Balancing Bureau.

D. TAB: Testing, adjusting, and balancing.

E. TABB: Testing, Adjusting, and Balancing Bureau.

F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

G. TDH: Total dynamic head.

1.4 PREINSTALLATION MEETINGS

A. TAB Conference: If requested by the Owner, conduct a TAB conference after approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.

1. Minimum Agenda Items:

    a. The Contract Documents examination report.
    b. The TAB plan.
    c. Needs for coordination and cooperation of trades and subcontractors.
    d. Proposed procedures for documentation and communication flow.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 45 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. System Readiness Checklists: Within 60 days of Contractor's Notice to Proceed, submit system readiness checklists as specified in "Preparation" Article.

E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.

F. Certified TAB reports.

G. Sample report forms.

H. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.6 QUALITY ASSURANCE

A. TAB Specialists Qualifications: Certified by AABC or NEBB.

1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC or NEBB.
2. TAB Technician: Employee of the TAB specialist and certified by AABC or NEBB as a TAB technician.

B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements of AABC or NEBB.

1.7 FIELD CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.8 COORDINATION

A. Perform testing, adjusting, and balancing after all systems have been shown to be installed and satisfactorily in full working order in both heating and cooling.

B. Perform testing, adjusting, and balancing after leakage and pressure testing for air and water systems have been satisfactorily completed.

C. Notify Architect, Engineer, WCPSS, and Commissioning Authority 7 days in advance of each testing and balancing so that there is the opportunity to witness.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible, and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.

L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes the following:

1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.
3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
b. Duct systems are complete with terminals installed.
c. Volume, smoke, and fire dampers are open and functional.
d. Clean filters are installed.
e. Fans are operating, free of vibration, and rotating in correct direction.
f. Variable-frequency controllers' startup is complete, and safeties are verified.
g. Automatic temperature-control systems are operational.
h. Ceilings are installed.
i. Windows and doors are installed.
j. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
    d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

2. Measure fan static pressures as follows:

    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.
    c. Measure static pressure across each component that makes up the air-handling system.
    d. Report artificial loading of filters at the time static pressures are measured.

3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.
2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

D. Verify final system conditions.

1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
2. Re-measure and confirm that total airflow is within design.
3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
4. Mark all final settings.
5. Test system in economizer mode. Verify proper operation and adjust if necessary.
6. Measure and record all operating data.
7. Record final fan-performance data.

3.6 PROCEDURES FOR MOTORS

A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test manual bypass of controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, nameplate data, and final settings.

3.7 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air for cooling coils.

3. Airflow.
4. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

3.8 CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:

1. Verify temperature control system is operating within the design limitations.
2. Confirm that the sequences of operation are in compliance with Contract Documents.
3. Verify that controllers are calibrated and function as intended.
4. Verify that controller set points are as indicated.
5. Verify the operation of lockout or interlock systems.
6. Verify the operation of valve and damper actuators.
7. Verify that controlled devices are properly installed and connected to correct controller.
8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.9 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.10 PROGRESS REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems balancing devices. Recommend changes and additions to systems balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC

systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

A. General: Prepare a certified typewritten report in letter-quality font, in 3-ring binder; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

a. Settings for outdoor-, return-, relief-, and exhaust-air dampers.
b. Conditions of filters.
c. Cooling coil, wet- and dry-bulb conditions.
d. Face and bypass damper settings at coils.
e. Fan drive settings including settings and percentage of maximum pitch diameter.
f. Inlet vane settings for variable-air-volume systems.
g. Settings for supply-air, static-pressure controller.
h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Pipe and valve sizes and locations.
4. Terminal units.
5. Balancing stations.
6. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Center-to-center dimensions of sheave and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.

f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.
l. Return-air damper position.
m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft.
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Refrigerant expansion valve and refrigerant types.
i. Refrigerant suction pressure in psig.
j. Refrigerant suction temperature in deg F.

G. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Coil identification.
d. Capacity in Btu/h.
e. Number of stages.
f. Connected volts, phase, and hertz.
g. Rated amperage.
h. Airflow rate in cfm.
i. Face area in sq. ft.

j. Minimum face velocity in fpm.

2. Test Data (Indicated and Actual Values):

a. Heat output in Btu/h.
b. Airflow rate in cfm.
c. Air velocity in fpm.
d. Entering-air temperature in deg F.
e. Leaving-air temperature in deg F.
f. Voltage at each connection.
g. Amperage for each phase.

H. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

I. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F.

d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft.
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

J. Air-Terminal-Device Reports – Supply, Return, and Exhaust Airflows:

1. Unit Data:

a. System and air-handling unit or power ventilator identification.
b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Air velocity in fpm.
c. Preliminary airflow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final airflow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

K. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. Water pressure drop in feet of head or psig.
e. Entering-air temperature in deg F.
f. Leaving-air temperature in deg F.

L. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.

3.12 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating duct services.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

1.4 INFORMATIONAL SUBMITTALS

A. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

B. Storage: Protect insulation from weather, moisture, and dirt.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

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

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket.

1. Subject to compliance with requirements, provide products by the following: Certainteed, Owen Corning, Knauf, or Johns-Manville.

F. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket.

1. Subject to compliance with requirements, provide products by the following:Insulation shall be Certainteed, Owen Corning, Knauf, or Johns-Manville.

G. If necessary to attain zero clearance to combustibles, grease exhaust ductwork will be wrapped with two layers of fire-rated duct wrap consisting of an inorganic fiber blanket encapsulated with a scrim-reinforced foil. Duct wrap will be UL listed and certified to ASTM E2336 (grease duct test standard) and ISO 6944 (air duct test standard). Manufacturer's ASTM E 2336 tested access door system will be provided where required.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
4. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
2. Service Temperature Range: Minus 50 to plus 220 deg F.
3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
4. Color: White.

2.4 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
2. Service Temperature Range: 0 to plus 180 deg F.
3. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.8 SECUREMENTS

A. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated.
2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

    a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
    b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.

c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
c. Adhesive-backed base with a peel-off protective cover.

5. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

B. Wire: 0.062-inch soft-annealed, stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
3. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, tape, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Floor, Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Floor, Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums, including Air Diffusers, Registers and Grilles: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.

f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, including air diffusers, registers and grilles, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with tape. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

   a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
   b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
   c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
   d. Do not overcompress insulation during installation.
   e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with tape. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply, return, relief, and outdoor air, including air diffusers, registers and grilles.
2. Indoor, exposed supply, return, relief, and outdoor air, including air diffusers, registers and grilles.
3. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed above a ceiling, rectangular, round, and flat-oval, supply, return, relief, and outside-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.0-lb/cu. ft. nominal density.

B. Exposed in finished areas and in mechanical equipment rooms, rectangular, round, and flat-oval, supply, return, relief, and outside-air duct insulation shall be the following:

1. Mineral-Fiber Board: 2 inches thick R-8.0.

3.8 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. None.

D. Ducts and Plenums, Exposed:

1. None.

3.9 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

B. Rectangular and round, supply, return, exhaust, and outside-air duct and plenum insulation shall be the following:

1. Mineral-Fiber Board: 2 inches thick R-8.0.

3.10 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material where ductwork is outdoors. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Ducts and Plenums:

1. Self-Adhesive Outdoor Jacket sealing system.

END OF SECTION 230713

SECTION 230923 - DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, configuration and installation for complete building automation system (BAS) (also identified as BMS, Direct Digital Control System For HVAC) including all necessary hardware and all operating and applications software as required for the complete performance of the Work, as shown on the Drawings, as specified herein.

B. Furnish and install controls as necessary for existing packaged heat pump and its space sensor to remain in operation and fully connected to and integrated with the building's existing TAC/CSI DDC system to fulfill the intent of the drawings and specifications, including DDC graphics. The systems shall include all necessary labor, electrical wiring, devices, and materials for a complete installed control system.

C. The new DOAS unit and hood exhaust fans shall not be connected to the existing building control system but shall operate independently. The new DOAS unit shall have a web-based user interface that shall be connected to the building's wi-fi system via a Pender County School furnished IP address and access.

D. When the existing DDC system is replaced in the future, this equipment will be connected to the new BAS DDC at that time.

E. Related Sections: Related sections include, but shall not be limited to, the following:

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
2. Applicable general requirements for electrical Work specified within Divisions 23 and 26 Specification Sections apply to this Section.

F. Except as otherwise noted, the control system shall consist of all necessary Controllers, Standalone Digital Control Units, Room Controllers, workstations, software, sensors, transducers, relays, valves, dampers, damper operators, control panels, and other accessory equipment, along with a complete system of electrical interlocking wiring to fill the intent of the specification and provide for a complete and operable system. Except as otherwise specified, provide operators for equipment such as dampers if the equipment manufacturer does not provide these. Coordinate requirements with the various Contractors.

G. The BAS system supplier shall review and study all HVAC drawings and the entire specification to familiarize themselves with the equipment and system operation and to verify the quantities and types of dampers, operators, alarms, etc. to be provided.

H. All interlocking wiring, wiring and installation of control devices associated with the equipment listed below shall be provided under this Contract in accordance with the Electrical Division, Division 26, of these specifications. When the new portion of the BAS system is fully installed

and operational, the BAS system supplier and representatives of the Owner will review and check out the system. At that time, the BAS system supplier shall demonstrate the operation of the system and prove that it complies with the intent of the drawings and specifications.

I. Provide services and manpower necessary for commissioning and checkout of the system in coordination with the HVAC Contractor, Balancing Contractor and Owner's representative.

J. All work performed under this section of the specifications shall comply with all governing codes, laws and governing bodies. If the drawings and/or specifications are in conflict with governing codes, the Contractor, with guidance from the engineer, shall submit a proposal with appropriate modifications to the project to meet code restrictions. If this specification and associated drawings exceed governing code requirements, the specification shall govern. The Contractor shall obtain and pay for all necessary construction permits and licenses.

K. The exact location of instruments, panelboards, accessories, etc., not definitely located shall be approved by the Owner or his representative. All automatic controls and accessories shall be located in accessible locations. All non-panel, as well as panel mounted instruments, shall be clearly labeled as to use, position and system served by means of engraved phenolic nameplates.

1.2 SUBMITTALS

A. General: Submittals shall be in accordance with the requirements of Division 01, in addition to those specified herein.

1. All shop drawings shall be prepared in Visio Professional or AutoCAD software. In addition to the drawings, the Contractor shall furnish electronically the identical information. Drawings shall be B size or larger.
2. Shop drawings shall include a riser diagram depicting locations of all controllers and workstations, with associated network wiring. Also included shall be individual schematics of each mechanical system showing all connected points with reference to their associated controller. Typicals will be allowed where appropriate.
3. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification. Valve, damper and air flow station schedules shall indicate size, configuration, capacity and location of all equipment.
4. Submit electronic copies of submittal data and shop drawings to the Engineer for review prior to ordering or fabrication of the equipment. The Contractor, prior to submitting, shall check all documents for accuracy.
5. The Engineer will make corrections, if required, and return to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.
6. The following is a list of post construction submittals that shall be updated to reflect any changes during construction and re-submitted as for record.

    a. System architecture drawing.
    b. Layout drawing for each control panel
    c. Wiring diagram for individual components
    d. System flow diagram for each controlled system
    e. Instrumentation list for each controlled system
    f. Sequence of control

g. Operation and Maintenance Manuals – at project completion

7. Information common to the entire system shall be provided. This shall include but not be limited to the following.

a. Product manuals for the key software tasks.
b. Operating the system.
c. Administrating the system.
d. Engineering the operator workstation.
e. Application programming.
f. Engineering the network.
g. Setting up the web server.
h. Report creation.
i. Graphics creation.
j. All other engineering tasks.
k. System Architecture Diagram.
l. Names, addresses, and telephone numbers of installing contractors and service representatives for equipment and control systems.
m. Licenses, guarantees, and warranty documents for equipment and systems.
n. Submit one copy for each building, plus two extra copies.

8. Information common to the systems in a single building shall be provided.

a. System architecture diagram for components within the building annotated with specific location information.
b. Record drawing for each control panel.
c. Record drawing wiring design diagram for all components.
d. Installation design details for each I/O device.
e. Record drawing system flow diagram for each system.
f. Sequence of control for each system.
g. Product data sheet for each component.
h. Installation data sheet for each component.
i. Submit two copies for each building and two extra copies.

9. Software shall be provided:

a. Submit a copy of all software installed on the servers and workstations.
b. Submit all licensing information for all software installed on the servers and workstations.
c. Submit a copy of all software used to execute the project even if the software was not installed on the servers and workstations.
d. Submit all licensing information for all of the software used to execute the project.
e. All software revisions shall be as installed at the time of the system acceptance.
f. Firmware Files
g. Submit a copy of all firmware files that were downloaded to or pre-installed on any devices installed as part of this project.
h. This does not apply to firmware that is permanently burned on a chip at the factory and can only be replaced by replacing the chip.
i. Submit a copy of all application files that were created during the execution of the project.
j. Submit a copy of all graphic page files created during the execution of the project.

1.3 QUALITY ASSURANCE

A. All bidders must be building automation contractors in the business of installing direct digital control building automation systems for a minimum of 5 years.

1. The contractor shall have a full service facility within 200 miles of the project that is staffed with engineers trained and certified by the manufacturer in the configuration, programming and service of the automation system. The contractor's technicians shall be fully capable of providing instructions and routine emergency maintenance service on all system components.

B. All bidders must be authorized distributors or branch offices of the manufacturers specified.

C. Each point in the new portions of the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the BAS shall be tested against the appropriate sequence of operation specified herein. Successful completion of the system test shall constitute the beginning of the warranty period. A written report shall be submitted to the owner indicating that the installed system functions in accordance with the plans and specifications.

D. The BAS system supplier shall commission and set in operating condition all major equipment (controls) and systems, such as the chilled water, hot water and all air handling systems, in the presence of the equipment manufacturer's representatives, as applicable, and the Owner and Architect's representatives.

E. The BAS system supplier shall provide a technician if required to assist the other contractors in testing, adjusting, and balancing all systems in the building. The BAS system supplier shall coordinate all requirements to provide a complete air balance with that contractor and shall include all labor and materials in their contract.

F. Startup Testing shall be performed for each task on the startup test checklist, which shall be initialed by the technician and dated upon test was completion along with any recorded data such as voltages, offsets or tuning parameters. Any deviations from the submitted installation plan shall also be recorded.

G. For new portions of the system, required elements of the startup testing include:

1. Measurement of voltage sources, primary and secondary
2. Verification of proper controller power wiring.
3. Verification of component inventory when compared to the submittals.
4. Verification of labeling on components and wiring.
5. Verification of connection integrity and quality (loose strands and tight connections).
6. Verification of bus topology, grounding of shields and installation of termination devices.
7. Verification of point checkout.
8. Each I/O device is landed per the submittals and functions per the sequence of control.
9. Analog sensors are properly scaled and a value is reported
10. Binary sensors have the correct normal position and the state is correctly reported.
11. Analog outputs have the correct normal position and move full stroke when so commanded.
12. Binary outputs have the correct normal state and respond appropriately to energize/de-energize commands.

13. Documentation of analog sensor calibration (measured value, reported value and calculated offset).
14. Documentation of Loop tuning (sample rate, gain and integral time constant).

H. For new portions of the system, a performance verification test shall also be completed for the operator interaction with the system. Test elements shall be written to require the verification of all operator interaction tasks including, but not limited to the following.

1. Graphics navigation.
2. Trend data collection and presentation.
3. Alarm handling, acknowledgement and routing.
4. Time schedule editing.
5. Application parameter adjustment.
6. Manual control.
7. Report execution.
8. Automatic backups.
9. Web Client access.

1.4 COORDINATION

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

B. Coordinate equipment from other divisions including "Intrusion Detection," "Lighting Controls," "Motor Control Centers," "Panel boards," and "Fire Alarm" to achieve compatibility with equipment that interfaces with those systems.

C. Coordinate with the Owner's IT department on locations for controllers, communication cabling, LAN drops, and TCP/IP addresses.

1.5 OWNERSHIP

A. The Owner shall retain licenses to software for the project.

B. The Owner shall sign a copy of the manufacturer’s standard software and firmware licensing agreement as a condition off the contractor. Such licenses grant use of all programs and application software to the Owner as defined by the manufacturer’s license agreement but shall protect the manufacturer’s rights to disclosure of Trade Secrets contained within such software.

C. The licensing agreement shall not preclude the use of the software by individuals under contract to the owner for commissioning, servicing or altering the system in the future. Use of the software by individuals under contract to the owner shall be restricted to use on the owner’s computers and only for the purpose of commissioning, servicing, or altering the installed system.

D. All project developed software, files and documentation shall become the property of the Owner. These include but are not limited to:

1. Server and workstation software
2. Application programming tools

3. Configuration tools
4. Network diagnostic tools
5. Addressing tools
6. Application files
7. Configuration files
8. Graphic files
9. Report files
10. Graphic symbol libraries
11. All documentation

1.6 WARRANTY

A. All components, system software, and parts furnished and installed by the BMS system supplier shall be guaranteed against defects in materials and workmanship in accordance with Division 01 of the specifications. Labor to repair, reprogram, or replace these components shall be furnished by the BMS system supplier at no charge during normal working hours during the warranty period. Materials furnished but not installed by the BMS system supplier shall be covered to the extent of the product only. Installation labor shall be the responsibility of the trade contractor performing the installation. All corrective software modifications made during warranty periods shall be updated on all user documentation and on user and manufacturer archived software disks. The Contractor shall respond to the Owner's request for warranty service within 24 standard working hours.

PART 2 - PRODUCTS

2.1 SYSTEM ARCHITECTURE

A. General

1. The Building Automation System (BAS) shall consist of controllers, etc. as necessary to fully integrate with and connect with the existing building DDC system.

2.2 DDC SENSORS AND POINT HARDWARE

A. Temperature Sensors: Shall match existing.

1. Acceptable Manufacturers: Schneider Electric or Veris industries
2. Room Sensor: Shall match existing.
3. Duct Probe Sensor: Shall match existing.
4. Duct Averaging Sensor: Shall match existing.

B. Current Sensors

1. Current status switches shall be used to monitor fans, pumps, motors and electrical loads. Current switches shall be available in split core models and offer either a digital or an analog signal to the automation system.
2. Acceptable manufacturers are Schneider Electric or Veris industries

C. Current Status Switches for motor status on all except ECM motors

1. General: Factory programmed current sensor to detect motor undercurrent situations such as belt or coupling loss on constant loads. Sensor shall store motor current as operating parameter in non-volatile memory. Push-button to clear memory.
2. Visual LED indicator for status.
3. Split core sensor, induced powered from monitored load and isolated to 600 VAC rms. Sensor shall indicate status from 0.5 A to 175 A.
4. Normally open current sensor output. 0.1A at 30 VAC/DC.
5. Basis of Design: Veris Model H608.
6. ECM motors, Basis of Design: ACI Model ECMCS25-A (less than 5HP), Veris Model H6ECM05 (above 5HP)

D. Dampers

1. See Section 23 33 00 Air Duct Accessories for specification of dampers.
2. Provide opposed blade dampers for modulating applications and parallel blade for two position control.

E. Damper Actuators

1. Direct-coupled type non-hydraulic designed for minimum 100,000 full-stroke cycles at rated torque.
2. Direct-coupled damper actuators must have a five-year warrantee.
3. Size for torque required for damper seal at maximum design conditions and valve close-off pressure for system design.
4. Direct-coupled damper actuators should accommodate 3/8", ½" 1.05" round or 3/8", ½" and ¾" square damper shafts.
5. Actuator operating temperature minimum requirements: 44, 88 and 133 lb.-in. are –25°F - 30°F (–32°C - 55°C). The 30, 35, 60, 150 and 300 lb.-in. are -25° - 140°F (-30°C - 60 °C). The 270 are -22° - 122°F (-30°C - 50 °C).
6. Overload protected electronically throughout rotation except for selected Floating actuators the have a mechanical clutch.
7. Spring Return Actuators: Mechanical fail safe shall incorporate a spring-return mechanism.
8. Non-Spring Return Actuators shall stay in the position last commended by the controller with an external manual gear release to allow positioning when not powered.
9. Power Requirements: 24Vac/dc.
10. Proportional Actuators controller input range from 0 - 10 Vdc, 2 - 10 Vdc or 4 - 20 mA models.
11. Housing: Minimum requirement NEMA type 2 with NEMA type 4 available for applications requiring higher ratings.
12. Actuators with a microprocessor should not be able to be modified by an outside source (cracked or hacked).
13. Actuators of 133 and 270 lb.-in. of torque or more should be able to be tandem mount or "gang" mount.
14. Agency Listings: ISO 9001, cULus, CE and CSA
15. Basis of Design: Schneider Electric SpaceLogic Actuators or approved equal.

F. Airflow Measuring Stations

1. Provide a thermal anemometer using instrument grade self heated thermistor sensors with thermistor temperature sensors.
2. The flow station shall operate over a range of 0 to 5,000 feet/min with an accuracy of +/- 2% over 500 feet/min and +/- 10 ft/min for reading less than 500 feet/min.

PART 3 - EXECUTION

3.1 GENERAL

A. In addition to the requirements specified herein, execution shall be in accordance with the requirements of Specification Section 23 00 00 and Drawings.

B. Examine equipment exterior and interior prior to installation. Report any damage and do not install any equipment that is structurally, moisture, or mildew damaged.

C. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

D. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

E. Install equipment in accordance with reviewed product data, final shop drawings, manufacturer’s written instructions and recommendations, and as indicated on the Drawings.

F. Provide final protection and maintain conditions in a manner acceptable to the manufacturer that shall help ensure that the equipment is without damage at time of Substantial Completion.

G. Demolition

1. Remove controls which do not remain as part of the building automation system, all associated abandoned wiring and conduit, and all associated pneumatic tubing. The Owner will inform the Contractor of any equipment which is to be removed that will remain the property of the Owner. All other equipment which is removed will be disposed of by the Contractor.

H. Access to Site

1. Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the Owner or the Owner’s Representative.

I. Code Compliance

1. All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer's recommendations. Should any discrepancy be found between wiring specifications in Division 17 and Division 16, wiring requirements of Division 17 will prevail for work specified in Division 17.

J. Cleanup

1. At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract.

3.2 SYSTEM ACCEPTANCE TESTING – FOR NEW PORTIONS OF THE SYSTEM

A. All application software will be verified and compared against the sequences of operation.

B. Control loops will be exercised by inducing a setpoint shift of at least 10% and observing whether the system successfully returns the process variable to setpoint. Record all test results and attach to the Test Results Sheet.

C. Test each alarm in the system and validate that the system generates the appropriate alarm message, that the message appears at all prescribed destinations (workstations or printers), and that any other related actions occur as defined (i.e. graphic panels are invoked, reports are generated, etc.). Submit a Test Results Sheet to the owner.

D. Perform an operational test of each unique graphic display and report to verify that the item exists, that the appearance and content are correct, and that any special features work as intended. Submit a Test Results Sheet to the owner.

E. Perform an operational test of each third party interface that has been included as part of the automation system. Verify that all points are properly polled, that alarms have been configured, and that any associated graphics and reports have been completed. If the interface involves a file transfer over Ethernet, test any logic that controls the transmission of the file, and verify the content of the specified information.

3.3 INSTALLATION

A. Hardware Installation Practices for Wiring

1. All controllers are to be mounted vertically and per the manufacturer’s installation documentation.
2. The 120VAC power wiring to each Ethernet or Remote Site controller shall be a dedicated run (or as identified on Electrical drawings), with a separate breaker. Each run will include a separate hot, neutral and ground wire. The ground wire will terminate at the breaker panel ground. This circuit will not feed any other circuit or device.
3. A true earth ground must be available in the building. Do not use a corroded or galvanized pipe, or structural steel.
4. For control wiring above accessible ceilings: Wires are to be attached to the building proper (or J hooks) at regular intervals such that wiring does not droop. Wires are not to be affixed to or supported by pipes, conduit, etc.
5. Conduit in finished areas will be concealed in ceiling cavity spaces, plenums, furred spaces and wall construction. Exception; metallic surface raceway may be used in finished areas on masonry walls. All surface raceway in finished areas must be color matched to the existing finish within the limitations of standard manufactured colors.

6. Conduit, in non-finished areas where possible, will be concealed in ceiling cavity spaces, plenums, furred spaces, and wall construction. Exposed conduit will run parallel to or at right angles to the building structure. Conduit and junction box covers shall be blue in color.
7. Wires are to be kept a minimum of three (3) inches from hot water, steam, or condensate piping.
8. Where sensor wires leave the conduit system, they are to be protected by a plastic insert.
9. Wire shall not be allowed to run across telephone equipment areas.
10. Provide fire caulking at all rated penetrations.

B. Installation Practices for Field Devices

1. Well-mounted sensors shall include thermal conducting compound within the well to insure good heat transfer to the sensor.
2. Actuators shall be firmly mounted to give positive movement and linkage shall be adjusted to give smooth continuous movement throughout 100 percent of the stroke.
3. Relay outputs shall include transient suppression across all coils. Suppression devices shall limit transients to 150% of the rated coil voltage.
4. Water line mounted sensors shall be removable without shutting down the system in which they are installed.
5. For duct static pressure sensors, the high pressure port shall be connected to a metal static pressure probe inserted into the duct pointing upstream. The low pressure port shall be left open to the plenum area at the point that the high pressure port is tapped into the ductwork.
6. For building static pressure sensors, the high pressure port shall be inserted into the space via a metal tube. Pipe the low pressure port to the outside of the building.

C. Wiring, Conduit, and Cable

1. All wire shall be copper and meet the minimum wire size and insulation class listed below:

    a. Power - 12 Gauge - 600 Volt
    b. Class One - 14 Gauge Std. - 600 Volt
    c. Class Two - 18 Gauge Std. - 300 Volt
    d. Class Three - 18 Gauge Std. - 300 Volt
    e. Communications - Per Mfr.

2. Power and Class One wiring may be run in the same conduit. Class Two and Three wiring and communications wiring may be run in the same conduit.
3. Where different wiring classes terminate within the same enclosure, maintain clearances and install barriers per the National Electric Code.
4. Where wiring is required to be installed in conduit, conduit shall be the requirements of Division 26.
5. Conduit shall be blue in color.
6. Flexible metallic conduit (max. 24”) shall be used for connections to motors, actuators, controllers, and sensors mounted on vibration producing equipment. Liquid-tight flexible conduit shall be use in exterior locations and interior locations subject to moisture.
7. Junction boxes shall be provided at all cable splices, equipment termination, and transitions from EMT to flexible conduit. Interior dry location J-boxes shall be galvanized pressed steel, nominal four-inch square with blank cover. Exterior and damp location JH-boxes shall be cast alloy FS boxes with threaded hubs and gasketed covers.

8. Where the space above the ceiling is a supply or return air plenum, the wiring shall be plenum rated. Teflon wiring can be run without conduit above suspended ceilings. EXCEPTION: Any wire run in suspended ceilings that is used to control outside air dampers or to connect the system to the fire management system shall be in conduit.
9. Fiber optic cable shall include the following sizes; 50/125, 62.5/125 or 100/140.
10. Only glass fiber is acceptable, no plastic.
11. Fiber optic cable shall only be installed and terminated by an experienced contractor. The BAS system supplier shall submit to the Engineer the name of the intended contractor of the fiber optic cable with their submittal documents.

D. Enclosures

1. For all I/O requiring field interface devices, these devices where practical shall be mounted in a field interface panel (FIP). The Contractor shall provide an enclosure which protects the device(s) from dust, moisture, conceals integral wiring and moving parts.
2. FIPs shall contain power supplies for sensors, interface relays and contactors, and safety circuits.
3. The FIP enclosure shall be of steel construction with baked enamel finish; NEMA 1 rated with a hinged door and keyed lock. The enclosure shall be sized for twenty percent spare mounting space. All locks shall be keyed identically.
4. All wiring to and from the FIP shall be to screw type terminals. Analog or communications wiring may use the FIP as a raceway without terminating. The use of wire nuts within the FIP is prohibited.
5. All outside mounted enclosures shall meet the NEMA-4 rating.
6. The wiring within all enclosures shall be run in plastic track. Wiring within controllers shall be wrapped and secured.

E. Identification

1. Identify all control wires with labeling tape or sleeves using words, letters, or numbers that can be exactly cross-referenced with as-built drawings.
2. All field enclosures, other than controllers, shall be identified with a Bakelite nameplate. The lettering shall be in white against a black or blue background.
3. Junction box covers shall be painted blue and marked to indicate that they are a part of the BAS system.
4. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with name plates.
5. All I/O field devices inside FIP's shall be labeled.

F. Location

1. The location of sensors shall be per mechanical drawings.
2. Space temperature sensors shall be mounted away from machinery generating heat, direct light and diffuser air streams.
3. Outdoor air sensors shall be mounted on the north building face directly in the outside air. Install these sensors such that the effects of heat radiated from the building or sunlight is minimized.
4. Field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced.

G. Software Installation

1. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software or other third party software necessary for successful operation of the system.

3.4 TRAINING

A. The BAS provider shall provide on-site training to the Owner's representative and maintenance personnel for the new portions of the system as necessary.

3.5 CONTROL SYSTEM SWITCH-OVER

A. Demolition of the existing control system shall occur after the new temperature control system is in place including new sensors and new field interface devices.

B. Switch-over from the existing control system to the new system shall be fully coordinated with the Owner. A representative of the Owner will be on site during switch-over.

C. The Contractor shall minimize control system downtime during switch-over. Sufficient installation mechanics will be on site so that the entire switch-over can be accomplished in a reasonable time frame.

3.6 DATABASE CONFIGURATION.

A. The Contractor shall provide all labor to configure those portions of the database that are required by the points list and sequence of operation.

3.7 COLOR GRAPHIC DISPLAYS.

A. Unless otherwise directed by the owner, the Contractor shall provide color graphic displays as depicted in the mechanical drawings for each system and floor plan. For each system or floor plan, the display shall contain the associated points identified in the point list and allow for setpoint changes as required by the owner.

3.8 POINT TO POINT CHECKOUT.

A. For new portion of the system, each I/O device (both field mounted as well as those located in FIPs) shall be inspected and verified for proper installation and functionality. A checkout sheet itemizing each device shall be filled out, dated and approved by the Project Manager for submission to the owner or owner's representative.

B. In case of wireless devices, the signal strength recorded during checkout shall be reported.

3.9 CONTROLLER AND WORKSTATION CHECKOUT.

A. For new portion of the system, a field checkout of all controllers and front end equipment (computers, printers, modems, etc.) shall be conducted to verify proper operation of both hardware and software. A checkout sheet itemizing each device and a description of the associated tests shall be prepared and submitted to the owner or owner's representative by the completion of the project.

END OF SECTION 230923

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes pipe and fitting materials and joining methods for the following:

1. Copper tube and fittings.
2. Plastic pipe and fittings.
3. Joining materials.
4. Transition fittings.
5. Dielectric fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following:

1. Pipe.
2. Fittings.
3. Joining materials.

B. Delegated-Design Submittal:

1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
2. Locations of pipe anchors and alignment guides and expansion joints and loops.
3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
4. Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installers of Pressure-Sealed Joints: Installers shall be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
2. Fiberglass Pipe and Fitting Installers: Installers of RTRF and RTRP shall be certified by manufacturer of pipes and fittings as having been trained and qualified to join fiberglass piping with manufacturer-recommended adhesive.

B. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.

C. DWV Copper Tubing: ASTM B 306, Type DWV.

D. Wrought-Copper Unions: ASME B16.22.

2.2 PLASTIC PIPE AND FITTINGS

A. PVC Plastic Pipe: ASTM D 1785, with wall thickness as indicated in "Piping Applications" Article.

1. PVC Plastic Pipe Fittings: Socket-type pipe fittings, ASTM D 2466 for Schedule 40 pipe.

2.3 JOINING MATERIALS

A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

B. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

C. Solvent Cements for PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Description:

a. Standard: ASSE 1079.
b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Description:

a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Condensate-Drain Piping, Inside Building: Type M Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

B. Condensate-Drain Piping, Exterior: Type M Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

3.2 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation. Insulate piping according to Section 230719 “HVAC Piping Insulation.”

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install valves according to Section 230523 “Valves for HVAC Piping.”

P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

R. Install shutoff valve immediately upstream of each dielectric fitting.

S. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

C. Dielectric Fittings for NPS 2-1/2 and larger: Use dielectric flanges or flange kits.

3.4 HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

C. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4: Maximum span, 6 feet; minimum rod size, 1/4 inch.
2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. NPS 1-1/4: Maximum span, 6 feet; minimum rod size, 3/8 inch.
4. NPS 1-1/2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
6. NPS 2-1/2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.

D. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.

E. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.

E. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Nonpressure Piping: Join according to ASTM D 2855.

3.6 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

3.7 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.

4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure, but not less than 100 psig. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 15 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks for continuous 2 two hours.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following products:

1. Sealants and gaskets.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct

Construction Standards - Metal and Flexible" and with performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Duct Dimensions: Unless otherwise indicated, all duct dimensions indicated on Drawings are inside clear dimensions and do not include insulation or duct wall thickness.

2.2 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized sheet steel unless otherwise indicated.

B. Transverse Joints: Fabricate joints in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. For ducts with longest side less than 36 inches, select joint types in accordance with Figure 2-1.
2. For ducts with longest side 36 inches or greater, use flange joint connector Type T-22, T-24, T-24A, T-25a, or T-25b. Factory-fabricated flanged duct connection system may be used if submitted and approved by engineer of record.
3. Where specified for specific applications, all joints shall be welded.

C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Where specified for specific applications, all joints shall be welded.

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Construct ducts of galvanized sheet steel unless otherwise indicated.
2. Subject to compliance with requirements, provide products by the following: McGill Airflow, Ductmate Industries, Linx Industries, or Eastern Sheetmetal.

B. Transverse Joints: Select joint types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

D. Tie Rods: Galvanized steel, 1/4-inch-minimum diameter for lengths 36 inches or less; 3/8-inch-minimum diameter for lengths longer than 36 inches.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested in accordance with UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10 inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Galvanized-steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and coordination drawings.

B. Install ducts in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths with fewest possible joints.

D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

G. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

H. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

I. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

J. Install fire and combination fire and smoke dampers where indicated on Drawings and as required by code, and by local authorities having jurisdiction. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers and specific installation requirements of the damper UL listing.

K. Install dampers and all other duct-mounted accessories in air ducts where indicated on Drawings.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials both before and after installation. All open ends of ductwork shall be covered with self-adhesive 3 mil polyethylene film.

M. Elbows:

1. Fabricate 90-degree rectangular mitered elbows to include turning vanes.

2. Fabricate 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.

N. Branch Connections: Use lateral or conical branch connections.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR TYPE II COMMERCIAL KITCHEN HOOD EXHAUST DUCT

A. Commercial Kitchen Hoods are Type II. Exhaust Ducts shall be per the requirements for SINGLE-WALL DUCTS AND FITTINGS.

B. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 DUCT SEALING

A. Seal ducts at a minimum to the following seal classes in accordance with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. All Locations, All Ducts: Seal Class A, unless otherwise indicated.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

G. At hangers on externally insulated ductwork, provide between duct and insulation 1-1/2 inches thick and 6-lb/cu. ft. nominal density mineral-fiber board insulation complying with Section 230713 “Duct Insulation”.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.

C. Duct system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.8 STARTUP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Fabricate all ducts to achieve SMACNA pressure class, seal class, and leakage class as indicated below.

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive 2-inch wg.

2. Ducts Connected to Constant-Volume Air-Handling Units:

a. Pressure Class: Positive 2-inch wg.

C. Return Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch wg.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.

3. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.

a. Concealed: Double wall, round, insulated between walls.
b. Welded seams and joints.
c. Pressure Class: Positive or negative 4-inch wg.
d. Airtight/watertight.

E. Outdoor-Air Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Match duct material.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam or Welded.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: 45-degree entry to round.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees."

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manual volume dampers.
2. Control dampers.
3. Turning vanes.
4. Duct-mounted access doors.
5. Flexible connectors.

B. Related Requirements:

1. Section 233346 "Flexible Ducts" for insulated and non-insulated flexible ducts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 MANUAL VOLUME DAMPERS

A. Low-Leakage, Aluminum, Manual Volume Dampers:

1. Subject to compliance with requirements, provide products by the following: Ruskin CD51, Pottorff, Greenheck, or United Enertech.
2. Comply with AMCA 500-D testing for damper rating.
3. Low-leakage rating, maximum leakage shall be 0.5% at pressure differentials under 4.0 in w.g., with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
4. Suitable for horizontal or vertical applications.
5. Frames:

    a. Hat shaped.
    b. 0.125” extruded aluminum.
    c. Reinforced corners.
    d. Flanges for attaching to walls and flangeless frames for installing in ducts.

6. Blades:

    a. Flat-blades, single piece.
    b. Parallel- or opposed-blade design.
    c. 0.125” extruded aluminum.

7. Blade Axles: Plated steel.
8. Bearings:

    a. Molded synthetic.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

9. Blade Seals: Closed-cell neoprene.
10. Jamb Seals: Compression type.
11. Tie Bars and Brackets: Aluminum.
12. Accessories:

a. Include locking device to hold single-blade dampers in a fixed position without vibration.

B. Jackshaft:

1. Size: 0.5-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include 2” stand-off elevated platform for insulated duct mounting.

2.4 CONTROL DAMPERS

A. Subject to compliance with requirements, provide products by the following: Ruskin CD50, Pottorff, Greenheck, or United Enertech.

B. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.

C. Frames:

1. Hat shaped.
2. 0.125” extruded aluminum.
3. Reinforced corners.

D. Blades:

1. Multiple blades with maximum blade width of 6 inches.
2. Parallel- and opposed-blade design.
3. Aluminum air-foil shaped single-piece blades.
4. Blade Edging: Closed-cell neoprene.

E. Blade Axles: 1/2-inch-diameter; plated steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

F. Bearings:

1. Molded synthetic sleeve.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.5 TURNING VANES

A. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

B. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

C. Vane Construction: Double wall.

2.6 DUCT-MOUNTED ACCESS DOORS

A. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

    a. Double wall, rectangular.
    b. Galvanized sheet metal with 1” insulation fill and thickness as indicated for duct pressure class.
    c. Hinges and Latches: 1-by-1-inchbutt or piano hinge and cam latches.
    d. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

    a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
    b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
    c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
    d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.7 FLEXIBLE CONNECTORS

A. Materials: Flame-retardant or noncombustible fabrics.

B. Coatings and Adhesives: Comply with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install manual volume dampers at points on supply, return, and exhaust systems where indicated on the drawings and as determined by testing, adjusting, and balancing. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
2. Adjacent to and close enough to fire dampers and combination fire and smoke dampers to reset or reinstall fusible links and observe operation. Access doors for access to fire dampers and combination fire and smoke dampers shall be outward operation.
3. Control devices requiring inspection.
4. Elsewhere as indicated.

G. Install access doors with swing against duct static pressure.

H. Access Door Sizes:

1. 16" x 20" or two inches less than the height of the duct.

I. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

J. Install flexible connectors to connect ducts to equipment.

K. Connect diffusers to ducts directly or with maximum 96-inch lengths of flexible duct clamped or strapped in place.

L. Connect flexible ducts to metal ducts with draw bands plus tape.

M. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, ceiling radiation dampers, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

B. As part of completion of the project, damper installing Contractor shall document and certify the testing and installation of all the dampers as per the NC Building Code, NFPA 80, NFPA 90A, and NFPA 105. Certification documentation from the Contractor(s) shall include report with photographs of each fire damper's installation and damper in closed and open position.

END OF SECTION 233300

SECTION 233346 - FLEXIBLE DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-insulated flexible ducts.
2. Insulated flexible ducts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

C. Comply with the Air Diffusion Council's "ADC Flexible Air Duct Test Code FD 72-R1."

D. Comply with ASTM E 96/E 96M, "Test Methods for Water Vapor Transmission of Materials."

2.2 NON-INSULATED FLEXIBLE DUCTS

A. Subject to compliance with requirements, provide products by the following: Flexmaster, McGill Airflow, or Thermaflex.

B. Non-Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 210 deg F.

2.3 INSULATED FLEXIBLE DUCTS

A. Subject to compliance with requirements, provide products by the following: Flexmaster, McGill Airflow, or Thermaflex.

B. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 210 deg F.
4. Insulation R-Value: R-6 minimum and comply with ASHRAE/IES 90.1.

2.4 FLEXIBLE DUCT CONNECTORS

A. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

B. Non-Clamp Connectors: Draw bands plus tape.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install flexible ducts according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install in indoor applications only. Flexible ductwork should not be exposed to UV lighting.

C. Connect diffusers to ducts directly or with maximum 8’-0” lengths of flexible duct clamped or strapped in place.

D. Connect flexible ducts to metal ducts with draw bands plus tape.

E. Install duct test holes where required for testing and balancing purposes.

F. Installation:

1. Install ducts fully extended.
2. Do not bend ducts across sharp corners.
3. Bends of flexible ducting shall not exceed a minimum of one duct diameter.

4. Avoid contact with metal fixtures, water lines, pipes, or conduits.
5. Install flexible ducts in a direct line, without sags, twists, or turns.

G. Supporting Flexible Ducts:

1. Suspend flexible ducts with bands 1-1/2 inches wide or wider and spaced a maximum of 48 inches apart. Maximum centerline sag between supports shall not exceed 1/2 inch per 12 inches.
2. Flexible ducts shall have a minimum of one support.
3. Install extra supports at bends placed approximately one duct diameter from center line of the bend.
4. Vertically installed ducts shall be stabilized by support straps at a maximum of 72 inches o.c.

H. DUCT SCHEDULE

1. All flexible ducts shall be insulated type, except where noted otherwise.

END OF SECTION 233346

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Centrifugal roof ventilators.

1.3 PERFORMANCE REQUIREMENTS

A. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curb adaptors.
7. Fan speed controllers.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One additional set(s) for each belt-driven unit.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 507 or UL 705 as applicable. Power ventilators for use for kitchen exhaust shall also comply with UL 762.

1.8 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Ventilators shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of ventilator components, noise or metal fatigue caused by ventilator blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Per installation Region per the Building Code.

2.2 CENTRIFUGAL ROOF

A. Subject to compliance with requirements, provide products by the following: Greenheck, Loren Cook, Carnes, Twin City, or PennBarry.

B. Shall be direct drive, unless indicated in Power Ventilator Schedule to be belt drive.

C. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Downblast Units: Provide spun-aluminum discharge baffle to direct discharge air downward.
2. Upblast Units where indicated on the drawings: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
3. Fan and motor isolated from exhaust airstream.

4. Finish:

    a. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Treat as necessary for coating to be applied over it.
    b. Factory Anodized aluminum finish.

D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

E. Belt Drives:

1. Resiliently mounted to housing.
2. Fan shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit. For fractional hp motors, thermal-overload protection may be achieved by providing thermally-protected motors.
3. Bird Screens: Removable, 1/2-inch mesh, stainless steel.
4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

    a. Dampers shall have an air leakage rate not greater than 20 cfm/sq ft where not less than 24 inches in either dimension and 40 cfm/sq ft where less than 24 inches in either dimension. The rate of air leakage shall be determined at 1.0 inch water gauge when tested in accordance with AMCA 500D for such purpose.

G. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in raised cant and mounting flange.
2. Overall Height: 12 inches above finished roof.
3. Finish: To match power ventilator.

H. Kitchen Hood Exhaust Fans: Shall also have the following:

1. Upblast discharge.
2. Grease collector.
3. Hinged subbase.
4. UL 762.
5. Vented Curb: Unlined with louvered vents in vertical sides as required for Kitchen hood exhaust fan discharge to be 40-inches above finished roof.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Enclosure Type: ODP.
3. NEMA Premium Efficient motors as defined in NEMA MG 1.
4. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
5. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
6. For units with multiple motors controlled by a single variable speed drive, provide motor interface panel and motor protection for each motor to allow remaining motors to operate even if one motor has stopped functioning.
7. Motors served by variable speed drives shall be inverter balanced across the motor speed range.
8. Motors served by variable speed drives shall be provided with shaft grounding rings

B. Variable-Frequency Motor Controller: Comply with Section 230950 "Variable-Speed Drives."

2.4 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Equipment Mounting:

1. Comply with requirements for vibration isolation devices specified in Section 230549 "Vibration Controls for HVAC."

C. Secure roof-mounted fans, and adapter curbs if required, to roof curbs with stainless steel hardware with EPDM washers, that comply with wind fastening requirements.

D. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

E. Support suspended units from structure using threaded steel rods and elastomeric hangers.

F. Install units with clearances for service and maintenance.

G. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories.

B. Make final duct connections to In-Line fans with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."

C. Install ducts adjacent to power ventilators to allow service and maintenance.

D. Ground equipment according to Section 260526 "Grounding and Bonding."

E. Connect wiring according to Section 260519 "Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust damper linkages for proper damper operation.
6. Verify lubrication for bearings and other moving parts.
7. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
8. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
9. Shut unit down and reconnect automatic temperature-control operators.
10. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

C. Replace fan and motor pulleys as required to achieve design airflow.

D. Lubricate bearings.

END OF SECTION 233423

SECTION 233713 - AIR DIFFUSERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Diffusers

B. Related Requirements:

1. Section 230713 “Duct Insulation” for insulation of backside of air diffusers.
2. Section 233300 "Air Duct Accessories" for fire, radiation, and smoke dampers, and volume-control dampers not integral to diffusers.
3. Section 233714 " Registers and Grilles" for adjustable-bar register and grilles, fixed-face registers and grilles, and linear bar grilles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 DIFFUSERS

A. Subject to compliance with requirements, provide products by the following: Carnes, Metal Aire, Titus, Krueger, or Price. All diffusers shall have a maximum NC level of 25 in the space for the specific airflow

B. Lay-in Ceiling Supply Air Diffuser (Aluminum):

1. Type: Aluminum fixed square louvered face, 4-way or 3-way blow as indicated on the drawings with baked white enamel finish unless indicated on the drawings to be field painted. White factory finish shall be necessary to receive field finish painting. Final color selected by the architect.

2. Panel border to drop in a 24”x24” “T” bar ceiling grid, with an adjustable vertical pattern. Vertical air adjustment shall be made by adjusting 4 perimeter blades to force air down in a vertical position.
3. Provide a square to round adapter.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

3.2 INSTALLATION

A. Install diffusers level and plumb. Provide supports at the corners of the diffusers and grilles per the ceiling manufacturers’ installation instructions.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

D. Insulate backside of air diffusers as specified in Section 230713 “Duct Insulation”.

E. Install radiation damper where indicated on the drawings.

3.3 ADJUSTING

A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 233714 - REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Registers
2. Grilles

B. Related Requirements:

1. Section 230713 “Duct Insulation” for insulation of backside of registers and grilles.
2. Section 233300 "Air Duct Accessories" for ceiling radiation dampers and volume-control dampers not integral to registers and grilles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Register and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

PART 2 - PRODUCTS

2.1 REGISTERS

A. Subject to compliance with requirements, provide products by the following: Carnes, Metal Aire, Titus, Krueger, or Price. All registers and grilles shall have a maximum NC level of 25 in the space for the specific airflow.

B. Sidewall Supply Air Register with fixed blades and OBD (Aluminum):

1. Type: Aluminum with baked white enamel finish unless indicated on the drawings to be field painted. White factory finish shall be necessary to receive field finish painting. Final color selected by the architect.
2. Horizontal Face Blade with integral core construction and 3/4" blade spacing and 45° deflection with 1-way blow. See mechanical schedule for size.
3. Border Frame is 1-1/4” flat standard with countersunk screwholes and mitered corners.
4. Provide opposed blade damper.

C. Lay-in Return Air Register:

1. Type: Aluminum fixed 1/2" x 1/2" egg crate with aluminum frame. Register shall be full flow across the entire face of the register and tapered up to the neck size. (See schedule for size).
2. White factory finish shall be necessary to receive field finish painting. Final color selected by the architect.
3. Provide plenum box the full size and length of the register.
4. Lay in Egg Crate Return to drop in a 24”x24” “T” bar ceiling grid (See schedule for size).
5. Provide opposed blade damper.

D. Lay-in Exhaust Air Register:

1. Type: Aluminum fixed blades
2. White factory finish shall be necessary to receive field finish painting. Final color selected by the Architect.
3. Horizontal Face Blade with all welded face bars and 1/2" blade spacing and 35° deflection. Face Bars shall be 1/8” thick with rounded edges. Blades to run long horizontal dimension.
4. Provide plenum box the full size and length of the register.
5. Lay in to drop in a 24”x24” “T” bar ceiling grid (See schedule for size).
6. Provide opposed blade damper.

2.2 GRILLES

A. Subject to compliance with requirements, provide products by the following: Carnes, Metal Aire, Titus, Krueger, or Price. All registers and grilles shall have a maximum NC level of 25 in the space for the specific airflow.

B. Lay-in Return Air Transfer Egg Crate:

1. Type: Aluminum fixed 1/2" x 1/2" egg crate with steel frame. Grille shall be full flow across the entire face of the register and tapered up to the neck size. (See schedule for size).
2. White factory finish shall be necessary to receive field finish painting. Final color selected by the architect.
3. Provide plenum box the full size and length of the register.
4. Lay in Egg Crate Return to drop in a 24”x24” “T” bar ceiling grid (See schedule for size).

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate registers and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where registers and grilles are installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

3.2 INSTALLATION

A. Install registers and grilles level and plumb.

B. Provide extra hangers at the corners of grilles and registers as required by the ceiling manufacturer’s installation instructions.

C. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

D. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, radiation and fire dampers.

E. Insulate backside of registers and grilles as specified in Section 230713 “Duct Insulation”.

F. Install radiation damper where indicated on the drawings.

3.3 ADJUSTING

A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233714

SECTION 233813 - COMMERCIAL-KITCHEN HOODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Commercial-kitchen hoods, Type II

1.3 DEFINITIONS

A. Standard Hood: A hood, usually field fabricated, that complies with design, construction, and performance criteria of applicable national and local codes.

B. Type II Hood: A hood designed for heat and steam removal and for other nongrease applications.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at site.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Standard hoods.

B. Shop Drawings: Signed and sealed by a qualified professional engineer.

1. Shop Drawing Scale: 1/2 inch = 1 foot
2. Show plan view, elevation view, sections, service requirements, duct connection sizes, and attachments to other work.
3. Show cooking equipment outline plan and elevation to confirm minimum code-required overhang.
4. Indicate performance, exhaust air airflow, and pressure loss.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.7 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D 1.1M, "Structural Welding Code - Steel," for hangers and supports; and AWS D9.1/D9.1M, "Sheet Metal Welding Code," for joint and seam welding.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 HOOD MATERIALS

A. Stainless-Steel Sheet: ASTM A666, Type 304.

1. Minimum Thickness: 0.050 inch
2. Finish: Comply with SSINA's "Finishes for Stainless Steel" for recommendations for applying and designating finishes.
    a. Finish shall be free from tool and die marks and stretch lines and shall have uniform, directionally textured, polished finish indicated, free of cross scratches. Grain shall run with long dimension of each piece.
3. Exposed Surfaces: No.4 finish (directional satin) ASTM A480/A480M,
4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

B. Sealant: ASTM C920; Type S, Grade NS, Class 25, Use NT. Elastomeric sealant shall be NSF certified for commercial-kitchen hood application. Sealants, when cured and washed, shall comply with requirements in 21 CFR 177.2600, for use in areas that come in contact with food.

1. Color: As selected by Architect from manufacturer's full range.
2. Backer Rod: Closed-cell polyethylene, in diameter larger than joint width.

2.3 GENERAL HOOD FABRICATION REQUIREMENTS

A. Welding: Use welding rod of same composition as metal being welded. Use methods that minimize distortion and develop strength and corrosion resistance of base metal. Make ductile welds free of mechanical imperfections such as gas holes, pits, or cracks.

1. Welded Butt Joints: Full-penetration welds for full-joint length. Make joints flat, continuous, and homogenous with sheet metal without relying on straps under seams, filling in with solder, or spot welding.
2. Grind exposed welded joints flush with adjoining material and polish to match adjoining surfaces.
3. Where fasteners are welded to underside of equipment, finish reverse side of weld smooth and flush.
4. Coat concealed stainless-steel welded joints with metallic-based paint to prevent corrosion.
5. After zinc-coated steel is welded, clean welds and abraded areas and apply SSPC-Paint 20, high-zinc-dust-content, galvanizing repair paint to comply with ASTM A780/A780M.

B. Form metal with break bends that are not flaky, scaly, or cracked in appearance; where breaks mar uniform surface appearance of material, remove marks by grinding, polishing, and finishing.

C. Sheared Metal Edges: Finish free of burrs, fins, and irregular projections.

D. In food zones, as defined in NSF, fabricate surfaces free from exposed fasteners.

E. Cap exposed fastener threads, including those inside cabinets, with stainless-steel lock washers and stainless-steel cap (acorn) nuts.

F. Fabricate pipe slots on equipment with turned-up edges sized to accommodate service and utility lines and mechanical connections.

G. Fabricate enclosures, including panels, housings, and skirts, to conceal service lines, operating components, and mechanical and electrical devices including those inside cabinets unless otherwise indicated.

H. Fabricate equipment edges and backsplashes according to SMACNA's "Kitchen Ventilation Systems & Food Service Equipment Guidelines."

I. Fabricate enclosure panels to ceiling and wall as follows:

1. Fabricate panels on all exposed side(s) with same material as hood and extend from ceiling to top of hood canopy.

2.4 EXHAUST HOOD FABRICATION, TYPE II HOOD

A. Streivor Inc.

B. Fabricate hoods according to NSF2, "Food Equipment."

C. Fabricate hoods to comply with SMACNA's "HVAC Duct Construction Standards: Metal and Flexible."

D. Hood Configuration: Exhaust only.

E. Hood Type: Heat and vapor removal.

F. Hood Style: single island.

G. Vapor Hood with mesh filter at duct.

H. Luminaires: Recessed LED luminaires and lamps with lenses sealed vapor tight. Wiring shall be installed in stainless-steel conduit on hood exterior. Number and location of luminaires shall provide a minimum of 50 fc at 30 inches above finished floor.

1. Light switches shall be mounted remotely. Provided and wired by electrical division.
2. Luminaires: LED complying with UL 1598.

I. Exhaust Damper: Streivor BalanceAire

1. Hood to be fitted with a UL710 Listed, internally adjustable opposed blade variable volume damper(s) per the size and shape of the drawings.
2. Opposed blades to include a positioning bracket that allows the damper blades to be adjusted from 5% to 100% open. Each positioning bracket has a locking/unlocking fastener on the inside of the damper that is accessible from inside of the hood that locks the damper blade in place.
3. Damper to be manufactured from 18 gauge of the same material type and finish as the hood exhaust plenum

J. Temperature Monitor

1. Auto Fan Start is required for NFPA 96 Section 8.2.3.3. Auto Fan Switches be located in hood exhaust collar with UL710 listed access enclosure and removable cover plate for access from withing the hood cavity.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Coordinate equipment layout and installation with adjacent Work, including luminaires, HVAC equipment, plumbing, and fire-suppression system components.

B. Install hoods and associated services with clearances and access for maintaining, cleaning, and servicing hoods, filters/baffles, grease extractor, and fire-suppression systems according to manufacturer's written instructions and requirements of authorities having jurisdiction.

C. Securely anchor and attach items and accessories to walls, floors, or bases with stainless-steel fasteners unless otherwise indicated.

D. Install hoods to operate free from vibration.

E. Install sealant in joints between equipment and abutting surfaces with continuous joint backing unless otherwise indicated. Provide airtight, watertight, vermin-proof, sanitary joints.

F. Install lamps, with maximum recommended wattage, in equipment with integral lighting.

G. Set initial temperatures and calibrate sensors.

H. Set field-adjustable switches.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each equipment item for proper operation. Repair or replace equipment that is defective, including units that operate below required capacity or that operate with excessive noise or vibration.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Perform hood performance tests required by authorities having jurisdiction.

B. [Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial-kitchen hoods.

END OF SECTION 233813

SECTION 234100 - PARTICULATE AIR FILTRATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pleated panel filters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include dimensions; operating characteristics; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each model indicated.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of filter and rack to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Provide one complete set of filters for all systems. If system includes prefilters, include prefilters.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in a clean, dry place.

B. Comply with manufacturer's written rigging and installation instructions for unloading and moving to final installed location.

C. Handle products carefully to prevent damage, breaking, denting, and scoring. Do not install damaged products.

D. Protect products from weather, dirt, dust, water, construction debris, and physical damage.

1. Retain factory-applied coverings on equipment to protect finishes during construction and remove just prior to operating unit.
2. Cover unit openings before installation to prevent dirt and dust from entering inside of units. If required to remover coverings during unit installation, reapply coverings over openings after unit installation and remove just prior to operating unit.
3. Replace installed products damaged during construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. ASHRAE Compliance:

1. Comply with ASHRAE 52.2 for MERV for methods of testing and rating air-filter units.

B. Comply with NFPA 90A and NFPA 90B.

C. Comply with UL 900.

2.2 PLEATED PANEL FILTERS

A. Description: Factory-fabricated, self-supported, extended-surface, pleated, panel-type, disposable air filters with holding frames.

1. Subject to compliance with requirements, provide products by the following: Flanders, AAF, or Camfil Farr.

B. Source Limitations: Obtain from single source from single manufacturer.

C. Capacities and Characteristics:

1. Face Size: As required.
2. Depth: 2 inches nominal.
3. Number of Filters, Wide by High: As required.
4. Maximum Face Velocity: 515 fpm.
5. Minimum Efficiency Reporting Value: MERV 8, with "Composite Average Particle Size Efficiency, Percent in Size Range, Micrometers" according to ASHRAE 52.2.

D. Media: Synthetic fibers coated with nonflammable adhesive.

1. Separators shall be bonded to the media to maintain pleat configuration.
2. Welded-wire grid shall be on downstream side to maintain pleat.
3. Media shall be bonded to frame to prevent air bypass.

E. Filter-Media Frame: Double wall cardboard frame sealed or bonded to the media.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine ducts, air-handling units, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF FILTERS

A. Position each filter unit with clearance for normal service and maintenance. Anchor filter holding frames to substrate.

B. Install filters in position to prevent passage of unfiltered air.

C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing with new, clean filters.

D. Coordinate filter installations with duct and air-handling-unit installations.

E. Provide complete sets of filters as necessary to protect equipment during construction, another change of filters at completion, and leave one additional complete set of filters per Maintenance Material Submittals requirements.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Test for leakage of unfiltered air while system is operating.

3.4 CLEANING

A. After completing system installation and testing, adjusting, and balancing of air-handling and air-distribution systems, clean filter housings and install new filter media.

END OF SECTION 234100

SECTION 237433 - DEDICATED OUTDOOR-AIR UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes factory-packaged units capable of supplying 100 percent outdoor air and providing cooling and heating.

B. **Unit is being purchased by Pender County Schools (PCS) including delivery of unit to site, warranty, and startup. Contractor shall comply with all portions of the Section and install unit per Part 3 – Execution.**

C. **Contractor shall coordinate with and receive unit at the project site directly from unit manufacturer, including offloading new unit upon delivery.**

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rated capacities, operating characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Prepare the following by or under the supervision of a qualified professional engineer:

    a. Mounting Details: Indicate coordinating requirements.
    b. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For units to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: Provide sets of filters for each system as necessary during construction, a clean set for TAB, a clean set at final occupancy, and one additional set of filters as Owner stock. If system includes prefilters, include prefilters.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to replace components of units that fail in materials or workmanship within specified warranty period.

B. Warranty Period for Compressors: Five years from date of Final Acceptance.

C. Warranty Period For Parts: Not including compressors, One year(s) from date of Final Acceptance.

D. **Contractor's Warranty shall be one-year installation and labor warranty per the project's General and Supplementary Conditions**.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by the following: Valent VX-312-60J-1-F3 (Basis of Design), Carrier, KCC, or pre-approved equal.

2.2 PERFORMANCE REQUIREMENTS

A. General Fabrication Requirements: Comply with requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Start-up."

B. Part Load Performance: Per AHRI 920, most current.

C. Cabinet Thermal Performance:

1. Maximum Overall U-Value: Comply with requirements in ASHRAE/IESNA 90.1.

D. Cabinet Surface Condensation:

1. Cabinet shall have additional insulation and vapor seals if required to prevent condensation on the interior and exterior of the cabinet.
2. Portions of cabinet located downstream from the cooling coil shall have a thermal break at each thermal bridge between the exterior and interior casing to prevent condensation from occurring on the interior and exterior surfaces. The thermal break shall not compromise the structural integrity of the cabinet.

E. Electrical components, devices, and accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Capacities and Characteristics: As scheduled on drawings.

2.3 CABINET

A. Construction: Double wall.

B. Exterior Casing Material: Galvanized steel with weather-resistant baked enamel finish.

C. Factory painted finish shall meet ASTM B117 650 hour salt spray test.

D. Interior Casing Material: Galvanized steel.

E. Lifting and Handling Provisions: Factory-installed shipping skids and lifting lugs.

F. Base Rails: Stainless-steel rails for mounting on frame as indicated on drawings.

G. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.

H. Service Doors: Hinged access doors with gaskets. Material and construction of doors shall match material and construction of cabinet in which doors are installed.

I. Roof: Standing seam or membrane; sloped to drain water.

J. Floor: Reinforced, metal surface; reinforced to limit deflection when walked on by service personnel. Insulation shall be below metal walking surface.

K. Base pan shall have no penetrations within the perimeter of the curb.

L. Insulation: Panels and cabinet shall be insulated with 2” foam insulation with a minimum initial R value of 6.7 per inch of thickness. Panels shall be double wall construction to provide nonporous, cleanable interior surfaces. All interior seams exposed to airflow shall be sealed.

M. Condensate Drain Pans:

1. Shape: Rectangular, with 1 percent slope (minimum) in at least two planes to direct water toward drain connection.
2. Size: Large enough to collect condensate from cooling coils including coil piping connections, coil headers, and return bends.
    a. Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
    b. Depth: A minimum of 2 inches deep.
3. Configuration: Double wall, with space between walls filled with foam insulation and moisture-tight seal.
4. Retain one of two "Material" subparagraphs below.
5. Material: Stainless-steel sheet.

6. Drain Connection:

   a. Located on one or both ends of pan, at lowest point of pan.
   b. Terminated with threaded nipple.

7. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

N. Surfaces in Contact with Airstream: Comply with requirements in ASHRAE 62.1 for resistance to mold and erosion.

2.4 SUPPLY FAN

A. Plenum Fan Type: Single width, non-overloading, with backward-inclined or airfoil blades.

1. Fan Wheel Drive: Direct drive.
2. Fan panel and frame Material: Powder-coated steel, stainless steel, or aluminum.
3. Fan Enclosure: Easily removable enclosure around rotating parts.

B. Motors:

1. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
2. Shaft grounding rings on motors with VFDs.

C. Mounting: Fan wheel, motor, and drives shall be mounted to fan casing with vibration isolators.

D. Provide with variable frequency drive for each fan integral to the unit within the unit’s cabinet or in NEMA 4X enclosures.

E. Airflow measurement may be via piezo ring and tap in each fan or via control dampers as hereinafter specified. Dampers shall be integral to the unit or its hoods. Integrate airflow cfm signals to unit controller.

F. Control and Isolation Dampers: As hereinafter specified.

2.5 COOLING AND HOT GAS REHEAT COILS

A. Capacity Ratings: Comply with ASHRAE 33 and ARI 410.

B. Tube Material: Copper.

C. Fin Material: Aluminum.

D. Fin and Tube Joints: Mechanical bond.

E. Leak Test: Coils shall be leak tested to 500 PSIG with air underwater.

F. Refrigerant Coil Suction and Distributor Header Materials: Seamless copper tube with brazed joints.

G. Coil Casing Material: Steel.

H. Coating: Corrosion-resistant coating uniformly applied to all coil surface areas with no bridging between fins.

2.6 REFRIGERATION SYSTEM

A. Comply with requirements in ASHRAE 15, "Safety Standard for Refrigeration Systems."

B. Refrigerant Charge: Factory charged with refrigerant and filled with oil.

C. Compressors: Digital Scroll compressors with integral vibration isolators, internal overcurrent and overtemperature protection, internal pressure relief, and crankcase heater. Digital compressor shall be able to fully modulate from 20%-100%. Provide multi-stage capacity as indicated on the drawings.

D. Refrigerant: R-454B or A2L type.

1. Provide unit with operating charge of refrigerant.

E. Systems Using A2L Refrigerants:

1. Systems using A2L refrigerant shall be listed to UL Standard 60335-2-40, current edition.
2. Per EPA SNAP 23, systems using A2L refrigerant shall have permanently affixed markings and labeling to indicate refrigerant installed in the system and Notice of leak detection system installed, and shall have service ports, pipes, hoses and other devices through which refrigerant flows to be marked in red.
3. Systems using A2L with refrigerant charge > 4.0 lbs in its largest independent circuit shall have integral factory installed refrigerant leak detection system mounted in the air handling unit section downstream of the evaporator coil with internal controls to automatically close upon refrigerant detected, unit commands compressors and electric heat (if present) off, and commands air handling unit’s fan to maximum airflow for air circulation. Once refrigerant has not been detected for a minimum of 5 minutes, unit shall return to normal operation.
4. For systems using A2L refrigerant, if releasable refrigerant charge in the system exceeds the levels allowed in ANSI/ASHRAE Standard 15 – 2022 or newer for the effective dispersal volume, provide safety isolation valves in both refrigerant lines as release mitigation controls. Valves shall automatically close upon signal from the unit integral refrigerant leak detector. Valve locations shall be as such for releasable refrigerant charge to be less than the levels allowed in ANSI/ASHRAE Standard 15 – 2022 or newer for the effective dispersal volume.

F. Refrigeration System Specialties:

1. Expansion valve with replaceable thermostatic element.
2. Refrigerant dryer.
3. High-pressure switch.

4. Low-pressure switch.
5. Thermostat for coil freeze-up protection during low ambient temperature operation or loss of air.
6. Brass service valves installed in discharge and liquid lines.
7. Low-ambient kit high-pressure sensor.
8. Hot-gas reheat solenoid valve modulating with a replaceable magnetic coil.

G. Capacity Control:

1. Hot-gas bypass refrigerant control for capacity control with continuous dehumidification on a single compressor.

H. Refrigerant condenser and reheat condenser coils:

1. Capacity Ratings: Complying with ASHRAE 33 and ARI 410 and coil bearing the ARI label.
2. Tube Material: Copper.
3. Fin Material: Aluminum.
4. Fin and Tube Joint: Mechanical bond.
5. Leak Test: Coils shall be leak tested with air underwater.
6. Coating: Corrosion-resistant coating uniformly applied.
7. There shall be a minimum of 6” space between the evaporator coil and the hot gas reheat coil.

I. Condenser Fan Assembly:

1. Fans: Direct-drive propeller type with statically and dynamically balanced fan blades.
2. Fan Props: Low-noise corrosion resistant glass reinforced polypropylene.
3. Fan Motors:

    a. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
    b. Motor Enclosure: Totally enclosed non-ventilating (TENV) or totally enclosed air over (TEAO) enclosure.

4. Fans controlled by VFD.
5. Fan Safety Guards: Steel with corrosion-resistant coating.

J. Safety Controls:

1. Compressor motor and condenser coil fan motor low ambient lockout.
2. Overcurrent protection for compressor motor.

2.7 ELECTRIC-RESISTANCE HEATING COIL

A. UL Compliance: Comply with requirements in UL 1995, "Heating and Cooling Equipment."

B. Electric-Resistance Heating Elements:

1. Coiled Resistance Wire: 80 percent nickel and 20 percent chromium.

2. Tubular-Steel Sheath: Compacted magnesium oxide powder.
3. Fins: Spiral-wound, copper-plated, steel fins continuously brazed to sheath.
4. Heating Capacity: Low density 35 W per sq. in., factory wired for single-point wiring connection; with time delay for element staging and overcurrent- and overheat-protection devices.
5. Safety Controls:

    a. Blower-motor interlock, air-pressure switch.
    b. Quiet mercury contactors.
    c. Time delay between steps.
    d. Integral, nonfused power disconnect switch.

C. Electric-Resistance Heating Elements:

1. Open-Coil Resistance Wire: 80 percent nickel and 20 percent chromium
2. Control: Fully modulating, SCR controlled.
3. Supports and Insulation: Floating ceramic bushings recessed into casing openings; fastened to supporting brackets and mounted in galvanized-steel frame.The primary heating section shall include finned tubular heating elements, automatic and manual cut-outs, low voltage controls, air proving switch, maximum 48 amps per circuit and fusing for heaters over 48 amps.
4. Heating Capacity: Low density 35 W per sq. in., factory wired for single-point wiring connection; with time delay for element staging and overcurrent- and overheat-protection devices.
5. Safety Controls:

    a. Blower-motor interlock, air-pressure switch.
    b. Quiet mercury contactors.
    c. Time delay between steps.
    d. Integral, nonfused power disconnect switch.

6. Heater shall be UL listed and approved and provide single point power connection.

2.8 CORROSION-RESISTANT COATINGS

A. Corrosion-Resistant Coating: Coat entire interior of unit and condenser, evaporator and hot gas reheat coils with factory-applied flexible epoxy polymer e-coat uniformly applied to all coil surface areas with no material bridging between fins. The coating process shall provide complete coil encapsulation and a uniform dry film thickness from 0.6 – 1.2 mils on all surface areas including fin edges to meet 5b rating cross hatched adhesion per ASTM B3359-93.

1. The coil coating shall meet the following test standards:

    a. Salt Spray Corrosion per ASTM B117: 10,000+ hrs.
    b. Cross Hatch Adhesion per ASTM D3359: 5B.
    c. Impact Resistance per ASTM2794: 120 in-lbs.
    d. Heat Transfer Reduction: less than 3%.

2.9 OUTDOOR-AIR INTAKE HOOD

A. Type: Manufacturer's standard hood or louver.

B. Materials: Match cabinet.

C. Bird Screen: Comply with requirements in ASHRAE 62.1.

D. Configuration: Designed to inhibit wind-driven rain and snow from entering unit.

2.10 FILTERS

A. Disposable Panel Filters:

1. See requirements specified in Section 234100 “Particulate Air Filtration”.

B. Mounting Frames:

1. Panel filters arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or from access plenum.
2. Galvanized or stainless steel with gaskets and fasteners, suitable for bolting together into built-up filter banks.

2.11 ELECTRICAL POWER CONNECTIONS

A. General Electrical Power Connection Requirements: Factory-installed and -wired switches, motor controllers, transformers, and other necessary electrical devices shall provide a single-point field power connection to unit.

B. Factory Wiring shall include factory installed safety barrier to isolate all high voltage components, mounted inside electrical compartment, to protect service personnel from incidental contact.

C. Factory-Mounted, Overcurrent-Protection Service: For each motor.

D. Controls: Factory wire unit-mounted controls where indicated.

E. Unit shall have through-the-base single connection of power to unit with unit-mounted HACR circuit breaker in water tight enclosure accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

F. Unit shall have Minimum Short Circuit/AIC/SCCR of 65,000 A.

2.12 CONTROLS

A. Integral factory microprocessor controller with web-based user interface for connection to School’s wi-fi with PCS provided IP address, factory color touchscreen human interface display unit, and BACnet communication interface for future DDC BAS controls.

B. Control sequence of operation is indicated on the Drawings.

C. Control Wiring: Factory wire connection for controls' power supply.

D. Control Devices: Sensors, transmitters, relays, switches, detectors, operators, actuators, and valves shall be manufacturer's standard items to accomplish indicated control functions.

E. Control and Isolation Dampers:

1. Damper Location: Factory installed inside unit for ease of blade axle and bushing service. Arrange dampers located in a mixing box to achieve convergent airflow to minimize stratification.
2. Damper Leakage: Comply with requirements in AMCA 500-D. Leakage shall not exceed 6.5 cfm per sq. ft. at a static-pressure differential of 4.0 inches water column when a torque of 5 inch pounds per sq. ft. is applied to the damper jackshaft.
3. Damper Rating: Rated for close-off pressure equal to the fan shutoff pressure.
4. Damper Label: Bear the AMCA seal for both air leakage and performance.
5. Blade Configuration: Unless otherwise indicated, use parallel blade configuration for two-position control and equipment isolation service and use modulating control when mixing two airstreams. For other applications, use an opposed-blade configuration.
6. Maximum Blade Width: 6 inches.
7. Maximum Blade Length: 48 inches.
8. Blade Seals: Replaceable, continuous perimeter vinyl seals and jambs with stainless-steel compression-type seals.
9. Bearings: Thrust bearings for vertical blade axles.
10. Airflow Measurement:

    a. Monitoring System: Complete and functioning system of airflow monitoring as an integral part of the damper assembly where indicated.
    b. Remote Monitoring Signal: 0-10 volt or 4-20 mA scaled signal.
    c. Accuracy of flow measurement: Within 5 percent of the actual flow rate between the range of the scheduled minimum and maximum airflow. For units with a large range between minimum and maximum airflow, configure the damper sections and flow measurement assembly as necessary to comply with accuracy.
    d. Straightening Device: Integral to the flow measurement assembly if required to achieve the specified accuracy as installed.
    e. Flow measuring device: Suitable for operation in untreated and unfiltered outdoor air. If necessary, include temperature and altitude compensation and correction to maintain the accuracy.

F. Damper Operators:

1. Factory-installed electric operator for each damper assembly with one operator for each damper assembly mounted to the damper frame.
2. Operator capable of shutoff against fan pressure and able to operate the damper with sufficient reserve power to achieve smooth modulating action and proper speed of response at the velocity and pressure conditions to which the damper is subjected.
3. Maximum Operating Time: Open or close damper 90 degrees in 30 seconds.
4. Adjustable Stops: For both maximum and minimum positions.
5. Position Indicator and Graduated Scale: Factory installed on each actuator with words "OPEN" and "CLOSED," or similar identification, at travel limits.

6. Spring-return operator to fail-safe; either closed or open as required by application.
7. Operator Type: Direct coupled, designed for minimum 60,000 full-stroke cycles at rated torque.
8. Position feedback Signal: For remote monitoring of damper position.
9. Coupling: V-bolt and V-shaped, toothed cradle.
10. Circuitry: Electronic overload or digital rotation-sensing circuitry.

2.13 ACCESSORIES

A. Duplex Receptacle: Factory mounted on unit with 15 amp 120 V GFCI duplex receptacle and weatherproof cover. Include transformer.

B. Safeties:

1. Condensate overflow switch.
2. Phase-loss reversal protection.
3. High and low pressure control.
4. Frostat

C. Hail guards of galvanized steel, painted to match casing.

D. Sound Attenuation Package: Compressor sound blankets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for piping, ducts, and electrical systems to verify actual locations of connections before equipment installation.

C. Examine equipment supports for suitable conditions where units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's rigging and installation instructions for unloading units and moving to final locations.

B. Equipment Mounting:

1. Comply with requirements for vibration isolation devices specified in Section 230549 "Vibration Controls for HVAC."

C. Install wall- and duct-mounted sensors furnished by manufacturer for field installation. Install control wiring and make final connections to control devices and unit control panel.

D. Install separate devices furnished by manufacturer and not factory installed.

E. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

3.3 CONNECTIONS

A. Duct Connections:

1. Comply with requirements in Section 233113 "Metal Ducts."
2. Shall be side/horizontal duct connection as indicated on the drawings.
3. Install ducts to connection to DOAS.
4. Connect ducts to units with flexible duct connectors. Comply with requirements for flexible duct connectors in Section 233300 "Air Duct Accessories."

B. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

C. Where installing piping adjacent to unit, allow space for service and maintenance.

D. Connect electrical wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

F. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection as specified in Division 26.

3.4 STARTUP SERVICE

A. Included with unit as part of Equipment Procurement, a factory-authorized service representative shall perform startup service.

B. Complete installation and startup checks shall include the following:

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Inspect units for visible damage to refrigerant compressor, condenser and evaporator coils, and fans.
3. Inspect casing insulation for integrity, moisture content, and adhesion.
4. Remove packing from vibration isolators.
5. Verify that clearances have been provided for servicing.
6. Verify that controls are connected and operable.
7. Verify that filters are installed.
8. Clean coils and inspect for construction debris.
9. Verify bearing lubrication.

10. Clean fans and inspect fan-wheel rotation for movement in correct direction without vibration and binding.
11. Start unit.
12. Start refrigeration system when outdoor-air temperature is within normal operating limits and measure and record the following:

    a. Cooling coil leaving-air, dry- and wet-bulb temperatures.
    b. Cooling coil entering-air, dry- and wet-bulb temperatures.
    c. Condenser coil entering-air dry-bulb temperature.
    d. Condenser coil leaving-air dry-bulb temperature.

13. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short-circuiting of air through outside coil or from outside coil to outdoor-air intake.

14. Inspect and record performance of interlocks and protective devices including response to smoke detectors by fan controls and fire alarm.
15. Operate unit for run-in period.
16. Calibrate controls.
17. Adjust and inspect high-temperature limits.
18. Inspect outdoor-air dampers for proper stroke.
19. Verify operational sequence of controls.

C. After startup, change filters, verify bearing lubrication, and adjust belt tension.

D. Remove and replace components that do not properly operate and repeat startup procedures as specified above.

E. Prepare written report of the results of startup services.

3.5 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.6 DEMONSTRATION

A. Included with unit as part of Equipment Procurement, a factory-authorized service representative shall train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 237433

SECTION 260000 – ELECTRICAL, BASICS

1.1 RELATED DOCUMENTS

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

1.2 GENERAL

A. Applicable requirements of any Instructions to Bidders, General Conditions of the Contract, and/or Supplemental Conditions are considered a part of the Electrical Specifications. The electrical contractor must examine all contract documents before submitting a proposal.

B. The electrical work must be performed by an electrical contractor, suitably licensed for the scope of work of this specific project.

C. The electrical contractor must assume total responsibility for any portion of the work provided by his subcontractors.

1.3 CODES AND STANDARDS

A. Building Codes:

1. Local Codes where applicable
2. National Electrical Safety Code (NESC)
3. National Fire Protection Association No. 70, National Electrical Code (NEC)
4. National Fire Protection Association No. 72, National Fire Alarm and Signaling Code
5. North Carolina State Building Code, Latest Edition and Revisions (NCSBC)
6. North Carolina State Fire Code, Latest Edition and Revisions

B. Industry Standards:

1. American National Standards Institute (ANSI)
2. American Society for Testing Materials Standards (ASTM)
3. Canadian Standards Association (CSA)
4. Electrical Testing Laboratories Standards (ETL)
5. Insulated Power Cable Engineers Association Standards (IPCEA)
6. Institute of Electrical and Electronics Engineers (IEEE)
7. International Society of Automation (ISA)
8. National Electrical Manufacturers Association Standards (NEMA)
9. Underwriter's Laboratories, Inc. Standards and approved listings (UL)

1.4 QUALITY ASSURANCE

A. Electrical materials, equipment, devices, fixtures, etc. must be listed and labeled by a third-party agency that is accredited by the NCBCC (North Carolina Building Code Council) to label

electrical & mechanical equipment. Listing and labeling must comply with NC Department of Insurance requirements as detailed in NC General Statutes 66-23 through 66-25. This paragraph applies to all electrical specification sections under specification divisions 26, 27, and 28.

1.5 SCOPE OF WORK

A. It is the intent and meaning of the drawings and specifications to call for finished work that has been tested and is ready for operation. The electrical contractor shall take this into consideration and include in his proposal allowance for contingencies that will allow him to provide minor pieces of materials and labor not specifically indicated but required for the job to operate properly. This paragraph is intended to insure that a complete job will be provided without requests for minor extras.

B. It shall be understood that where the words “furnish,” “provide,” and/or “install” are used, it is intended that this CONTRACTOR must purchase and install completely all material necessary and required for this particular item, system, equipment, etc.

1.6 ELECTRICAL SERVICE

A. The electrical contractor is responsible for coordination with the Utility Company and assistance to the OWNER for an additional electrical service for the facility. He shall act as coordinator between the Utility Company and the OWNER and must supply the Utility Company with equipment characteristics, load data, etc.

B. Construction and testing power shall be paid for as described in the General Conditions of the project manual.

1.7 RECORD DRAWINGS

A. A set of drawings covering the electrical contract will be provided to the electrical contractor to mark in color all changes, modifications, or revisions effected during construction. These field mark-up drawings are to be turned over to the electrical designer.

B. The electrical contractor shall provide final installed photographs of switchboards and panelboards. Photographs shall clearly show equipment designations, manufacturer nameplates, breaker positions, breaker ratings, and directory descriptions.

1.8 APPROVAL OF MATERIALS

A. Construction phase: The CONTRACTOR must submit his proposal on the specified materials and equipment, or their equivalent, provided the words "or equal" or "or approved equal" follow the named manufacturers. If the above phrases do not appear, the specified manufacturers must be furnished without substitution. Equivalent shall be interpreted to mean an item of material or equipment, similar to that named and which is suitable for the same use and capable of performing the same functions as that named, with the Design Team being the judge of equality.

B. Where no specific material or equipment type is mentioned, any first-class product of a reputable manufacturer may be used provided it conforms to the requirements of the specifications.

1.9 SHOP DRAWINGS AND SUBMITTAL DATA PROCEDURES

A. The CONTRACTOR must submit PDF files of shop drawings, certified prints, literature, and product data sheets to the Design Team for all major items of equipment and materials for review and approval. It is preferred that all electrical submittals for the project be submitted at one and the same time.

B. Product data sheets with multiple components, part numbers, etc. must be clearly marked or highlighted to identify what specific product/model/part number/component is proposed for this project. All instances of the proposed part number components in the product data must be marked or highlighted throughout product data sheets submitted.

C. The CONTRACTOR must analyze all shop drawings and submittal data and certify that they meet requirements of Contract Drawings and Specifications, prior to delivery to the Design Team. CONTRACTOR Certification must be in the form of suitable approval stamp placed on each shop drawing/submittal submitted.

1. If the shop drawings or submittal data deviate from the Contract Documents, the CONTRACTOR must advise the Design Team of deviations in writing, accompanying the shop drawings and submittal data, including the reason for deviations.

D. If the Design Team deems submittal data is either incomplete or incorrect, a resubmittal will be required. Where a resubmittal is not necessary but confirmation of receipt of review comments is requested, confirmation must be submitted in writing.

E. At least one set of all final submittal data, shop drawings, certified prints, etc., must be maintained at the job site and available to representatives of the Design Team.

F. Approval by the Design Team of shop drawings and submittal data is for general conformance with the contract documents and design concept.

1. Such approval does not relieve the CONTRACTOR of responsibility for compliance with the project drawings and specifications.
2. Such approval for any materials, apparatus, devices, and layouts does not relieve the CONTRACTOR from the responsibility of furnishing same of proper dimensions, size, quantity, quality and all performance characteristics to efficiently complete the requirements and intent of the contract documents.
3. Such approval does not relieve the CONTRACTOR from responsibility for errors of any sort on the shop drawings.

G. Physical sizes of equipment used in the design layout are those of reputable equipment manufacturers. The CONTRACTOR is responsible for providing equipment that will fit the space available. If the CONTRACTOR elects to use equipment that results in conflicts with space clearance or codes, it is the responsibility of the CONTRACTOR to correct issues at his expense. The CONTRACTOR shall be responsible for providing code clearances. Where equipment is designated for existing space, the CONTRACTOR must make necessary field

measurements to ascertain space requirements, including those for connections; and must furnish and install such sizes and shapes of equipment that the final installation suits the intent and meaning of the drawings and specifications.

H. Catalog Data for OWNER

1. The CONTRACTOR must provide compilations of catalog data, bound in suitable loose-leaf binders, for each manufactured item of equipment used in the electrical work. These shall be presented to the Design Team for transmittal to the OWNER before the final inspection is made. Data shall include printed installation, operation, and maintenance instructions for each item, indexed by product with heavy sheet dividers and tabs. All warranties must be included with each item. Each manufacturer's name, address, and telephone number must be clearly indicated. Generally, shop drawings and submittal data alone are not adequate for catalog data.

I. Record Documents for OWNER

1. Conductor and cable megger test results.
2. Field mark-up as-built drawings.
3. Warranty documents.

1.10 DRAWINGS AND SPECIFICATIONS

A. The Electrical drawings and specifications are complementary each to the other, and what may be called for by one shall be as binding as if called for by both. The drawings are diagrammatic and indicate generally the location of outlets, devices, equipment wiring, etc and show the general arrangement of raceways, fixtures, and equipment. Drawings must be followed as closely as actual building construction and the work of other trades will permit; however, all work must suit the finished surroundings and/or trim.

B. Any omission from either the drawings or the specifications are unintentional, and it is the responsibility of the CONTRACTOR to call to the attention of the Design Team any pertinent omissions before submitting a proposal. Complete and working systems are required, whether every small item of material is shown and specified or not.

C. The electrical work must conform to the requirements shown on all of the drawings. General and Structural drawings shall take precedence over Electrical Drawings. Because of small scale of the electrical drawings, it is not practical to indicate offsets, fittings and accessories that may be required. The CONTRACTOR must investigate the structural and finish conditions affecting the work and must arrange his work accordingly, providing such fittings and accessories as may be required to meet such conditions, without additional cost to the OWNER and as directed by the Design Team.

D. Load circuits must be installed as indicated on the drawings. Circuit number revisions will not be accepted unless approved in writing by the Engineer.

1.11 COORDINATION OF WORK

A. It is understood and agreed that by submitting a proposal, the CONTRACTOR has, by careful examination, satisfied himself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the general and local conditions and all other matters which can and may affect the work under this contract. The CONTRACTOR is responsible for visiting the site and thoroughly familiarizing himself with the existing conditions and also any contractual requirements as may be set forth in other divisions of the specifications and in other contract documents. No extras will be considered because of additional work necessitated by obvious job conditions that are not indicated on the drawings.

B. The CONTRACTOR must compare the electrical drawings and specifications with the drawings and specifications for other trades and must report any discrepancies between them to the Design Team. If needed, request from the Design Team written instructions for changes necessary in the electrical work. The electrical work must be installed in cooperation with other trades installing interrelated work. Before installation, the CONTRACTOR must make proper provisions to avoid interferences in a manner approved by the Design Team. All changes required in the work of the CONTRACTOR caused by his neglect to do so are to be made by him at his expense.

C. Location of electrical raceways, switches, panels, equipment, fixtures, etc., must be adjusted to accommodate the work to interferences anticipated and encountered. The CONTRACTOR shall determine the exact route and location of each electrical raceway prior to make up and assembly.

D. Right-of-Way: Lines which pitch shall have the right-of-way over those which do not pitch. For example; steam, condensate and plumbing drains shall normally have right of way. Lines whose elevations cannot be changed shall have the right of way over lines whose elevations can be changed.

E. Offsets and changes in direction of electrical raceways must be made as required to maintain proper headroom and to clear pitched lines whether or not indicated on the drawings. The CONTRACTOR must furnish and install elbows, pull boxes, etc., as required to affect these offsets, transitions, and changes in directions. Conflicts between electrical raceways, fixtures, etc., and ductwork which cannot be resolved otherwise, will be resolved by the Design Team.

F. The CONTRACTOR must install all electrical work to permit removal (without damage to other parts) of any equipment requiring periodic replacement or maintenance. The CONTRACTOR must arrange electrical raceways and equipment to permit ready access to valves, cocks, traps, starters, motors, control components, etc., and to clear the opening of swinging and overhead doors and of access panels.

G. Work at Existing Facilities:

1. Where work may be required to be performed at existing and/or occupied facilities, such work must be scheduled and arranged to be done at the convenience of the OWNER so as not to interfere with, disrupt, or disturb normal operations at the facilities. The CONTRACTOR must obtain written approval from the OWNER before proceeding with work at existing facilities and must work at existing facilities on schedule as agreed upon with the OWNER. This is not to be necessarily construed to mean that the

CONTRACTOR is expected to perform work at existing facilities on holidays, weekends, etc., but that the Contractor must schedule work with the OWNER for the OWNER's beneficial and normal usage of the facilities, and that the CONTRACTOR will be required to maintain the schedule as approved by the OWNER.

2. The CONTRACTOR must, at all times, provide safety barriers, protective devices, screening, dust barriers, etc., as required to maintain the safety and comfort of the building's personnel and/or occupants in or near his work area.
3. The CONTRACTOR is responsible for cleanup in connection with his work at existing facilities. At the end of each working day, all debris, boxes, waste, etc. must be removed from the facilities and properly disposed of. Equipment, materials, etc. may be left inside the facilities, but such must be properly stored, stacked, and located as approved by the OWNER.
4. The CONTRACTOR must do all cutting, patching, finishing, repairing, painting, etc., necessary for electrical work to be installed at existing facilities. All finishes must be left to equal finish and condition prior to cutting. No cutting of structural members will be allowed. All cutting of walls, floors, roofs, etc. must be repaired and/or replaced to a finish equal to that found prior to cutting.
5. The CONTRACTOR must route conduits and locate equipment as approved by the OWNER and Design Team. Routing and locations must be firmly established and approved before proceeding with any phase of the work.
6. The CONTRACTOR is responsible for any and all damage to the existing facilities, grounds, walkways, paving, etc. caused by the work, the CONTRACTOR and/or his personnel, and/or his equipment in the accomplishment of this work. Such damages must be repaired and/or replaced by the CONTRACTOR at his expense, to equal finish prior to damage. The Design Team will be the judge as to equal finishes, etc.
7. Certain power requirements must be met without interruption during certain times on the existing electrical system. It is anticipated that partial power outages will be necessary to accomplish the work covered by these drawings and specifications. The CONTRACTOR must determine in advance the dates, times and duration of these outages and must obtain permission from the OWNER to shut down the electric power. Unauthorized power outages will not be tolerated.

H. Equipment and Materials (General):

1. Materials must be new and shall bear the manufacturer's name, trade name, and listing label in every case where a standard has been established for the particular material. The equipment to be furnished under this specification shall be essentially the standard product of manufacturers regularly engaged in the production of the required type of equipment and shall be the manufacturer's latest approved design.
2. Electrical motors shall meet the minimum efficiency requirements identified in the Code of Federal Regulations 10 CFR Part 431.
3. Delivery and Storage:

    a. Store products to allow for inspection and measurement of quantity or counting of units.
    b. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

1) Electrical equipment shall be delivered to the site and stored in original containers. Store inside dry, heated spaces, but readily accessible for inspection by the Design Team until installed.
2) Rusty and/or corroded materials and equipment will be replaced at the direction of the Design Team.

c. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
d. Protect stored products from damage.

4. Equipment and materials of the same general type must be of the same make throughout the work to provide uniform appearance, operation and maintenance.
5. At the completion of work; fixtures, equipment, and materials must be cleaned and polished thoroughly and turned over to the OWNER in a condition satisfactory to the Design Team. Damage or defects, developing before acceptance of the work must be corrected at the CONTRACTOR's expense.
6. Manufacturer's directions must be followed completely in the delivery, storage, protection, and installation of all equipment and materials. The CONTRACTOR must promptly notify the Design Team, in writing, of any conflicts between requirements of the Contract Documents and the manufacturer's directions and must obtain the Design Team's written instructions before proceeding with the work. Should the CONTRACTOR perform any work that does not comply with the manufacturer's instructions, recommendations, or requirements; it must be corrected at his expense as directed by the Design Team.

I. Sleeves, Inserts, Openings, Etc.:

1. Anchor bolts, sleeves, inserts, supports, etc., that may be required for electrical work must be furnished, located, and installed by the electrical contractor. Where working under a subcontract for a General Contractor, the electrical contractor must give sufficient information (marked and located) to the General Contractor in time for proper placement in the construction schedule. Should the electrical contractor delay or fail to provide sufficient information in time, the electrical contractor must cut and patch construction as necessary and required to install electrical work, with finishes completed to the satisfaction of the the Design Team.

J. Cutting and Patching:

1. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. The electrical contractor is responsible for cutting and patching as required for the proper installation of electrical work for this project. Cutting shall be kept to a minimum. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Finishes must be restored to the satisfaction of the the Design Team.

K. Locations and Measurements:

1. Outlets, equipment, fixtures, etc. are shown and located on the drawings as intended based on the Design Team’s understood project scope. All measurements for installation must be verified on the project and coordinated with the drawings of other disciplines. In

all cases, work must suit the surrounding trim and/or decoration and construction. The locations of outlets for appliances must be installed so that when connected they permit the proper installation of appliances. Slight relocations of outlets, devices, and equipment shall be made by the electrical contractor as required or as directed by the Design Team at no additional cost to the OWNER.

L. Workmanship:

1. Work must be executed as required by the drawings and specifications, must be done in a workmanlike manner by skilled mechanics, and must present a neat, trim, and mechanical appearance when completed. All work shall be performed as required by the progress of the job.

M. Final Inspections and Equipment Demonstrations:

1. The CONTRACTOR must acquire permits for construction & coordinate all required inspections with the office of the local electrical inspector and/or local authority having jurisdiction, if required. The CONTRACTOR shall provide the Owner two (2) copies of Electrical Inspectors' written reports.
2. The CONTRACTOR shall furnish ladders, required tools, and personnel to open equipment, fixtures, boxes, panels, etc. to enable the Design Team representatives to observe any parts of the installation they may request.
3. The CONTRACTOR shall furnish meters for observation of readings as directed by the Design Team representative. Meters to be furnished include: clamp-on type ammeter, voltmeter, insulation resistance tester (i.e., often called a megger), and clamp-on type ground resistance tester.

N. Operating Instructions:

1. At the completion of the entire installation, the CONTRACTOR shall arrange to operate each component of systems and then systems as a whole. When all the requirements of the plans and specifications have been met, the CONTRACTOR shall then arrange to instruct the OWNER's operating and maintenance personnel in the correct and proper procedures for the operation and maintenance of the systems

END OF SECTION 260000

SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Supporting devices for electrical components.
2. Cutting and patching for electrical construction.
3. Electrical demolition.

1.3 SUBMITTALS

A. Product Data:

1. Support channels and hardware.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. Metal Items for Use Indoors: Plain Steel.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel

C. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.

D. Aluminum Slotted Support Systems: Preformed aluminum channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.

E. Slotted Support Systems Fittings and Accessories: Products of the same manufacturer as channels.

F. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

G. Expansion Anchors:

1. Inside: Carbon-steel wedge or sleeve type.
2. Outside: Hot-dip galvanized steel wedge or sleeve type.

H. Toggle Bolts:

1. Inside: All steel springhead type.
2. Outside: Hot-dip galvanized steel springhead type.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange during progress of construction to facilitate the electrical installations that follow.

1. Set inserts, sleeves, raceways, boxes, etc. in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work.

C. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.

3.2 ELECTRICAL EQUIPMENT INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

3.3 ELECTRICAL SUPPORTING DEVICE APPLICATION

A. Selection of Supports: Comply with manufacturer's written instructions.

B. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.4 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate pipe hangers or clamps.

F. Install 1/4-inch- diameter or larger threaded hanger rods, unless otherwise detailed.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

I. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

J. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Steel: Spring-tension clamps on steel.
6. Light Steel: Sheet-metal screws.
7. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.5 DEMOLITION

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

D. Remove demolished material from Project site after coordination with the Owner's representative. Equipment and/or materials that the Owner desires to retain shall be moved to a location designated by the Owner's representative.

E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.6 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work.

3.7 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint.

B. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.

C. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

D. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

E. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.8 CLEANING AND PROTECTION

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Final Acceptance.

END OF SECTION 260500

SECTION 260519 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 PRE-CONSTRUCTION SUBMITTALS

A. Product Data:

1. Conductors.
2. Connectors and splices.

1.4 CLOSEOUT SUBMITTALS

A. Field Quality-Control Test Reports: Insulation resistance (Megger) testing.

PART 2 - PRODUCTS

2.1 POWER CONDUCTORS AND CABLES

A. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.

B. Conductor Material:

1. Copper complying with NEMA WC70 / ICEA S-95-658 solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
2. Power and lighting circuitry: Minimum conductor size shall be #12, and maximum conductor size shall be #500 kcmil.

C. Conductor Insulation Types: Type THHN/THWN-2 complying with NEMA WC70 / ICEA S-95-658.

2.2 CONTROL CONDUCTORS AND CABLE

A. Discrete control conductors: Copper, stranded, type THHN/THWN-2.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

1. For conductors #8 & smaller, use wire-nut type twist connectors.
2. For conductors #6 & larger, use pre-insulated solderless connectors with one spare port for future cable connection.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

A. Service Entrance, Feeders, Branch Circuits: Type THHN/THWN-2, single conductors in raceway.

B. Discrete Control Circuits: Type THHN/THWN-2, in raceway.

3.2 INSTALLATION

A. Use manufacturer-approved pulling compound or lubricant where necessary. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables, conductors, or raceway.

C. Identify and color-code conductors and cables according to Section "Electrical Identification”.

D. Shared neutral conductors must not be used unless specifically indicated so on homerun circuitry designations on the drawings.

3.3 CONNECTIONS

A. Connect equipment, outlet, device, and component connections to wiring systems and to ground. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B. Where tightening torque is indicated as a numeric value on equipment or in installation instructions provided by the manufacturer, a calibrated torque tool must be used to achieve that indicated torque value, unless the equipment manufacturer has provided installation instructions for an alternative method of achieving required torque.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.4 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
2. Inspect for physical damage. test conductors and cable for continuity and shorts.
3. Insulation Resistance (Megger) testing for building wire and cable:

   a. All current carrying phase conductors and neutrals must be tested as installed, and before connections are made, for insulation resistance and accidental grounds. Measure insulation resistance between phase conductors, between phase conductors and neutral conductors, and between phase conductors and ground. For electronic type testers, measurements must be made after test has been underway for 60 seconds.

Voltage Rating	Minimum Test Voltage	Minimum Insulation Resistance
0-250 V	500 VDC	25 megohms
251 -600 V	1000 VDC	100 megohms
601 - 5000 V	2500 VDC	1000 megohms

   b. The CONTRACTOR must correct malfunctioning conductors and cables, including replacement if necessary, and retest to demonstrate compliance.
   c. Certify compliance with test parameters.

4. Control / Signal Transmission Media Tests:

   a. Test cable segments for faulty connectors, splices, terminations, and the integrity of the cable and its component parts.
   b. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

B. Test Reports:

1. Provide tabulated insulation resistance readings for each panel circuit. A sample test report form is attached for reference.

C. Witness Tests:

1. The CONTRACTOR shall furnish an insulation resistance tester and show Design Team representative and/or Owner that the conductors comply with the specified requirements.

INSULATION RESISTANCE TEST REPORT

PROJECT NAME _____ DATE: _____

PROJECT NUMBER _____ Report values in mega-ohms

FEEDER ID / EQPT FED	SOURCE INFO	PHASE A TO PHASE B	PHASE A TO PHASE C	PHASE B TO PHASE C	PHASE A TO NEUTRAL	PHASE B TO NEUTRAL	PHASE C TO NEUTRAL	PHASE A TO GROUND	PHASE B TO GROUND	PHASE C TO GROUND

Manufacturer & model of test equipment _____

Name of person performing tests _____

Signature of person performing tests _____ DATE: _____

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 PRE-CONSTRUCTION SUBMITTALS

A. Product Data:

1. Ground rods.
2. Connection / test / inspection wells.
3. Exothermic weld materials.

1.4 CLOSEOUT SUBMITTALS

A. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.5 QUALITY ASSURANCE

A. Comply with UL 467.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section "Conductors and Cables."

B. Grounding Electrode Conductors: Stranded cable.

C. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

2.2 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Sectional type; copper-clad steel, ¾” diameter by 120 inches in length.

B. Connection / Test / Inspection Wells: Provide handholes as specified below:

1. Cylinder, minimum dimensions of 10" diameter x 10" deep, PVC, with cover.
2. Box, minimum dimensions of 12" x 12" x 12" deep with cover, green PVC or polyethylene.

PART 3 - EXECUTION

3.1 APPLICATION

A. In raceways, use insulated equipment grounding conductors.

B. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

C. Underground Grounding Conductors: Use bare, tinned, stranded-copper conductors. Bury a minimum of 24 inches below grade.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

3.3 INSTALLATION

A. Ground Rods:

1. For service entrance, install a minimum of two rods spaced at least twenty-two feet from each other and located at least the same distance from other grounding electrodes.
2. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
3. Interconnect ground rods with grounding electrode conductors. Use exothermic welds for connections to ground rods. Make connections without exposing the ground rod steel.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Where grounding electrode conductors are installed in metal conduit, bond metal conduit to conductor at each end with a grounding bushing.

D. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, Paragraph 250.52(A)(3), using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG. If using structure concrete foundation, and it is less than 20 feet long, coil excess conductor within the base of the foundation. Bond conductor to reinforcing steel. Extend grounding conductor below grade and connect to building grounding ring or to a grounding electrode external to concrete.

3.4 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

3.5 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at service disconnect enclosure grounding terminal or main ground bar, at ground test wells, and at any other location where a maximum ground-resistance level is specified. Measure ground resistance not less than two full

days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.

a. Perform tests by the fall-of-potential method according to IEEE 81; or
b. Perform tests with a clamp-on ground tester.

3. Maximum grounding electrode system resistance values:

a. Equipment Rated 500 kVA and Less: 10 ohms.
b. Equipment Rated 500 to 1000 kVA: 5 ohms.
c. Equipment Rated More Than 1000 kVA: 3 ohms.
d. Substations and Pad-Mounted Switching Equipment: 5 ohms.
e. Manhole Grounds: 10 ohms.

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and take corrective action to reduce ground resistance to comply with specified values. Demonstrate compliance by retesting.

END OF SECTION 260526

SECTION 260533 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
2. Section "Wiring Devices" for devices installed in boxes.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

1.4 PRE-CONSTRUCTION SUBMITTALS

A. Product Data:

1. Raceways and fittings.
2. Boxes.

1.5 COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.6 FIELD CONDITIONS

A. Ground Water: Assume ground-water level is at grade level unless a lower water table is noted on Drawings.

PART 2 - PRODUCTS

2.1 METALLIC CONDUIT

A. Rigid Aluminum Conduit: Produced to ANSI C80.5; listed to UL 6A.

B. Rigid Steel Conduit: Produced to ANSI C80.1; listed to UL 6.

C. IMC: Produced to ANSI C80.6; listed to UL 1242.

D. EMT and Fittings:

1. Produced to ANSI C80.3; listed to UL 797.
2. Fittings: Plated-steel, hexagonal, compression type with insulated throat type.

E. Aluminum EMT:

1. Material: 6063 aluminum alloy.
2. Produced to ANSI C80.3; listed to UL 797A.

F. FMC: Listed to UL 1.

G. LFMC: Listed to UL 360.

H. Fittings:

1. NEMA FB 1; compatible with conduit and tubing materials.
2. Connectors shall be insulated throat type. If uninsulated throat connectors are installed, use insulating bushings to protect conductors.

2.2 NONMETALLIC CONDUIT AND TUBING

A. RNC: Produced to NEMA TC 2; listed to UL 651.

1. Schedule 40 and Schedule 80 PVC.

B. RNC Fittings: Produced to NEMA TC 3; listed to UL 514B; match to conduit or tubing type and material.

2.3 METAL WIREWAYS

A. Listed to UL 870.

B. Material and Construction: Sheet metal sized and shaped as indicated.

1. Indoors: NEMA 1.
2. Outdoors: NEMA 3R.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Select features as required to complete wiring system and to comply with NFPA 70.

E. Wireway Covers:

1. Indoors: Hinged type.
2. Outdoors: Flanged-and-gasketed type.

F. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, cast aluminum with cast aluminum gasketed cover.

C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

D. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with cast aluminum gasketed cover.

E. Metal Hinged-Cover Enclosures:

1. Interior Locations: NEMA 250, Type 1 with continuous hinged cover, concealed hinge, and flush latch. Finished inside and out with manufacturer's standard enamel.
2. Exterior Locations: NEMA 250, Type 3R galvanized steel with continuous hinged cover and 3-point latch.
3. Removable interior panel.
4. Metal barriers to separate wiring of different systems and voltages.
5. Accessory feet where required or freestanding applications.

F. Recessed steel TV box:

1. Power and low voltage applications for flat screen TV’s.
2. Recessed space to keep plugs, connectors, and cords inside the box.
3. Non-metallic, paintable white trim plate.
4. Design Basis: Arlington #TVBS Series.

PART 3 - EXECUTION

3.1 RACEWAY AND BOXES APPLICATION

A. See Raceway Schedule in the project drawings.

B. Minimum Raceway Size: 3/4-inch trade size.

C. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Intermediate Steel Conduit: Use threaded rigid metal conduit fittings, unless otherwise indicated.

D. Do not install aluminum conduits embedded in or in contact with earth or concrete without protection. For direct burial or concrete encasement or penetrations, coat aluminum conduit with asphaltum or bituminous type coating.

E. EMT must not be installed where raceway or fittings would be in direct contact with the earth, underground, in/below concrete, exposed to the elements, exposed to severe physical damage, or exposed to severe corrosive influence.

F. Boxes and Enclosures: If indicated differently on drawings from what is noted below, contact the Engineer for direction on which type to provide.

1. Outdoors: NEMA 250, Type 3R.
2. Indoors: NEMA 250, Type 1, except Type 4 for damp or wet locations.

3.2 INSTALLATION

A. Keep raceways a minimum of 6 inches away from runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Section "Basic Electrical Materials and Methods."

D. Install temporary closures to prevent foreign matter from entering raceways.

E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

G. Conceal raceways within finished walls, ceilings, and floors, unless otherwise indicated.

1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

H. Conduits installed on the inside face of exterior building walls must be spaced off the wall surface a minimum of ¼" using strut-type channel or "clamp-backs".

I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.
2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

J. Join raceways with fittings designed and approved for that purpose and make joints tight.

K. Expansion Fittings:

1. Where raceways of any type pass a building or structure expansion joint, a standard expansion fitting must be provided and installed. Review architectural and structural drawings for locations of expansion joints.
2. Where raceways installed are subject to temperature swings, install expansion fittings spaced in accordance with manufacturer instructions and NFPA 70 requirements.
3. Expansion fittings must be compatible with the type of raceway being used.

L. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
3. Where using boxes with concentric, eccentric, or over-sized knockouts; provide bonding bushings and jumpers. Size bonding jumpers in accordance with NEC Table 250-122, connecting to the box with ground lugs.

M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Label each end of pull wires with location of opposite end.

N. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.

O. Flexible Connections:

1. Use maximum of 72 inches of flexible conduit for recessed and semi-recessed lighting fixtures.
2. Use maximum of 24 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for all motors.
3. Use LFMC in damp or wet locations.

P. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings and finishes are without damage or deterioration at time of Final Acceptance.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

1. Exposed threads on galvanized conduits and fittings, installed outdoors, must be coated with galvanizing paint or equivalent protective coating.

END OF SECTION 260533

SECTION 260553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes electrical identification materials and devices intended to comply with NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 PRE-CONSTRUCTION SUBMITTALS

A. Product Data:

1. Self-adhesive labels.
2. Engraved plastic nameplates.
3. Two-part, permanent, epoxy adhesive.
4. Double coated, tape with adhesive.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 BOX AND DEVICE LABELS

A. Self-Adhesive Labels: Plastic, thermal, transfer-printed, 3 mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

2.2 CABLE LABELS

A. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches.

2.3 NAMEPLATES AND SIGNS

A. Engraved Plastic Nameplates and Signs: Engraving stock, plastic laminate, minimum 1/16” thick for signs up to 20 sq. in. and 1/8” thick for larger sizes.

B. Fasteners for Nameplates and Signs:

1. Self-adhesive plastic labels.
2. Two-part, permanent epoxy adhesive that is weatherproof and sunlight/UV resistant.
3. High performance, double coated tape with adhesive. Design Basis: 3M #06383, 3M #VHB 5962, or approved equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before applying.

E. Circuit Identification Labels on Boxes: Panel and circuit number.

1. Interior Boxes:

a. Exposed: Self-adhesive plastic label on cover.
b. Concealed:

1) Self-adhesive plastic label on cover; or
2) Permanent marker on cover, legible in a standing position by Design Team and Owner.

2. Exterior Boxes:

a. Engraved plastic label on cover; and
b. Self-adhesive plastic label inside cover.

F. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines; install continuous underground-line warning tape located directly above line at 6 to 8 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.

G. Color-Coding of Phase, Neutral, and Ground Conductors: Use the following colors for service, feeder, and branch-circuit phase conductors:

1. | Configuration | Phase A | Phase B | Phase C | Neutral | Ground |
   |---|---|---|---|---|---|
   | 120/240-V, 1 Ph, 3W | Black | Red | N/A | White | Green |
   | 120/240-V, 3 Ph, 4W | Black | Orange | Blue | White | Green |
   | 120/208-V, 3 Ph, 4W | Black | Red | Blue | White | Green |
   | 277/480-V, 3 Ph, 4W | Brown | Orange | Yellow | Gray | Green |
2. For conductors #6 AWG and smaller, factory apply color the entire length of conductors.
3. For conductors #4 AWG and larger, field apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
4. At each panelboard, a color code legend must be permanently posted corresponding to the conductors and voltage in that panelboard.

H. Apply identification to conductors as follows:

1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

I. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment. Attach engraved labels with two-part, permanent epoxy adhesive or high performance double coated adhesive tape. Apply labels for each unit of the following categories of equipment:

1. Panelboards, electrical cabinets, and enclosures.
2. Access doors and panels for concealed electrical items.
3. Disconnect switches.

Nameplate colors shall be: White surface with black core.

END OF SECTION 260553

SECTION 260923- LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following lighting control devices:

1. Switchbox-mounted occupancy and vacancy sensors.
2. Indoor occupancy and vacancy sensors.

1.3 DEFINITIONS

A. PIR: Passive infrared.

1.4 PRE-CONSTRUCTION SUBMITTALS

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

B. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Plan indicating typical coverage area of each sensor.
2. Interconnection diagrams showing field-installed wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.6 COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

2.3 SWITCHBOX-MOUNTED OCCUPANCY AND VACANCY SENSORS

A. Manufacturers:

1. Cooper Controls.
2. Hubbell Lighting Inc.
3. Leviton Mfg. Company Inc.
4. Watt Stopper (The).

B. Description: Dual technology, ultrasonic and PIR type, with integral power-switching contacts rated for 800 W at 120-V ac and 1200 W at 277-V ac, minimum; suitable for electronic ballasts, LED drivers, or 1/6-hp motors.

1. Field configurable occupancy sensing or vacancy sensing operating modes. Operation:

    a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
    b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

2. Include ground wire.

C. Single Relay Unit: Device contains one relay for controlling load circuit.

1. Design Basis: Hubbell # LHMTS1.
2. One On-Off button for manual control.

2.4 INDOOR OCCUPANCY AND VACANCY SENSORS

A. Manufacturers:

1. Cooper Controls.

2. Hubbell Lighting Inc.
3. Leviton Mfg. Company Inc.
4. Watt Stopper (The).

B. General Description: Wall- or ceiling-mounting, as indicated on the drawings; low-voltage solid-state units with separate line-voltage relay units.

1. Configurable occupancy sensing or vacancy sensing operating modes. Operation:

    a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
    b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Units: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.

    a. Where indicated for 277-V ac lighting systems, provide additional relay units where required for simultaneous control of 120-V ac exhaust fans.

4. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted though a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.

C. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in., and detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/second.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch-high ceiling.

D. Design Basis: Hubbell # OMNIDT2000. If room size is significantly smaller than 2000 sq. ft., evaluate the use of a unit with applicably sized reduced range.

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve at least 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Section "Conductors and Cables".

B. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Section "Electrical Identification".

B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify actuation of each sensor and adjust time delays.

B. Remove and replace lighting control devices where test results indicate that they do not comply with specified requirements and control intent.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 6 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

END OF SECTION 260923

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

B. RMS: Root mean square.

1.4 PRE-CONSTRUCTION SUBMITTALS

A. Product Data:

1. For each type of panelboard, overcurrent protective device, accessory, and component indicated.
2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.
b. Trim types and details.
c. Bus configuration, current, and voltage ratings.
d. Short-circuit current rating of panelboards and overcurrent protective devices.
e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

B. Comply with NEMA PB 1.

1.7 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Six spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Panelboards, Overcurrent Protective Devices, and Accessories:

a. ABB / G.E.
b. Eaton Corporation; Cutler-Hammer Products.
c. Siemens Energy & Automation, Inc.
d. Square D.

2.2 MANUFACTURED UNITS

A. Enclosures: Flush mounted cabinets, as scheduled in the drawings.

1. Rated for environmental conditions at installed location.

a. Typical Indoor Locations: NEMA 250, Type 1.

1) Front Hinged Cover: Entire front trim hinged to box with full-length piano hinge, and with standard door within hinged trim cover.
2) Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.

2. Directory Card: With transparent protective cover, mounted in metal frame, inside panelboard door.

B. Phase Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

C. Ground and Neutral Bars:

1. Equipment Ground Bar: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
2. Neutral Bar: Neutral bar shall be fully sized to match the panel ampere rating. Neutral bar terminal quantity shall be sized adequately for the quantity of feeder and branch-circuit neutral conductors.

D. Conductor Connectors: Suitable for use with conductor material.

1. Main and Neutral Lugs: Mechanical type.
2. Ground Lugs and Bus Configured Terminators: Mechanical or compression type.

E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices. These locations will be indicated as SPACE on the panel schedules in the drawings.

2.3 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Main Overcurrent Protective Devices: Circuit breaker, where scheduled.

1. Include ground-fault protection for service breakers where rated 1000 Amps or higher and over 150V to ground.

B. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

C. Molded-Case Circuit Breaker: UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. GFCI Circuit Breakers: 5-mA trip sensitivity for personnel protection; single- and two-pole configurations.

D. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
2. Multipole units enclosed in a single housing or factory-assembled to operate as a single unit.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 74 inches above finished floor, unless otherwise indicated.

C. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

D. Install overcurrent protective devices and controllers. Set field-adjustable circuit-breaker trip ranges. Prepare documentation of circuit breaker trip settings for Owner record documents.

E. Panel breaker configurations must be installed as indicated on the panel schedules or as noted. Breaker position revisions will not be accepted unless approved in writing by the Engineer.

F. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

G. Install filler plates in unused spaces.

H. For flush mounted panelboards and unless noted otherwise, stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.

3.2 IDENTIFICATION

A. Create a directory to indicate installed circuit loads. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

B. Panelboard Nameplates: Label each panelboard with laminated-plastic nameplate mounted as specified in Section "Electrical Identification".

3.3 CONNECTIONS

A. Ground equipment according to Section "Grounding and Bonding".

B. Connect wiring according to Section "Conductors and Cables".

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.
3. Neutral–ground bond testing: After all fixtures, devices and equipment are installed and all connections completed to each panel, the CONTRACTOR shall disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and grounded enclosure. If this reading is less than 25 mega-ohms, the CONTRACTOR shall disconnect the branch circuit neutral wires from the neutral bar. The CONTRACTOR shall then test each one separately to the panel until the low reading ones are found. The CONTRACTOR must correct troubles, re-connect, and re-test until at least 25 mega-ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in manufacturer's installation instructions for molded-case circuit breakers.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.5 CLEANING

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles.
2. Switches.
3. Device wall plates.

1.3 DEFINITIONS

A. GFCI: Ground-fault circuit interrupter.

1.4 PRE-CONSTRUCTION SUBMITTALS

A. Product Data:

1. Receptacles and Switches.
2. Cover plates.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wiring Devices:

a. Bryant Electric, Inc./Hubbell Subsidiary.
b. Eagle Electric Manufacturing Co., Inc.
c. Hubbell Incorporated; Wiring Device-Kellems.
d. Leviton Mfg. Company Inc.
e. Lutron.
f. Pass & Seymour/Legrand; Wiring Devices Div.

2.2 RECEPTACLES

A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596, and UL 498.

B. Straight-Blade and Locking Receptacles:

1. Heavy-Duty grade.
2. Arranged for back and side wiring with brass screws.
3. Grounding type with hex head ground screw terminal.
4. 15-amp and 20-amp, 125-Volt and 250-Volt receptacles in damp or wet locations must be listed weather-resistant type.
5. Receptacles shall accommodate back and side wiring and must be grounding type with separate single or double grounding screw terminals.

C. Tamper-Resistant Convenience Receptacles, 125 V, 15 & 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

D. Countertop Pop-up Receptacles:

1. Type: Round pop-up style, capable to mount recessed in countertop.
2. Top flange finish selection by Architect.
3. Threaded locking flange, accommodates below counter wiring.
4. Contains (2) 20A duplex receptacles.
5. Design basis: Lew Electric #PUR20AC2PD series

E. GFCI Receptacles:

1. Straight blade, feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle.
2. Comply with UL 498 and UL 943.
3. Design units for installation in a 2-3/4-inch-deep outlet box without an adapter.

2.3 SWITCHES

A. Toggle Switches: Comply with UL 20.

1. Heavy-Duty grade, quiet type without the use of mercury switches.
2. Arranged for back and side wiring with brass screws.
3. Grounding type with hex head ground screw terminal.
4. Types:

    a. Single-pole.
    b. Two-pole.
    c. Three-way.
    d. Four-way.
    e. Pilot light: Illuminated when switch is on.
    f. Key operated: Factory supplied key in lieu of switch handle.
    g. Double-throw, momentary-contact, center-Off: For use as equipment control.

B. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.

1. Control: Continuously adjustable slider; with single-pole or three-way switching to suit connections.

2.4 COVER PLATES

A. Single and combination types to match corresponding wiring devices.

1. Size: All plates shall be oversized / jumbo with matching vertical dimension.
2. Plate-Securing Screws: Metal with head color to match plate finish.
3. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished stainless steel.
4. Material for Unfinished Spaces: Galvanized steel.
5. Toggle Switch Serving as a Disconnect: Wallplate must be configured with brackets on both sides of the switch to accommodate a padlock to secure the switch in the Off position.

2.5 FINISHES

A. Color:

1. Wiring Devices Connected to Normal Power System: White, unless otherwise indicated or required by NFPA 70.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies level, plumb, and square with building lines.

1. Installation height shall be as detailed in the drawings.

B. Install tamper-resistant receptacles at locations as required by the NEC and/or the local authority having jurisdiction.

C. Arrangement of Devices: Mount flush unless noted otherwise:

1. Receptacles over counters, backsplashes, etc. shall be mounted with long dimension horizontal.
2. Otherwise, unless noted differently, mount with long dimension vertical, and with grounding terminal of receptacles on top.
3. Group adjacent switches under single, multigang wall plates.

D. Remove wall plates and protect devices and assemblies during painting.

3.2 IDENTIFICATION

A. Comply with Section “Electrical Identification.”

1. Receptacles and Switches: Identify panelboard and circuit number from which served. Use hot, stamped / thermal printing with black-filled lettering on face of plate, and durable wire markers inside outlet boxes.

3.3 CONNECTIONS

A. Ground equipment according to Section "Grounding and Bonding”.

B. Connect wiring according to Section "Conductors and Cables”.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Enclosures.

1.2 PRE-CONSTRUCTION SUBMITTALS

A. Product Data:

1. For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
2. Enclosure types and details for types other than UL 50E, Type 1.
3. Current and voltage ratings.
4. Short-circuit current ratings (interrupting and withstand, as appropriate).
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.

1.3 CLOSEOUT SUBMITTALS

A. Warranty documentation.

B. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. If Section “Operation and Maintenance Data” is included in the project manual, in addition to items there, include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.4 WARRANTY

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within warranty period.

1. Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Obtain products from single manufacturer.

B. Manufacturers:

1. ABB / G.E.
2. Eaton Corporation; Cutler-Hammer Products.
3. ESL Power Systems.
4. Hubbell.
5. Legrand.
6. Siemens Energy & Automation, Inc.
7. Square D/Group Schneider.

C. Product Selection for Restricted Space: Where drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2.2 FUSIBLE SWITCHES

A. Type HD, Heavy Duty:

1. Single throw.
2. Pole quantity, voltage, and Amperage as required for circuit controlled.
3. UL 98 and NEMA KS 1, horsepower rated. Where fused, clips or bolt pads must accommodate fuses rated for the nameplate rating of equipment controlled.
4. Lockable handle with provisions to lock in either the On or OFF position and interlocked with cover in closed position.

B. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Service-Rated Switches: Labeled for use as service equipment.
4. Lugs: Suitable for number, size, and conductor material as indicated in the drawings.

2.3 ENCLOSURES

A. Enclosed Switches: UL 489, NEMA KS 1, UL 50E, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish:

1. Indoor Locations: UL 50E Type 1.
2. Outdoor Locations: UL 50E Type 3R.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work will indicate Installer's acceptance of areas and conditions as satisfactory.

3.2 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

C. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

1. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
2. Install fuses in fusible devices.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 " Electrical Identification."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data are as described in the Specifications and shown on Drawings.

b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that unit is clean. Clean interior with vacuum, not compressed air.
e. Inspect exposed surfaces and repair damaged finishes.
f. Inspect bolted electrical connections for high resistance. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
g. Switches:

1) Verify blade alignment, blade penetration, travel stops, and mechanical operation.
2) Verify that fuse sizes and types match the Specifications, Drawings, and equipment nameplate rating requirements.
3) Verify that each fuse has adequate mechanical support and contact integrity.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.

B. Nonconforming Work:

1. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

3.6 PROTECTION

A. After installation, protect enclosed switches and circuit breakers from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 262816

SECTION 265119 – LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes interior LED luminaires, LED luminaires mounted on exterior building surfaces, materials, finishes, supports.

B. Related Requirements:

1. Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting contactors.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 PRE-CONSTRUCTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire callout designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
5. Include emergency lighting units, including batteries, chargers, photometric performance data.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

B. Warranty documents.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. LED Arrays: Furnish at least one of each type.
2. LED Drivers: Furnish at least one of each type.
3. Diffusers and Lenses: Furnish at least one of each type.
4. Globes and Guards: Furnish at least one of each type.

If field replaceable components are not available, furnish at least one fixture of each type in lieu of the extra materials noted above.

1.7 QUALITY ASSURANCE

A. Provide luminaires from a single manufacturer for each luminaire type.

B. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.9 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

A. Standards:

1. Design Lights Consortium (DLC) qualified products list or ENERGY STAR certified.
2. UL 1598, Standard for Luminaires.
3. Recessed luminaires must comply with NEMA LE 4.
4. UL Listing: Listed for damp or wet location as applicable.

B. CRI minimum of 80 CCT.

C. Rated lamp life of 50,000 hours minimum to L70.

D. Lamps dimmable from 100 percent to 0 percent of maximum light output.

E. Internal driver.

F. Input Voltage Tolerance: +/- 10% of nominal rated voltage.

2.2 RECESSED CAN DOWNLIGHT

A. Universal mounting bracket.

B. Integral junction box with conduit fittings.

C. Fixtures installed in the building thermal envelope must be:

1. IC rated.
2. Labeled as having an air leakage rate of not more than 2.0 cfm when tested in accordance with ASTM E283 at a 1.57 psf pressure differential.
3. Sealed with a gasket between the housing and interior wall or ceiling covering.

2.3 EMERGENCY LIGHTING UNITS

A. General: Self-contained units complying with UL 924.

1. LED lamp heads.
2. Battery: Sealed, maintenance-free, nickel-cadmium or nickel metal hydride type with minimum 10-year nominal life and special warranty. Battery sized to provide emergency illumination for not less than 90 minutes.
3. Charger: Fully automatic, solid-state type with sealed transfer relay.
4. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
5. Integral Time-Delay Relay: Holds unit on for fixed interval when power is restored after an outage; time delay permits high-intensity-discharge lamps to restrike and develop adequate output.

2.4 EXIT SIGNS

A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.

B. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum of rated lamp life.

C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

1. Battery: Sealed, maintenance-free, nickel-cadmium or nickel metal hydride type with special warranty. Battery sized to provide emergency illumination for not less than 90 minutes.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

2.5 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.

2.6 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.7 LUMINAIRE SUPPORT

A. Comply with requirements in Section "Basic Materials and Methods" for channel and angle iron supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as luminaire.

D. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gauge**.**

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gauge.

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire mounting devices must be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaire Support:

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls or a minimum 20 gauge backing plate attached to structure.

G. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

H. Ceiling-Grid-Mounted Luminaires:

1. Fixture is to be supported at two (2) opposite ends to the steel frame of the building using the same type of wire as used to support the lay-in ceiling track.
2. Support Clips:

    a. Fasten fixtures to ceiling grid main runner members with manufacturer clips.

3. Fixtures of Sizes Less Than Ceiling Grid Pattern:

    a. Install as indicated on reflected ceiling plans or center in acoustical panel.
    b. Support fixtures independently with at least two 3/4-inch (metal channels spanning and secured to ceiling tees.
    c. Fixture is to be supported at two (2) opposite ends to the steel frame of the building using the same type of wire as used to support the lay-in ceiling track.

4. Luminaire support wires must be color coded and tagged to be distinguishable from the grid support wires.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories; and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal. Perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery must be tested for 90 minutes. The battery test must demonstrate compliance with the requirements of NEC 700.12(I). Repair and/or replace any units that fail the test, then retest.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

END OF SECTION 265119

SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pathways.
2. UTP cabling.
3. Multiuser telecommunications outlet assemblies.
4. Cable connecting hardware and patch panels.
5. Telecommunications outlet/connectors.
6. Cabling system identification products.
7. Cable management system.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. EMI: Electromagnetic interference.

C. IDC: Insulation displacement connector.

D. LAN: Local area network.

E. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

F. RCDD: Registered Communications Distribution Designer.

G. UTP: Unshielded twisted pair.

1.4 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the patch panel located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Bridged taps and splices must not be installed in the horizontal cabling.

B. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment. The maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) in the horizontal cross-connect.

1.5 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system must comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

1.6 SUBMITTALS

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

B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules.
2. Cabling administration drawings and printouts.
3. Patch panels. Detail mounting assemblies and show elevations and physical relationship between the installed components.

C. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

D. Field quality-control reports.

E. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation must be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.

D. Grounding: Comply with ANSI-J-STD-607-A.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of UTP cable for open and short circuits.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 COORDINATION

A. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.11 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Patch-Panel Units: One of each type.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A.

B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

C. Conduit and Boxes: Comply with requirements in Section "Raceway and Boxes."

1. Outlet boxes must be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

2.2 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden CDT Inc.; Electronics Division.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.
4. Draka USA.
5. Genesis Cable Products; Honeywell International, Inc.
6. KRONE Incorporated.
7. Mohawk; a division of Belden CDT.
8. Molex Premise Networks; a division of Molex, Inc.
9. Nordex/CDT; a subsidiary of Cable Design Technologies.
10. Superior Essex Inc.
11. SYSTIMAX Solutions; a CommScope, Inc. brand.
12. 3M.
13. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Description: 100-ohm, 4-pair UTP, covered with a blue thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

    a. Communications, General Purpose: Type CM or CMG.
    b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
    c. Communications, Riser Rated: Type CMR, complying with UL 1666.
    d. Communications, Limited Purpose: Type CMX.
    e. Multipurpose: Type MP or MPG.
    f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
    g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

2.3 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Technology Systems Industries, Inc.
2. Dynacom Corporation.
3. Hubbell Premise Wiring.
4. KRONE Incorporated.
5. Leviton Voice & Data Division.
6. Molex Premise Networks; a division of Molex, Inc.
7. Nordex/CDT; a subsidiary of Cable Design Technologies.
8. Panduit Corp.
9. Siemon Co. (The).
10. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables must be terminated with connecting hardware of same category or higher.

C. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks per Field: One for each four-pair conductor group of cables, plus spares and blank positions adequate to suit specified expansion criteria.

D. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

E. Patch Cords: Factory-made, four-pair cables in 48-inch (1200-mm) lengths; terminated with eight-position modular plug at each end.

1. Patch cords must have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords must have latch guards to protect against snagging.

2.4 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.

B. Workstation Outlets:

1. Two-port-connector assemblies mounted in single faceplate.
2. Four-port-connector assemblies mounted in multigang faceplate.
3. See drawings for other outlet quantities for number of ports. Mount assemblies in multigang faceplate.
4. Metal Faceplate: Stainless steel, complying with requirements in Section "Wiring Devices."
5. For use with snap-in jacks accommodating any combination of UTPwork area cords.

a. Flush mounting jacks.

6. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.5 GROUNDING

A. Comply with requirements in Section "Grounding and Bonding" for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

2.6 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Section " Electrical Identification."

2.7 SOURCE QUALITY CONTROL

A. Factory test UTP cables on reels according to TIA/EIA-568-B.1.

B. Factory test UTP cables according to TIA/EIA-568-B.2.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Wiring Method: Install cables in raceways except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, where unenclosed wiring method may be used. Conceal raceway except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.

B. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF PATHWAYS

A. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Section "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.

B. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

C. Comply with requirements in Section "Raceway and Boxes" for installation of conduits and wireways.

D. Install manufactured conduit sweeps and long-radius elbows whenever possible.

E. Pathway Installation in Communications Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 6 inches (152 mm) above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

3.3 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps must not be used for heating.
9. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
10. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1524 mm) apart.

3. Cable must not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Group connecting hardware for cables into separate logical fields.

F. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

3. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
4. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.4 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.5 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section " Electrical Identification ."

B. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.

C. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.

D. Cable and Wire Identification:

1. Label each cable within 4 inches (100 mm) of each termination, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
3. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

    a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
    b. Label each unit and field within distribution racks and frames.

4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

E. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.

1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect UTP cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. UTP Performance Tests:

    a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

1) Wire map.
2) Length (physical vs. electrical, and length requirements).
3) Insertion loss.
4) Near-end crosstalk (NEXT) loss.
5) Power sum near-end crosstalk (PSNEXT) loss.
6) Equal-level far-end crosstalk (ELFEXT).
7) Power sum equal-level far-end crosstalk (PSELFEXT).
8) Return loss.
9) Propagation delay.
10) Delay skew.

C. Document data for each measurement. Data for submittals must be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

D. End-to-end cabling will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

END OF SECTION 271500

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SYSTEM DESCRIPTION

A. Microprocessor controlled, intelligent reporting fire detection and alarm system.

1.3 SUMMARY

A. Section Includes:

1. Existing fire alarm system to be modified.
2. System smoke detectors.
3. Heat detectors.
4. Carbon monoxide detectors.
5. Interface relay device.

1.4 DEFINITIONS

AHJ	Authority Having Jurisdiction.
AHU	Air Handler Unit.
LED	Light-emitting diode.
NICET	National Institute for Certification in Engineering Technologies.
NRTL	Nationally Recognized Testing Laboratory.

1.5 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the North Carolina State Building Code.

B. Comply with applicable provisions of NFPA 72, National Fire Alarm Code.

C. Equipment supplied shall be specifically listed for its intended use and shall be installed in accordance with the manufacturer's instructions.

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Firms shall be regularly engaged in the manufacture of fire alarm systems of the types, sizes, and electrical characteristics required for this project.
2. The system shall comply with provisions of UL safety standards pertaining to fire detection and alarm systems. Products and components shall be Listed and Labeled.
3. Fire detection and alarm systems and accessories shall be FM approved.
4. Firms shall maintain factory authorized service organization. Firms shall maintain spare parts stock.

B. Designer for Preparation of Shop Drawings and Calculations Qualifications:

1. Personnel shall be trained and certified by manufacturer for system design required for this Project.
2. Personnel shall be certified by NICET as fire-alarm Level II (minimum) technician.

C. Installer Qualifications:

1. Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
2. Supervisor of installation shall be certified by NICET as fire-alarm Level II (minimum) technician.
3. Supervisor of installation shall be certified as an authorized representative of the equipment manufacturer.
4. Minimum of 5 years of experience installing fire detection and alarm systems similar in size and scope to this project.

D. Manufacturer's Field Service Technician Qualifications:

1. Personnel shall be certified by NICET as fire-alarm Level II (minimum) technician.
2. Personnel shall be trained and certified by manufacturer for installation of units specifically required for this Project within the most recent 24 months.
3. If not trained by the manufacturer within 24 months (as noted in 2 above), but within 36 months, NICET fire alarm Level III (minimum) technician certification is required.

E. Source Limitations for Fire-Alarm System and Components:

1. Obtain fire-alarm system equipment and components from a single source.
2. For facilities with existing functional systems in place, new components shall be compatible and listed for use with, and operate as, an extension of existing system.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 SUBMITTALS

A. Qualification Data:

1. Designer:

a. Manufacturer training certification.

b. NICET certification

2. Installer:

a. Manufacturer training certification.
b. NICET certification.
c. Authorized representative of equipment manufacturer certification.
d. Experience documentation; 5 years of similar size & scope projects.

3. Manufacturer Field Service Technician:

a. Manufacturer training certification.
b. NICET certification.

4. Existing Fire Alarm System Manufacturer Certification: Provide system manufacturer's certification that new components to be provided have been tested as, and will operate as, a system with the existing fire alarm panel.

B. Product Data:

1. Manufacturer data for each type of product, equipment, device, etc. proposed.
2. Duct detectors: Provide performance parameters and installation details for detectors, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.

C. Installation Instructions: Manufacturer's detailed installation instructions duct mounted smoke detectors which require mechanical installation.

D. Sample Warranty Statement.

E. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "System Record of Completion" document with "Completion Documents" Article in "Documentation" chapter in NFPA 72.
3. Technical literature for all control equipment, devices, isolation modules, relays, power supplies, alarm/supervisory signal initiating devices, etc. Include maintenance data and parts lists. Include circuit diagrams of all control panels, modules, annunciators, communications panels, etc.

1.8 PROJECT CONDITIONS

A. Existing Fire Alarm System to Be Modified

1. An existing Firelite MS-10UD fire alarm control panel is located in the storage room in the main office area.

2. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as required by code. Report deficiencies to the Architect/Engineer/Owner.
3. All new devices, equipment, and components shall be compatible with and operate as an extension of the existing system.
4. Field verify existing zone quantities, device quantities, power supplies, circuitry configurations, NAC loads, battery data, etc. in order to gather sufficient information to provide accurate submittal information for existing system expansion capabilities.

B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide 24-hour fire watch personnel:

1. Notify Architect/Engineer/Owner no fewer than two weeks in advance of proposed interruption of fire-alarm service.
2. Do not proceed with interruption of fire-alarm service without Owner's written permission.

1.9 WARRANTY

A. Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail because of defects in materials or workmanship within one year from the date of final inspection and acceptance by the Owner.

PART 2 - PRODUCTS

2.1 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Carbon monoxide detectors.

B. Fire-alarm signal shall initiate the following actions:

1. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode. Typically, shutdown of all HVAC equipment will be initiated.

2.2 FIRE-ALARM CONTROL UNIT

A. Circuits:

1. Initiating Device Circuits (IDC): NFPA 72 Class B.

2. Wiring Methods:

   a. All fire alarm circuitry shall be in ¾" minimum metal conduit. Use surface metal raceway where exposed. Junction boxes and covers not in finished areas shall be painted red. PVC conduit may be used underground, in concrete, or in locations subject to severe corrosion.
   b. All other circuits shall be wired with 14 AWG minimum, stranded copper, type THHN/THWN conductors. Color codes follow:

      1) Initiating Circuits, General: Red(+) / White(-).
      2) Initiating Circuits, Smoke Only: Violet(+) / Gray(-).
      3) Notification Appliance / alarm initiating circuits: Blue(+) / Black(-).
      4) AHU Shutdown Circuits: Yellow(+) / Brown(-).
      5) Separate 24 VDC operating power (for equipment): Yellow(+) / Brown(-).
      6) Circuits from zone adapter modules (ZAMs) to monitored devices: Violet(+) / Gray(-).

   c. Conduits that penetrate exterior walls shall be sealed with non-hardening electrical putty to prevent condensation infiltration.
   d. Splices are allowed only at device terminals or on terminal blocks in cabinets.
   e. Terminal block screws shall have pressure wire connectors of the self-lifting or box lug type.

2.3 SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Four-wire type detectors may be required if connecting to an existing four-wire system.
3. Integral Visual-Indicating Lights: Provide both alarm and power LEDs, flashing under normal conditions. LEDs shall burn steady, to indicate an alarm condition.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring. Provide terminals in the fixed base for connection of a remote alarm LED.
5. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
6. Test Means: Provide a means to simulate an alarm condition and report to the FACU. Test shall be initiated at the detector (activation of a magnetic switch).

B. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Each sensor shall have multiple levels of detection sensitivity.
2. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied. Extend the full width of the duct and provide end support for those over 36" long.
3. Provide a Remote Alarm Indicating Light (RAIL) with test switch for each duct detector, installed in the nearest corridor or public area.
4. Provide a hinged duct access panel, 12"x12" minimum, for sampling tube inspection and cleaning.

5. Weatherproof Duct Housing Enclosure: Where installed outside or in damp or wet locations, provide NEMA 250, Type 4X; NRTL listed for use with the supplied detector.

2.4 HEAT DETECTORS

A. General Requirements for Heat Detectors:

1. Comply with UL 521.
2. Integral Visual-Indicating Lights: Provide both alarm and power LEDs, flashing under normal conditions. LEDs shall burn steady, to indicate an alarm condition.
3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring. Provide terminals in the fixed base for connection of a remote alarm LED.
4. Use electronic sensor to measure thermal conditions caused by fire.

B. Heat Detector, Combination Type:

1. Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
2. Fixed-temperature sensing shall be independent of rate-of-rise sensing.
3. Mounting: Twist-lock base interchangeable with smoke-detector bases.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 194 deg F.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.

2.5 CARBON MONOXIDE DETECTORS

A. Description: A device that detects the presence of a specific carbon monoxide concentration.

B. UL FTAM - Carbon Monoxide Detectors:

1. Detector sounder base emits Temporal-4 signal.
2. Testable by introducing test carbon monoxide into sensing cell.

2.6 RELAY INTERFACE DEVICES

A. Interface Relays:

1. For use in auxiliary control functions, operating as a dry contact relay.
2. Typical equipment control functions would include direct signals to shut down mechanical equipment under fire alarm conditions.

2.7 SURGE PROTECTION

A. DC Circuits Extending Outside Building:

1. Mount inside the building, near the point of entry to or exit from each building in a labeled enclosure.
2. Provide "pi"-type filter on each conductor, consisting of primary arrestor, series impedance, and fast-acting secondary arrestor that clamps at 30-40V.
3. A minimum of 36" of conductor length shall be provided between the "pi"-type filter and the first system device in the building.
4. Acceptable models: Citel America #B280-24VD3, Ditek #DTK-2MHLP24BWB, Simplex #2081-9027/9028.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Existing Fire Alarm System to Be Modified

1. Perform a full test of the existing system prior to starting work. Document any equipment or components not functioning as required by code. Report deficiencies to the Architect/Engineer/Owner.
2. Field verify existing device quantities, power supplies, circuitry configurations, etc. in order to gather sufficient information to provide accurate submittal information for new voltage drop and battery calculations.
3. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide 24-hour fire watch personnel:

    a. Notify Architect/Engineer/Owner no fewer than two weeks in advance of proposed interruption of fire-alarm service.
    b. Do not proceed with interruption of fire-alarm service without Owner's written permission.

C. Equipment and Device Mounting:

1. Install devices securely attached to walls, ceilings, floors, building structure. Hardware and supports shall be suitable for the load supported. Ceiling mounted devices shall not be supported solely by suspended ceilings.

D. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.

3. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.
4. When installed in a room, orient so that the alarm LED is visible from the nearest door to the corridor.

E. Duct Smoke Detectors:

1. Comply with NFPA 72 and NFPA 90A.
2. Install sampling tubes so they extend the full width of duct, and install detectors and sampling tubes in a manner that provides convenient access for periodic cleaning and calibration. Sampling tubes over 36" long shall be supported at both ends.
3. Each installation shall have a hinged or latched duct access panel (12"x12" minimum) for sampling tube inspection and cleaning. Provide a permanent decal on duct indicating air flow direction.
4. Each duct detector shall have a RAIL installed in the nearest corridor or public area, identified with an engraved label affixed to the wall or ceiling.
5. Proper installation of duct detectors and access doors shall be coordinated between the Electrical Contractor subcontractor, Mechanical Contractor subcontractor, Fire Alarm subcontractor, and approved by the Engineer prior to equipment installation.

F. Detector Protection:

1. Unless suitably protected from dust, paint, etc.; detectors shall not be installed until final construction clean-up is complete. If contaminated, detectors shall be replaced.
2. Where accidental damage or deliberate abuse is anticipated, provide a protective guard that is listed for use with the detector and is acceptable to the AHJ.

G. Audible Alarm-Indicating Devices: Unless ceiling mounted, install not less than 6 inches below the ceiling. Install horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

H. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn; and unless ceiling mounted, install at least 6 inches below the ceiling.

3.2 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section " Electrical Identification."

B. Appliances shall be labeled with unique numbers that are indicated on as-built drawings and permanently mounted on device bases. Labels shall be legible from floor level. Detectors shall be labeled uniquely and sequentially starting at the FACU with device designations. Labels shall be printed black lettering on clear background and attached to the device base.

C. Junction and pull box covers shall be labeled to indicate the circuits or function of the conductors contained in the boxes. Labels shall be neatly applied with black lettering on clear background.

D. Conductors shall be labeled with permanent wire markers at connections at the FACU, other control equipment, power supplies, and terminal cabinets.

3.3 FIELD QUALITY CONTROL

A. Final field tests shall be witnessed by authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service technician to make necessary connections to the FACU; to program the system; to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

    a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
    b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. Conductor Testing: All conductors shall be tested for grounds, opens and shorts prior to termination at panels and installation of detector heads. Conductors shall be megger tested for a minimum of 10 megohms from conductor to ground and conductor to conductor. Provide record of test results to Engineer in advance of acceptance inspection.
3. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
4. Factory-authorized service representative shall prepare the NFPA 72 "Fire Alarm System Record of Completion" form. Submit "Fire Alarm System Record of Completion" form to Engineer for delivery to Owner.
5. After system test and submission of "Fire Alarm System Record of Completion" form, request Engineer to schedule an AHJ acceptance inspection, a minimum of 2 days after completion of system testing.
6. For AHJ acceptance inspection, perform sampling testing as directed by AHJ for detectors and functional tests. Provide 2-way radios, ladders, smoke source, and other materials needed for testing the system.

D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 283111